



# City of Tacoma Tacoma Public Library

# REQUEST FOR BIDS LB23-0178F Main Library Remodel

Submittal Deadline: 11:00 a.m., Pacific Time, Tuesday, October 3rd, 2023

Submittals must be received by the City's Procurement and Payables Division prior to 11:00 a.m. Pacific Time.

For electronic submittals, the City of Tacoma will designate the time of receipt recorded by our email, <a href="mailto:sendbid@cityoftacoma.org">sendbid@cityoftacoma.org</a>, as the official time of receipt. This clock will be used as the official time of receipt of all parts of electronic bid submittals. Late submittals will be returned unopened and rejected as non-responsive.

**Submittal Delivery:** Sealed submittals will be received as follows:

## By Email:

sendbid@cityoftacoma.org

Maximum file size: 35 MB. Multiple emails may be sent for each submittal

**Bid Opening:** Sealed submittals in response to a RFB will be opened Tuesday's at 11:15 AM by a purchasing representative and read aloud during a public bid opening held at the Tacoma Public Utilities Administrative Building North, 3628 S. 35<sup>th</sup> Street, Tacoma, WA 98409, conference room M-1, located on the main floor. They will also be held virtually Tuesday's at 11:15 AM. Attend <u>via this link</u> or call 1 (253 215 8782. Submittals in response to an RFP, RFQ or RFI will be recorded as received. As soon as possible, after 1:00 PM, on the day of submittal deadline, preliminary results will be posted to <u>www.TacomaPurchasing.org.</u>

**Solicitation Documents:** An electronic copy of the complete solicitation documents may be viewed and obtained at the City's plan distribution service provider, ARC, 632 Broadway, Tacoma, WA, or by going to <a href="http://www.e-arc.com/location/tacoma">http://www.e-arc.com/location/tacoma</a>. Prospective bidders will be required to pay reproduction costs. A list of vendors registered for this solicitation is also available at their website.

**Pre-Proposal Meeting:** A pre-proposal meeting will be held at 1102 Tacoma Ave. S, Tacoma WA 98402 on September 13<sup>th</sup>, 2023 at 10:00 AM.

**Project Scope:** Demo existing interior conditions, remove and replace carpeting and lighting, demo existing and rebuild central staircase, build new bathrooms, construct new interior walls.

Estimate: \$5,600,000

**Paid Sick Leave:** The City of Tacoma requires all employers to provide paid sick leave as set forth in Title 18 of the Tacoma Municipal Code and in accordance with State of Washington law.

Americans with Disabilities Act (ADA Information: The City of Tacoma, in accordance with Section 504 of the Rehabilitation Act (Section 504 and the Americans with Disabilities Act (ADA, commits to nondiscrimination on the basis of disability, in all of its programs and activities. Specification materials can be made available in an alternate format by emailing the contact listed below in the *Additional Information* section.

**Title VI Information:** "The City of Tacoma" in accordance with provisions of Title VI of the Civil Rights Act of 1964, (78 Stat. 252, 42 U.S.C. sections 2000d to 2000d-4 and the Regulations, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin in consideration of award.

**Additional Information:** Requests for information regarding the specifications may be obtained by contacting Tina Eide, Senior Buyer by email to <a href="mailto:teide@cityoftacoma.org">teide@cityoftacoma.org</a>.

**Protest Policy:** City of Tacoma protest policy, located at <a href="https://www.tacomapurchasing.org">www.tacomapurchasing.org</a>, specifies procedures for protests submitted prior to and after submittal deadline.

F

Meeting sites are accessible to persons with disabilities. Reasonable accommodations for persons with disabilities can be arranged with 48 hours advance notice by calling 253-502-8468.

Form No. SPEC-040C Revised: 07/11/2023

#### SPECIAL REMINDER TO ALL BIDDERS

HEALTH & SAFETY: Be sure to comply with all City of Tacoma health and safety requirements.

PLEASE NOTE: Be sure you have complied with all specifications and requirements and have signed all required documents.

YOUR ATTENTION IS PARTICULARLY CALLED to the following forms, which must be executed in full and submitted with your bid response:

- 1. <u>BID PROPOSAL</u>: The unit prices bid must be shown in the space provided. Check your computations for omissions and errors.
- SIGNATURE PAGE: To be filled in and executed by a duly authorized officer or representative of the bidding entity. If the bidder is a subsidiary or doing business on behalf of another entity, so state, and provide the firm name under which business is hereby transacted.
- 3. <u>BID BOND</u>: The Bid Bond must be executed by the person legally authorized to sign the bid, and must be properly signed by the representatives of the surety company unless the bid is accompanied by a certified check. If Bid Bond is furnished, the form furnished by the City must be followed; no variations from the language thereof will be accepted. The amount of the Bid Bond must be not less than 5% of the total amount bid.
- CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUTES: Bidder shall complete this form in its entirety to ensure compliance with state legislation (SHB 2017).
- STATE RESPONSIBILITY AND RECIPROCAL BID PREFERENCE INFORMATION: Bidder shall complete this form in its entirety to ensure compliance with state legislation (SHB 2010).
- 6. <u>LIST OF SUBCONTRACTOR CATEGORIES OF WORK:</u> Bidder shall list all subcontractor(s) proposed to perform the work of heating, ventilation and air conditioning, plumbing, as described in Chapter 18.106 RCW and electrical as described in Chapter 19.28 RCW. Bidder shall also list all subcontractor(s) proposed to perform the work of structural steel installation and/or rebar installation.

FAILURE TO LIST SUBCONTRACTORS WILL RESULT IN THE BID BEING NON-RESPONSIVE AND THEREFORE VOID.

7. <u>STATEMENT OF QUALIFICATIONS:</u> The Contractor or subcontractor shall fill out this form in its entirety proving they meet the requirements as outlined in these specifications. It shall be the sole determination of the Engineer to determine if the Contractor/subcontractor does in fact meet the requirements. This is a condition of award of the Contract.

## 8. EQUITY IN CONTRACTING (EIC) UTILIZATION FORM

Bidders shall complete the Equity in Contracting Utilization Form in accordance with the City of Tacoma Equity in Contracting Regulations Manual and Chapter 1.07 of the City of Tacoma Municipal Code (TMC). This form shall be fully and accurately completed and returned with submission of the Bid and will be used to determine if the Bidder is in compliance with the EIC regulations and the TMC.

As part of the City of Tacoma's ongoing work to address past disparities and to increase the City's contracting with and utilization of historically underutilized businesses, the Equity in Contracting (EIC) Program places requirements on City contracts for utilization of businesses certified by the Washington State Office of Minority and Women's Business Enterprise and approved by the Equity in Contracting Program ("Certified Businesses"). The EIC Program also provides guidance and technical assistance to Certified Businesses who are interested in providing supplies, services and public works to the City of Tacoma. The EIC Program requirements are contained in Tacoma Municipal Code Chapter 1.07.

See City of Tacoma – Equity In Contracting Program section for additional information.

## **POST AWARD FORMS EXECUTED UPON AWARD:**

- A. CONTRACT: Must be executed by the successful bidder.
- B. PAYMENT BOND TO THE CITY OF TACOMA: Must be executed by the successful bidder and his/her surety company.
- C. PERFORMANCE BOND TO THE CITY OF TACOMA: Must be executed by the successful bidder and his/her surety company.
- D. CERTIFICATE OF INSURANCE: Shall be submitted with all required endorsements.
- E. LEAP UTILIZATION PLAN: Shall be submitted at the Pre-Construction Meeting.
- F. GENERAL RELEASE.

**CODE OF ETHICS**: The successful bidder agrees that its violation of the City's Code of Ethics contained in TMC Chapter 1.46 shall constitute a breach of the contract subjecting the contract to termination.

## LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM (LEAP):

The Local Employment and Apprenticeship Training Program (LEAP) has been adopted to counteract economic and social ills, which accompany high rates of unemployment within the City of Tacoma. The Tacoma City Council established the mandatory LEAP program for public works contracts pursuant to Ordinance No. 28520. The primary goal is to provide an

opportunity for City of Tacoma residents and Tacoma Public Utilities ratepayers to enter apprenticeship programs, acquire skills, and perform work that will provide living wages.

## LEAP Goals:

- Local Employment Utilization Goal Prime contractor is required to ensure that 15
  percent of the labor hours worked on the project are performed by residents of the City
  of Tacoma or local economically distressed areas, whether or not such person is an
  Apprentice.
- 2. Apprentice Utilization Goal Prime contractor is required to ensure that 15 percent of the labor hours worked on the project are performed by Apprentices who reside in the Tacoma Public Utilities service area.

NOTE: If both goals are assigned to this project, the two goals can be satisfied concurrently if the prime contractor utilizes individuals who simultaneously meet the requirements of both goals, such as an apprentice who resides in the City of Tacoma or in a local economically distressed area.

See City of Tacoma – Local Employment and Apprenticeship Training Program section for additional information.

## CITY OF TACOMA FINANCE/PURCHASING DIVISION SPECIAL NOTICE TO BIDDERS

Public works and improvement projects for the City of Tacoma are subject to Washington state law and Tacoma Municipal Code, including, but not limited to the following:

## I. STATE OF WASHINGTON

## A. RESPONSIBILITY CRITERIA - STATE OF WASHINGTON

In order to be considered a responsible bidder the bidder must meet the following mandatory state responsibility criteria contained in RCW 39.04.350:

- 1. Have a current certificate of registration as a contractor in compliance with chapters 18.27 RCW, 18.106 RCW, 70.87 RCW, 19.28 RCW, which must have been in effect at the time of bid submittal;
- 2. Have a current Washington Unified Business Identifier (UBI) number;
- 3. If applicable:
  - a. Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW;
  - b. Have a Washington Employment Security Department number, as required in Title 50 RCW:
  - c. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW and;
- 4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 (unlicensed or unregistered contractors) or 39.12.065(3) (prevailing wage).
- 5. Have received training on the requirements related to public works and prevailing wage under this chapter and chapter 39.12 RCW and must designate a person or persons to be trained on these requirements. The training must be provided by the department of labor and industries or by a training provider whose curriculum is approved by the department. Bidders that have completed three or more public works projects and have had a valid business license in Washington for three or more years are exempt from this subsection.

## **B. RECIPROCAL PREFERENCE FOR RESIDENT CONTRACTORS:**

Effective March 30, 2012, RCW 39.04.380 imposes a reciprocal preference for resident contractors. Any bid received from a non-resident contractor from a state that provides an instate percentage bidding preference is subject application of a comparable percentage disadvantage.

A non-resident contractor from a state that provides an in-state percentage bidding preference means a contractor that:

- 1. Is from a state that provides a percentage bid preference to its resident contractors bidding on public works projects, and
- 2. Does not have a physical office located in Washington at the time of bidding on the City of Tacoma public works project.

The state of residence for a non-resident contractor is the state in which the contractor was incorporated, or if not a corporation, the state in which the contractor's business entity was formed.

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The City of Tacoma will evaluate all non-resident contractors for an out of state bidder preference. If the state of the non-resident contractor provides an in state contractor preference, a comparable percentage disadvantage will be applied to the non-resident contractor's bid prior to contract award. The responsive and lowest and best responsible bidder after application of any non-resident disadvantage will be awarded the contract.

The reciprocal preference evaluation does not apply to public works procured pursuant to RCW 39.04.155, RCW 39.04.280, federally funded competitive solicitations where such agencies prohibit the application of bid preferences, or any other procurement exempt from competitive bidding.

Bidders must provide the City of Tacoma with their state of incorporation or the state in which the business entity was formed and include whether the bidder has a physical office located in Washington.

The bidder shall submit documentation demonstrating compliance with above criteria on the enclosed State Responsibility and Reciprocal Bidder Information form.

#### C. SUBCONTRACTOR RESPONSIBILITY

- The Contractor shall include the language of this subcontractor responsibility section in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. The requirements of this section apply to all subcontractors regardless of tier.
- 2. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:
  - a. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
  - b. Have a current Washington Unified Business Identifier (UBI) number;
  - c. If applicable, have:
  - a. Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW;
  - b. A Washington Employment Security Department number, as required in Title 50 RCW:
  - c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
  - d. An electrical contractor license, if required by Chapter 19.28 RCW;
  - e. An elevator contractor license, if required by Chapter 70.87 RCW and:
- 3. Not be disqualified from bidding on any public works contract under RCW 39.06.010 (unlicensed or unregistered contractors) or 39.12.065(3) (prevailing wage).

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## **II. CITY OF TACOMA**

## A. SUPPLEMENTAL RESPONSIBILITY CRITERIA - CITY OF TACOMA:

In order to be considered a responsible bidder, the prospective bidder shall have all of the following qualifications set forth in Tacoma Municipal Code 1.06.262:

- 1. Adequate financial resources or the ability to secure such resources;
- 2. The necessary experience, stability, organization and technical qualifications to perform the proposed contract;
- 3. The ability to comply with the required performance schedule, taking into consideration all existing business commitments:
- 4. A satisfactory record of performance, integrity, judgment and skills; and
- 5. Be otherwise qualified and eligible to receive an award under applicable laws and regulations.
  - a. Bidder Responsibility. Bidders shall not be in violation of 39.04.350 RCW Bidder Responsibility Criteria Supplemental Criteria.

In addition to the mandatory bidder responsibility criteria listed immediately above, the City may, in addition to price, consider any or all of the following criteria contained in Tacoma Municipal Code Chapter 1.06.262 in determining bidder responsibility:

- 1. The ability, capacity, experience, stability, technical qualifications and skill of the respondent to perform the contract;
- 2. Whether the respondent can perform the contract within the time specified, without delay or interference:
- 3. Integrity, reputation, character, judgment, experience, and efficiency of the respondents, including past compliance with the City's Ethics Code;
- 4. Quality of performance of previous contracts;
- 5. Previous and existing compliance with laws and ordinances relating to contracts or services:
- 6. Sufficiency of the respondent's financial resources;
- 7. Quality, availability, and adaptability of the supplies, purchased services or public works to the particular use required;
- 8. Ability of the respondent to provide future maintenance and service on a timely basis:
- 9. Payment terms and prompt pay discounts:
- 10. The number and scope of conditions attached to the submittal:
- 11. Compliance with all applicable City requirements, including but not limited to the City's Ethics Code and its Equity in Contracting and Local Employment and Apprenticeship Training programs;
- 12. Other qualification criteria set forth in the specification or advertisement that the appropriate department or division head determines to be in the best interests of the City.

The City may require bidders to furnish information, sworn or certified to be true, to demonstrate compliance with the City responsibility criteria set forth above. If the city manager or director of utilities is not satisfied with the sufficiency of the information provided, or if the prospective respondent does not substantially meet all responsibility requirements, any submittal from such respondent must be disregarded.

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## B. ADDITIONAL SUPPLEMENTAL CRITERIA - NOT APPLICABLE

## C. MODIFICATIONS TO SUPPLEMENTAL CRITERIA

Potential bidders may request modifications to the City's **supplemental criteria** by submitting a written request to the Purchasing Division via email to <a href="mailto:bids@cityoftacoma.org">bids@cityoftacoma.org</a> no later than 5:00 p.m. Pacific Time, three days prior to the submittal deadline. Please include the Specification No. and Title when submitting such requests. Requests must include justification for why certain criteria should be modified. Requests received after this date and time will not be considered.

The City will respond to a timely submitted request prior to the bid opening date. Changes to the supplemental criteria, if warranted, will be issued by addendum to the solicitation documents and posted to the City's website for the attention of all prospective bidders.

## D. DETERMINATION OF BIDDER RESPONSIBILITY

If the City determines the bidder does not meet the criteria above and is therefore not a responsible bidder, the City shall notify the bidder in writing with the reasons for its determination. If the bidder disagrees, the bidder may appeal the determination in a manner consistent with the City's Protest Policy. Appeals are coordinated by the Purchasing Division heard by the Procurement and Payables Division manager for contracts less than or equal to \$500,000 and by Contracts and Awards Board for contracts greater than \$500,000.

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## **BIDDER QUESTION FORM**

## **Main Library Remodel**

SPECIFICATION NO.: LB23-0178F

Prospective bidders must submit questions or clarifications in writing on this form allowing time for a written reply to reach all prospective bidders before the submission of the bids. Bidder questions shall be submitted on this form via e-mail to:

Tina Eide, Senior Buyer.

E-mail address: teide@cityoftacoma.org

All e-mails must be received by **Noon on Friday, September 22, 2023**. Where changes in the project documents are required, an addendum will be issued to everyone on the plan holder's list and posted on <a href="https://www.tacomapurchasing.org">www.tacomapurchasing.org</a>.

I have the following question(s):		
Submitted by:		
Cabillition by:	Name	
	Representing	
	Address	
	Phone Number	

## SUBSTITUTION REQUEST FORM

## **Main Library Remodel**

SPECIFICATION NO.: LB23-0178F

Prospective bidders may request substitutions in writing on this form. Substitutions shall be submitted on this form via e-mail to:

Tina Eide, Senior Buyer.

E-mail address: teide@cityoftacoma.org

All e-mails must be received by **Noon on Friday, September 22, 2023.** Where changes in the project documents are required, an addendum will be issued to everyone on the plan holder's list and posted on <a href="https://www.tacomapurchasing.org">www.tacomapurchasing.org</a>.

Submitted By			
Signature			
Company			
Mailing Address			
City			Zip
Phone	Fax	E-r	mail
Please check if there	are attachments		
1. We hereby submit	for your consideration	n the following product	t instead of the specified item for the above project:
Section	<u>Page</u>	Line/Paragraph	Specified Item
2. Proposed Substitu	tion.		
3. Reason for Substit			
4. Attach complete to be noted with any		g cuts, drawings, sampl	es, etc. Exact models and description of products sha
5. Include complete	information on chang	ges to Drawings, and/or	Specifications which proposed substitution will
require for its proper	installation.		
6a. If so, how?			
7. Describe the effec	t substitution has on	other trades.	
8. Describe difference	es between proposed	d substitution and speci	fied item
			s are: Same Different (explain on attachment) or superior to the specified item. The undersigned agrees to pay for

changes to the building and systems design, including engineering and detailing costs caused by the requested substitution.

## SUBSTITUTION REQUEST FORM

Main Library Remodel SPECIFICATION NO.: LB23-0178F

For Reviewer			
☐ Approved for	Bidding subject to review and app	proval of Submittals (and as noted below)	Rejected - Inadequate Information
☐ Not Accepted	Received Too Late		
Ву	41	Date	_
Remarks			

## **VOLUME ONE**

Cover

Request for Bids Special Reminder to All Bidders Special Notice to Bidders Bidder Question Form

Substitution Request Form

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00.04.00	LIVANO Considerate Dining

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(Revised December 15, 2020)

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SECTION I REQUIREMENTS ARE BINDING ON ALL RESPONDENTS.

#### 1.01 USE AND COMPLETION OF CITY PROPOSAL SHEETS

#### A. Respondent's Proposal

Each Respondent must bid exactly as specified on the Proposal sheets. All proposals must remain open for acceptance by the City for a period of at least 60 calendar days from the date of opening of the bids.

#### B. Alterations of Proposals Not Allowed

Proposals that are incomplete or conditioned in any way contain alternatives or items not called for in the General Provisions and Specifications, or not in conformity with law may be rejected as being nonresponsive. The City cannot legally accept any proposal containing a substantial deviation from these Specifications.

## C. Filling Out City Proposal Sheets

All proposals must be completed using the proposal sheets and forms included with this specification, and the prices must be stated in figures either written in ink or typewritten. No proposal having erasures or interlineations will be accepted unless initialed by the Respondent in ink.

#### 1.02 CLARIFICATION OF PROPOSAL FOR RESPONDENT

If a prospective Respondent has any questions concerning any part of the Proposal, he/she may submit a written request for answer of his/her questions. Any interpretation of the Proposal will be made by an Addendum duly issued and mailed or delivered to each prospective Respondent. Such addendum must be acknowledged in the proposal. The City of Tacoma will not be responsible for any other explanation or interpretation of the bid documents.

#### 1.03 RESPONDENT'S BOND OR CERTIFIED CHECK

Each bid for construction must be accompanied either by a certified or cashier's check for 5 percent of the total amount bid, including tax, payable to the City Treasurer, or an approved bid bond, by a surety company authorized to do business in the State of Washington, for 5 percent of the total amount bid. The person legally authorized to sign the bid must sign all bid bonds. The approved bid bond form attached to these Specifications should be used: no substantial variations from the language thereof will be accepted.

If a bid bond is used, the 5 percent may be shown either in dollars and cents, or the bid bond may be filled in as follows, "5 percent of the total amount of the accompanying proposal."

The check of the successful Respondent will be returned after award of the Contract, acceptance of the Payment and Performance Bond and City's receipt of the signed Contract. The checks of all other Respondents will be returned immediately upon the award of the Contract. Bid bonds will not be returned.

## 1.04 DELIVERY OF PROPOSALS TO THE CITY'S PURCHASING OFFICE

- **A.** Proposal packages must be received by the City's Procurement and Payables Division in SAP Ariba (unless another form of delivery is stated), prior to the scheduled time and date stated in the Solicitation.
- **B.** Supplier is solely responsible for timely delivery of its Submittal.
- **C.** Submittals received after the time stated in the solicitation will not be accepted.
- **D.** For purposes of determining whether a Submittal has been timely received in SAP Ariba, the City's Procurement and Payables Division will rely on the submittal clock in SAP Ariba.

#### 1.05 LICENSES/PERMITS

- A. Suppliers, if applicable, must have a Washington state business license at the time of Submittal and throughout the term of the Contract. Failure to include a Washington state business license may be grounds for rejection of the Submittal or cancellation of contract award. Information regarding Washington state business licenses may be obtained at <a href="http://bls.dor.wa.gov">http://bls.dor.wa.gov</a>.
- B. Upon award, it is the responsibility of the Supplier to register with the City of Tacoma's Tax and License Division, 733 South Market Street, Room 21, Tacoma, WA 98402-3768, 253-591-5252, <a href="https://www.cityoftacoma.org/government/city\_departments/finance/tax\_and\_license/">https://www.cityoftacoma.org/government/city\_departments/finance/tax\_and\_license/</a>. Supplier shall obtain a business license as is required by Tacoma Municipal Code Subtitle 6C.20.
- C. During the term of the Contract, Supplier, at its expense, shall obtain and keep in force any and all necessary licenses and permits.

## 1.06 CONTRACTOR'S STATE REGISTRATION NUMBER

Contractors for construction or public works construction are required to be licensed by the state. If the provisions of Chapter 18.27 of the Revised Code of Washington apply to the Respondent, then the Respondent's Washington State Contractor's Registration No. must accompany the bid.

## 1.07 BID IS NONCOLLUSIVE

The Respondent represents by the submission of the Proposal that the prices in this Bid are neither directly nor indirectly the result of any formal or informal agreement with another Respondent.

#### 1.08 EVALUATION OF BID

## A. Price, Experience, Delivery Time and Responsibility

In the evaluation of bids, the Respondent's experience, delivery time, quality of performance or product, conformance to the specifications and responsibility in performing other contracts (including satisfying all safety requirements) may be considered in addition to price. In addition, the bid evaluation factors set forth in City Code Section 1.06.262 may be considered by the City. Respondents who are inexperienced or who fail to properly perform other contracts may have their bids rejected for such cause.

#### **B. Pregualified Electrical Contractor**

Certain types of electrical construction require special expertise, experience, and prequalification of the Contractor (or subcontractor) by the City. In such cases, the Respondent must be prequalified or the Respondent must subcontract with a City prequalified electrical contractor for the specialty work.

### C. Insertions of Material Conflicting with Specifications

Only material inserted by the Respondent to meet requirements of the Specifications will be considered. Any other material inserted by the Respondent will be disregarded as being nonresponsive and may be grounds for rejection of the Respondent's Proposal.

## D. Correction of Ambiguities and Obvious Errors

The City reserves the right to correct obvious errors in the Respondent's proposal. In this regard, if the unit price does not compute to the extended total price, the unit price shall govern.

## 1.09 WITHDRAWAL OF BID

## A. Prior to Bid Opening

Any Respondent may withdraw his/her Proposal prior to the scheduled bid opening time by delivering a written notice to the City's Procurement and Payables Office. The notice may be submitted in person or by mail; however, it must be received by the City's Procurement and Payables Office prior to the time of bid opening.

### B. After Bid Opening

No Respondent will be permitted to withdraw his/her Proposal after the time of bid opening, as set forth in the Call for Bids, and before the actual award of the Contract, unless the award of Contract is delayed more than sixty (60) calendar days after the date set for bid opening. If a delay of more than 60 calendar days does occur, then the Respondent must submit written notice withdrawing his/her Proposal to the Purchasing Manager.

#### 1.10 OPENING OF BIDS

At the time and place set for the opening of bids, all Proposals, unless previously withdrawn, will be publicly opened and read aloud, irrespective of any irregularities or informalities in such Proposal.

## 1.11 CITY COUNCIL/PUBLIC UTILITY BOARD FINAL DETERMINATION

The City Council or Public Utility Board of the City of Tacoma shall be the final judge as to which is the lowest and best bid in the interest of the City of Tacoma. The City reserves the right to reject any and all bids, waive minor deviations or informalities, and if necessary, call for new bids.

#### 1.12 RESPONDENT'S REFUSAL TO ENTER INTO CONTRACT

Any Respondent who refuses to enter into a Contract after it has been awarded to the Respondent will be in breach of the agreement to enter the Contract and the Respondent's certified or cashier's check or bid bond shall be forfeited.

#### **1.13 TAXES**

## A. Include in Proposal All Taxes

Respondent shall include in his/her Proposal all applicable local, city, state, and federal taxes. It is the Respondent's obligation to state on his/her Proposal sheet the correct percentage and total applicable Washington State and local sales tax. The total cost to the City including all applicable taxes may be the basis for determining the low Respondent.

#### B. Federal Excise Tax

The City of Tacoma is exempt from federal excise tax. Where applicable, the City shall furnish a Federal Excise Tax Exemption certificate.

#### C. City of Tacoma Business and Occupation Tax

Sub-Title 6A of the City of Tacoma Municipal Code (TMC) provides that transactions with the City of Tacoma, may be subject to the City of Tacoma's Business and Occupation Tax. It is the responsibility of the Respondent awarded the Contract to register with the City of Tacoma's Department of Tax and License, 733 South Market Street, Room 21, Tacoma, WA 98402-3768, telephone 253-591-5252. The City's Business and Occupation Tax amount shall not be shown separately but shall be included in the unit and/or lump sum prices bid.

## 1.14 FIRM PRICES/ESCALATION

Except as specifically allowed by the Special Provisions, only firm prices will be accepted.

#### **1.15 AWARD**

#### A. Construction and/or Labor Contracts

Unless specifically noted in the Special Provisions or Proposal sheets, all construction and/or labor contracts will be awarded to only one Respondent.

#### B. Supply/Equipment Contracts

The City reserves the right to award an equipment or supply contract for any or all items to one or more Respondents as the interests of the City will be best satisfied.

#### 1.16 INCREASE OR DECREASE IN QUANTITIES

The City of Tacoma reserves the right to increase or decrease the quantities of any items under this Contract and pay according to the unit prices quoted in the Proposal (with no adjustments for anticipated profit).

## 1.17 EXTENSION OF CONTRACT

Contracts resulting from this specification shall be subject to extension by mutual agreement per the same prices, terms and conditions.

#### 1.18 PAYMENT TERMS

- A. Prices will be considered as net 30 calendar days if no cash discount is shown. Payment discount periods of twenty (20) calendar days or more if offered in the submittal, will be considered in determining the apparent lowest responsible submittal. Discounts will be analyzed in context of their overall cumulative effect. Invoices will not be processed for payment nor will the period of cash discount commence until receipt of a properly completed invoice and until all invoiced items are received and satisfactory performance of the Contractor has been attained. If an adjustment in payment is necessary due to damage or dispute, the cash discount period shall commence on the date final approval for payment is authorized.
- **B.** ePayable/Credit Card Acceptance. Submittals offering ePayable/Credit card acceptance may be compared against submittals offering a prompt payment discount to evaluate the overall cumulative effect of the discount against the advantage to the City of the ePayable/Credit card acceptance, and may be considered in determining the apparent lowest responsible submittal.

#### 1.19 PAYMENT METHOD - EPAYABLES - CREDIT CARD ACCEPTANCE - EFT/ACH ACCEPTANCE

- A. Payment methods include:
  - EPayables (Payment Plus). This is payment made via a virtual, single use VISA card number
    provided by the City's commercial card provider. Suppliers accepting this option will receive "due
    immediately" payment terms. Two options for acceptance are available to suppliers. Both are
    accompanied by an emailed advice containing complete payment details:
    - Straight-through processing (buyer initiated). Immediate, exact payments directly deposited to supplier accounts by the City's provider bank; the supplier does not need to know card account details.
    - Supplier retrieves card account through the secure, on-line portal provided via email notifications sent by the City's commercial card provider.
  - Credit card. Tacoma's VISA procurement card program is supported by standard bank credit suppliers and requires that merchants abide by the VISA merchant operating rules. It provides "due immediately" payment terms.
    - Suppliers must be PCI-DSS compliant (secure credit card data management) and federal FACTA (sensitive card data display) compliant.
    - Suppliers must be set up by their card processing equipment provider (merchant acquirer) as a minimum of a Level II merchant with the ability to pass along tax, shipping and merchant references information.
  - Electronic Funds Transfer (EFT) by Automated Clearing House (ACH). Standard terms are net 30 for this payment method.
  - · Check or other cash equivalent. Standard terms are net 30 for this payment method.
- B. The City's preferred method of payment is by ePayables (Payment Plus) followed by credit card (aka procurement card). Suppliers may be required to have the capability of accepting the City's ePayables or credit card methods of payment. The City of Tacoma will not accept price changes or pay additional fees when ePayables (Payment Plus) or credit card is used.
- **C.** The City, in its sole discretion, will determine the method of payment for goods and/orservices as part of the Contract.

#### 1.20 COOPERATIVE PURCHASING

The Washington State Interlocal Cooperative Act RCW 39.34 provides that other governmental agencies may purchase goods and services on this solicitation or contract in accordance with the terms and prices indicated therein if all parties are agreeable.

### 1.21 PUBLIC DISCLOSURE: PROPRIETARY OR CONFIDENTIAL INFORMATION

**A.** Respondent's Submittals, all documents and records comprising any Contract awarded to Respondent, and all other documents and records provided to the City by Respondent are deemed public records subject to disclosure under the Washington State Public Records Act, Chapter 42.56 RCW (Public Records Act). Thus, City may be required, upon request, to disclose the Contract and documents or records related to it unless an exemption under the Public Records Act or other laws applies. In the event CITY receives a request for such disclosure, determines in its legal judgment that no applicable exemption to disclosure applies; and Respondent has complied with the requirements to Respondent has complied with the requirements to mark records considered confidential or proprietary

as such requirements are stated below, City agrees to provide Respondent 10 days written notice of impending release. Should legal action thereafter be initiated by Respondent to enjoin or otherwise prevent such release, all expense of any such litigation shall be borne by Respondent, including any damages, attorneys' fees or costs awarded by reason of having opposed disclosure. City shall not be liable for any release where notice was provided and Respondent took no action to oppose the release of information.

**B.** If Respondent provides City with records or information that Respondent considers confidential or proprietary, Respondent must mark all applicable pages or sections of said record(s) as "Confidential" or "Proprietary." Further, in the case of records or information submitted in response to a Request for Proposals, an index must be provided indicating the affected pages or sections and locations of all such material identified Confidential or Proprietary. Information not included in the required index will not be reviewed for confidentiality or as proprietary before release. If Supplier fails to so mark or index Submittals and related records, then the City, upon request, may release said record(s) without the need to satisfy the requirements of subsection A above; and Respondent expressly waives its right to allege any kind of civil action or claim against the City pertaining to the release of said record(s). Submission of materials in response to City's Solicitation shall constitute assent by Respondent to the foregoing procedure and Respondent shall have no claim against the City on account of actions taken pursuant to such procedure.

### 1.22 FEDERAL AID PROJECTS

The City of Tacoma in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation, subtitle A, Office of the Secretary, part 21, nondiscrimination in federally assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises as defined at 49 CFR, part 26, will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, or sex in consideration for an award.

#### **SECTION II - CONTRACT REQUIREMENTS**

## 2.01 CONTRACTOR'S RESPONSIBILITY

## A. Contract Documents

The Respondent to whom the Contract is awarded, hereinafter called the Contractor, shall enter into a Contract with the City of Tacoma, within 10 days after receipt from the City of Tacoma of a properly prepared Contract. In addition, the Contractor will do all things required to promptly perform this Contract pursuant to the terms of this Contract. Certain contracts for supplies, goods or equipment may use the City Purchase Order in place of a formal contract document.

#### **B. Surety Bonds**

Except as modified by the Special Provisions, the Respondent to whom the Contract is awarded shall provide a payment and performance bond, including power of attorney, for 100 percent of the amount of his/her bid (including sales taxes), to insure complete performance of the Contract including the guarantee. The bonds must be executed by a surety company licensed to do business in the State of Washington. For a supply-type contract, a cashier's check or cash may be substituted for the bonds; however, this cash or cashier's check must remain with the City through the guarantee period and any interest on said amount shall accrue to the City.

#### C. Independent Contractor

Contractor is an independent contractor; no personnel furnished by the Contractor shall be deemed under any circumstances to be the agent or servant of the City. Contractor shall be fully responsible for all acts or omissions of Subcontractors and its and their suppliers and of persons employed by them, and shall be specifically responsible for sufficient and competent supervision and inspection to assure compliance in every respect with the Contract. There shall be no contractual relationship between any Subcontractors or supplier and the City arising out of or by virtue of this agreement. No provision of the Contract is intended or is to be construed to be for the benefit of any third party.

#### 2.02 CONFLICTS IN SPECIFICATIONS

Anything mentioned in the Specifications and not shown on the Drawings and anything on the Drawings and not mentioned in the Specifications shall be of like effect and shall be understood to be shown and/or mentioned in both. In case of differences between Drawings and Specifications, the Specifications shall govern. In addition, in the event of any conflict between these General Provisions, the Special Provisions, the Technical Provisions and/or the Proposal pages, the following order of precedence shall control:

- 1. Proposal pages prevail if they conflict with the General, Special or Technical Provisions.
- 2. Special Provisions prevail if they conflict with the General Provisions and/or Technical Provisions.
- 3. Technical Provisions prevail if they are in conflict with the General Provisions.

In case of discrepancy of figures between Drawings, Specifications or both, the matter shall immediately be submitted to the Engineer for determination. Failure to submit the discrepancy issue to the Engineer shall result in the Contractor's actions being at his/her own risk and expense. The Engineer shall furnish from time to time such detailed drawings and other information as he/she may consider necessary.

#### 2.03 INSPECTION

#### A. Of the Work

All materials furnished and work done shall be subject to inspection.

The Inspector administering the Contract shall at all times have access to the work wherever it is in progress or being performed, and the Contractor shall provide proper facilities for such access and inspection. Such inspection shall not relieve the Contractor of the responsibility of performing the work correctly, utilizing the best labor and materials in strict accordance with the Specifications of this Contract. All material or work approved and later found to be defective shall be replaced without cost to the City of Tacoma.

#### B. Inspector's Authority

The inspector shall have power to reject materials or workmanship which do not fulfill the requirements of these Specifications, but in case of dispute the Contractor may appeal to the Director or Superintendent, whose decision shall be final. The word "Director" means the Director of the City of Tacoma General Government department that is administering the contract. The word "Superintendent" means the Superintendent of the City of Tacoma, Department of Public Utilities Division that is administering the contract

The Contract shall be carried out under the general control of the representative of the particular City Department or Division administering the Contract, who may exercise such control over the conduct of the work as may be necessary, in his or her opinion, to safeguard the interest of the City of Tacoma. The Contractor shall comply with all orders and instructions given by the representative of the particular Department or Division administering the Contract in accordance with the terms of the Contract.

Provided, that for the purposes of construction contracts, such control shall only apply (a) to the extent necessary to ensure compliance with the provisions of this contract, and (b) to the extent necessary to fulfill any nondelegable duty of the City for the benefit of third parties not engaged in promoting the activity of this contract.

Nothing herein contained, however, shall be taken to relieve the Contractor of his/her obligations or responsibilities under the Contract.

#### 2.04 FEDERAL, STATE AND MUNICIPAL REGULATIONS

All federal, state, municipal and/or local regulations shall be satisfied in the performance of all portions of this Contract. The Contractor shall be solely responsible for all violations of the law from any cause in connection with work performed under this Contract.

#### 2.05 INDEMNIFICATION

#### A. Indemnification

Contractor acknowledges that pursuant to the terms of this agreement, Contractor is solely and totally responsible for the safety of all persons and property in the performance of this Contract. To the greatest extent allowed by law, Contractor assumes the risk of all damages, loss, cost, penalties and expense and agrees to indemnity, defend and hold harmless the City of Tacoma, from and against any and all liability which may accrue to or be sustained by the City of Tacoma on account of any claim, suit or legal action made or brought against the City of Tacoma for the death of or injury to persons (including Contractor's or subcontractor's employees) or damage to property involving Contractor, or subcontractor(s) and their employees or agents, arising out of and in connection with or incident to the performance of the Contract including if the City is found to have a nondelegable duty to see that work is performed with requisite care, except for injuries or damages caused by the sole negligence of the City. In this regard, Contractor recognizes that Contractor is waiving immunity under industrial Insurance Law, Title 51 RCW. This indemnification extends to the officials, officers and employees of the City and also includes attorney's fees and the cost of establishing the right to indemnification hereunder in favor of the City of Tacoma. In addition, within the context of competitive bidding laws, it is agreed that this indemnification has been mutually negotiated. Provided however, this provision is intended to be applicable to the parties to this agreement and it shall not be interpreted to allow a Contractor's employee to have a claim or cause of action against Contractor.

## B. Limitation of Liability for Primarily Supply-Type Contracts

In all contracts where the total cost of the supply of materials and/or equipment constitute at least 70 percent of the total contract price (as determined by the City), the City agrees that it will not hold the contractor, supplier or manufacturer liable for consequential damages for that part of the contract related to the manufacture and/or design of the equipment, materials or supplies.

#### 2.06 CONTRACTOR'S INSURANCE

- **A.** During the course and performance of a Contract, Contractor will provide proof and maintain the insurance coverage in the amounts and in the manner specified in the City of Tacoma Insurance Requirements as is applicable to the services, products, and deliverables provided under the Contract. The City of Tacoma Insurance Requirements document, if issued, is fully incorporated into the Contract by reference.
- **B.** Failure by City to identify a deficiency in the insurance documentation provided by Contractor or failure of City to demand verification of coverage or compliance by Contractor with these insurance requirements shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

## 2.07 ASSIGNMENT AND SUBLETTING OF CONTRACT

#### C. Assignment

The Contract shall not be assigned except with the consent of the Superintendent or his/her designee.

Requests for assignment of this contract must be in writing with the written consent of the surety, and the request must show the proposed person or organization to which the contract is assigned is capable, experienced and equipped to perform such work. The proposed substitute person or organization may be required to submit to the City information as to his/her experience, financial ability and give statements covering tools, equipment, organization, plans and methods to fulfill any portion of the Contract prior to approval of assignment.

## D. Subletting

The Contract shall not be sublet except with the written consent of the Superintendent or his/her designee. In the event that a prequalified electrical contractor is necessary to perform certain portions of the work, such work may be subcontracted with a City prequalified electrical contractor for the type of work involved.

Requests for subletting of this Contract must be in writing with the written consent of the Surety, and the request must show the proposed person or organization to which the Contract is sublet is capable, experienced and equipped to perform such work. The proposed substitute person or organization may be required to submit to the City information as to his experience, financial ability and give statements covering tools, equipment, organization, plans and methods to fulfill any portion of the Contract prior to approval of subletting.

The written consent approving the subletting of the Contract shall not be construed to relieve the Contractor of his/her responsibility for the fulfillment of the Contract. The Subcontractor shall be considered to be the agent of the Contractor and the Contractor agrees to be responsible for all the materials, work and indebtedness incurred by the agent.

A subcontractor shall not sublet any portion of a subcontract for work with the City without the written consent of the City.

#### 2.08 **DELAY**

#### E. Extension of Time

With the written approval of the Superintendent or his/her designee, the Contractor may be granted additional time for completion of the work required under this Contract, if, in the Superintendent's opinion the additional time requested arises from unavoidable delay.

## F. Unavoidable Delay

Unavoidable delays in the prosecution of the work shall include only delays from causes beyond the control of the Contractor and which he/she could not have avoided by the exercise of due care, prudence, foresight and diligence. Delay caused by persons other than the Contractor, Subcontractors or their employees will be considered unavoidable delays insofar as they necessarily interfere with the Contractor's completion of the work, and such delays are not part of this Contract.

Unavoidable delay will not include delays caused by weather conditions, surveys, measurements, inspections and submitting plans to the Engineer of the particular Division involved in administering this Contract.

#### 2.09 GUARANTEE

## A. Guarantee for Construction, Labor or Services Contract

Neither the final certificate of payment or any provision in the Contract Documents, nor partial or entire occupancy of the premises by the City, shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of final acceptance of the work unless a longer period is specified. The City will give notice of observed defects with reasonable promptness.

If it has been discovered, before payment is required under the terms of the Contract, that there is a failure to comply with any of the terms and provisions of this Contract, the City has the right and may withhold payment.

In case of a failure of any part of the work, materials, labor and equipment furnished by the Contract or to fully meet all of the requirements of the Contract, the Contractor shall make such changes as may be necessary to fully meet all of the specifications and requirements of this Contract. Such changes shall be made at the Contractor's sole cost and expense without delay and with the least practicable inconvenience to the City of Tacoma. Rejected material and equipment shall be removed from the City's property by and at the expense of the Contractor.

#### **B.** Guarantee for Supply Contracts

Unless a longer period is specified, the supplier and/or manufacturer of the supplies, materials and/or equipment furnished pursuant to this Contract agrees to correct any defect or failure of the supplies, materials and/or equipment which occurs within one year from the date of: (1) test energization if electrical or mechanical equipment; (2) commencement of use if supplies or materials, provided, however, said guarantee period shall not extend beyond eighteen months after date of receipt by the City. All of the costs (including shipping, dismantling and reinstallation) of repairs and/or corrections of defective or failed equipment, supplies and/or material is the responsibility of the supplier and/or manufacturer.

When the supplier is not the manufacturer of the item of equipment, supplier agrees to be responsible for this guarantee and supplier is not relieved by a manufacturer's guarantee.

#### C. Guarantee Period Extension

The Contract guarantee period shall be suspended from the time a significant defect is first documented by the City until the work or equipment is repaired or replaced by Contractor and accepted by the City. In addition, in the event less than ninety (90) days remain on the guarantee period (after recalculating), the guarantee period shall be extended to allow for at least ninety (90) days from the date the work or equipment is repaired or replaced and accepted by the City.

#### 2.10 DEDUCTIONS FOR UNCORRECTED WORK

If the City of Tacoma deems it expedient to correct work not done in accordance with the terms of this Contract, an equitable deduction from the Contract price shall be made.

#### 2.11 CITY OF TACOMA'S RIGHT TO TERMINATE CONTRACT

#### A. Termination for Convenience

- 1. Supplies. The City may terminate a Contract for supplies at any time upon prior written notice to Contractor. Upon the effective date of termination specified in such notice, and payment by the City, all conforming supplies, materials, or equipment previously furnished hereunder shall become its property.
- 2. Services. The City may terminate a Contract for services at any time, with or without cause, by giving 10-business day's written notice to Supplier. In the event of termination, all finished and unfinished work prepared by Supplier pursuant to the Contract shall be provided to the City. In the event City terminates the Contract due to the City's own reasons and without cause due to Supplier's actions or omissions, the City shall pay Supplier the amount due for actual work and services necessarily performed under the Contract up to the effective date of termination, not to exceed the total compensation set forth in the Contract.

#### B. Termination for Cause

- 1. The City may terminate a Contract for either services or supplies in the event of any material breach of any of the terms and conditions of the Contract if the Contractor's breach continues in effect after written notice of breach and 30 days to cure such breach and fails to cure such breach
- 2. Bankruptcy. If the Contractor should be adjudged as bankrupt, or makes a general assignment for the benefit of creditors, or a receiver should be appointed on account of his/her insolvency, or if he/she or any of his/her subcontractors should violate any of the provisions of the Contract, or if the work is not being properly and diligently performed, the City of Tacoma may serve written notice upon the Contractor and Surety, executing the Payment and Performance Bond, of its intention to terminate the Contract; such notice will contain the reasons for termination of the Contract, and unless within 10 days after the serving of such notice, such violation shall cease and an arrangement satisfactory to the City of Tacoma for correction thereof shall be made, the Contract shall, upon the expiration of said I 0 days, cease and terminate and all rights of the Contractor hereunder shall be forfeited. In the event the Contract is terminated for cause, Contractor shall not be entitled to any lost profits resulting therefrom.
- 3. Notice. In the event of any such termination for cause, the City of Tacoma shall immediately send (by regular mail or other method) written notice thereof to the Surety and the Contractor. Upon such termination the Surety shall have the right to take over and perform the Contract, provided however, the Surety must provide written notice to the City of its intent to complete the work within 15 calendar days of its receipt of the original written notice (from the City) of the intent to terminate. Upon termination and if the Surety does not perform the work, the City of Tacoma may take over the work and prosecute the same to completion by any method it may deem advisable, for the account of and at the expense of the Contractor, and the Contractor and the Surety shall be liable to the City of Tacoma for all cost occasioned to the City of Tacoma thereby. The City of Tacoma may without liability for doing so, take possession of and utilize in completing the work, such materials, equipment, plant and other property belonging to the Contractor as may be on the site of the work and necessary therefore.

#### **2.12 LIENS**

In the event that there are any liens on file against the City of Tacoma, the City of Tacoma shall be entitled to withhold final or progress payments to the extent deemed necessary by the City of Tacoma to properly protect the outstanding lien claimants until proper releases have been filed with the City Clerk.

#### 2.13 LEGAL DISPUTES

#### A. General

Washington law shall govern the interpretation of the Contract. The state or federal courts located in Pierce County Washington shall be the sole venue of any mediation, arbitration, or litigation arising out of the Contract.

Respondents providing submittals from outside the legal jurisdiction of the United States of America will be subject to Tacoma's City Attorney's Office (CAO) opinion as to the viability of possible litigation pursuant to a contract resulting from this Specification. If it is the opinion of the CAO that any possible litigation would be beyond reasonable cost and/or enforcement, the submittal may be excluded from evaluation.

## **B.** Attorney Fees

For contracts up to \$250,000, which become the subject of litigation or arbitration, the substantially prevailing party may be entitled to reasonable attorney fees, as provided in RCW 39.04.240. Provided, however, the attorney fee hourly rate for the City of Tacoma's assistant city attorneys is agreed to be \$150 per hour or the same as the hourly rate for Contractor's legal counsel, whichever is greater.

#### 2.14 DELIVERY

Prices must be quoted F.O.B. destination, freight prepaid and allowed with risk of loss during transit remaining with Contractor/Supplier (unless otherwise stated in these Specifications) to the designated address set forth in these Specifications.

Deliveries shall be between 9:00 a.m. and 3:30 p.m.; Monday through Friday only (except legal holidays of the City of Tacoma).

Legal holidays of the City of Tacoma are:

New Year's Day January I

Martin Luther King's Birthday

Washington's Birthday

Memorial Day

3rd Monday in February
Last Monday in May

Independence Day July 4

Labor Day 1st Monday in September

Veteran's Day November 11

Thanksgiving Day 4th Thursday of November Day after Thanksgiving 4th Friday of November

Christmas Day December 25

When any of these holidays occur on Saturday or Sunday, the preceding Friday or the following Monday, respectively, is a legal holiday for the City of Tacoma.

#### 2.15 PACKING SLIPS AND INVOICES

- **A.** Packing slips and shipping notices shall be sent to the specific City Division or Department receiving the item(s) at the address stated in City's Solicitation or as otherwise stated in the Contract and include complete description of items, contents of items if crated or cased, quantity, shipping point, carrier, bill of lading number and City of Tacoma purchase order.
- **B.** Each invoice shall show City of Tacoma purchase order number, release number if applicable, quantity, unit of measure, item description, unit price and extended price for each line if applicable, services and deliverables provided if applicable. Line totals shall be summed to give a grand total to which sales tax shall be added, if applicable.
  - For transactions conducted in SAP Ariba, invoices shall be submitted through Ariba.
  - For invoices paid by ACH or by check, unless stated otherwise, invoices shall be electronically submitted by email with corresponding PO number listed in the subject line to\_ accountspayable@cityoftacoma.org.

3. For invoices paid by credit card, invoices shall also display the last name of the cardholder and last four digits (only) of the card number (e.g., Jones/6311). Unless stated otherwise, invoices shall be electronically submitted by email with corresponding PO number listed in the subject line to (do not combine different POs into one invoice or charge) to <a href="mailto:pcardadmin@cityoftacoma.org">pcardadmin@cityoftacoma.org</a>.

#### 2.16 APPROVED EQUALS

**A.** Unless an item is indicated as "No substitute", special brands, when named, are intended to describe the standard of quality, performance or use desired. Equal items will be considered by the City, provided that the respondent specifies the brand and model, and provides all descriptive literature, independent test results, product samples, local servicing and parts availability to enable the City to evaluate the proposed "equal".

- **B.** The decision of the City as to what items are equal shall be final and conclusive. If the City elects to purchase a brand represented by the respondent to be an "equal", the City's acceptance of the item is conditioned on the City's inspection and testing after receipt. If, in the sole judgment of the City, the item is determined not to be an equal, the item shall be returned at the respondent's expense.
- **C.** When a brand name or level of quality is not stated by the respondent, it is understood the offer is exactly as specified. If more than one brand name is specified, respondents must clearly indicate the brand and model/part number being bid.

#### 2.17 ENTIRE AGREEMENT

This written contract represents the entire Agreement between the parties and supersedes any prior oral statements, discussions or understandings between the parties.

#### 2.18 CODE OF ETHICS

The City's Code of Ethics, Chapter 1.46, Tacoma Municipal Code, provides ethical standards for City personnel and prohibits certain unethical conduct by others including respondents and contractors. Violation of the City's Code of Ethics will be grounds for termination of this contract.

#### 2.19 FEDERAL FINANCIAL ASSISTANCE

If federal funds, including FEMA financial assistance to the City of Tacoma, will be used to fund, pay or reimburse all or a portion of the Contract, Contractor will comply with all applicable Federal law, regulations, executive orders, FEMA policies, procedures, and directives and the following clauses will be incorporated into the Contract:

- A. EQUAL EMPLOYMENT OPPORTUNITY During the performance of this Contract, Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:
  - 1. Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
  - 2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
  - 3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other

employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

- 4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- 5. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- 6. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- 7. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- 8. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

## B. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

- 1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- 2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (B)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (B)(1) of this section, in the sum of \$27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

- 3. Withholding for unpaid wages and liquidated damages. The City shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (B)(2) of this section.
- 4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (B)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (B)(1) through (4) of this section.

#### C. CLEAN AIR ACT

- 1. Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.
- 2. Contractor agrees to report each violation to the City and understands and agrees that the City will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
- 3. Contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by FEMA.

## D. FEDERAL WATER POLLUTION CONTROL ACT

- 1. Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.
- 2. Contractor agrees to report each violation to the City, understands, and agrees that the City will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
- 3. Contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by FEMA.

#### E. DEBARMENT AND SUSPENSION

- 1. This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the contractor is required to verify that none of the contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).
- Contractor must comply with 2 C.F.R. pt. 180, subpart C and C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.
- 3. This certification is a material representation of fact relied upon by the City. If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to (insert name of recipient/subrecipient/applicant), the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.
- 4. Contractor agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

#### F. BYRD ANTI-LOBBYING AMENDMENT

- 1. Contractors who apply or bid for an award of \$100,000 or more shall file the required certification with City. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the City.
- If applicable, Contractor must sign and submit to the City the following certification:

#### APPENDIX A, 44 C.F.R. PART 18 - CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- 2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

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#### G. PROCUREMENT OF RECOVERED MATERIALS

- 1. In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired:
  - a. Competitively within a timeframe providing for compliance with the contract performance schedule;
  - b. Meeting contract performance requirements; or
  - c. At a reasonable price.
- 2. Information about this requirement, along with the list of EPA- designated items, is available at EPA's Comprehensive Procurement Guidelines web site, https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program.
- Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

[Section III is for contracts that involve construction and/or labor, and are not applicable to contracts solely for material/supply purchases.]

#### **GENERAL PROVISIONS**

## **SECTION III - CONSTRUCTION AND/OR LABOR CONTRACTS**

SECTION III REQUIREMENTS APPLY ONLY TO CONSTRUCTION AND/OR LABOR CONTRACTS AND ARE IN ADDITION TO APPLICABLE REQUIREMENTS CONTAINED IN SECTION II CONTRACT REQUIREMENTS.

## 3.01 RESPONDENT'S DUTY TO EXAMINE

The Respondent agrees to be responsible for examining the site(s) and to have compared them with the Specifications and Contract Drawings, and to be satisfied as to the facilities and difficulties attending the execution of the proposed Contract (such as uncertainty of weather, floods, nature and condition of materials to be handled and all other conditions, obstacles and contingencies) before the delivery of his/her Proposal. No allowance will be subsequently made by the City on behalf of the Respondent by reason of any error or neglect on Respondent's part, for such uncertainties as aforesaid.

### 3.02 PERMITS

Except when modified by the Special Provisions, the Contractor shall procure and pay for all permits and licenses necessary for the completion of this Contract including those permits required by the City of Tacoma. The City will obtain county or state road crossing permits if required. In the event a necessary permit is not obtained, the Contractor will not be permitted to work on items subject to said permit and any delays caused thereby will not be subject to extra compensation or extensions.

# 3.03 NOTIFICATION OF OTHER GOVERNMENTAL AGENCIES AND UTILITIES WHEN UNDERGROUND WORK IS INVOLVED

The Contractor shall notify all other affected governmental agencies and utilities whenever underground work is done under the terms of this Contract. The Contractor is required to obtain permission of the appropriate public and private utilities and governmental agencies before performing underground work pursuant to the terms of this Contract. The Contractor is required to call "one call" at 1-800-424-5555 for all work involving excavation or digging more than 12 inches beneath ground or road surface.

The City may have indicated on the plans and specifications the existence of certain underground facilities that are known to the City department responsible for this Contract. It is the Contractor's responsibility to fully comply with the Underground Utility Locate Law, Chapter 19.122 RCW. If the site conditions are "changed or differing" as defined by RCW 19.122.040(I), the Contractor may pursue the party responsible for not properly marking or identifying the underground facility. The Contractor agrees not to file any claim or legal action against the City (department responsible for this Contract) for said "changed or differing" conditions unless said City department is solely responsible for the delay or damages that the Contractor may have incurred.

#### 3.04 TRENCH EXCAVATION BID ITEM

In the event that "trench excavation" in excess of four feet requires a safety system pursuant to Washington State law and safety shoring, sloping, sheeting, or bracing is used, a separate bid item should be set forth in the Proposal for this work. If a separate bid item is not set forth in the Proposal pages, said installed safety system shall be paid at \$3.00 per lineal foot of trench, which unit price includes both sides of the trench.

#### 3.05 SAFETY

#### A. General

The Contractor shall, at all times, exercise adequate precautions for the safety of all persons, including its employees and the employees of a Subcontractor, in the performance of this Contract and shall comply with all applicable provisions of federal, state, county and municipal safety laws and regulations. It is the Contractor's responsibility to furnish safety equipment or to contractually require Subcontractors to furnish adequate safety equipment relevant to their responsibilities.

The Contractor shall obtain the necessary line clearance from the inspector before performing any work in, above, below or across energized Light Division circuits.

The Inspector and/or Engineer may advise the Contractor and the Safety Officer of any safety violations. It is the Contractor's responsibility to make the necessary corrections. Failure to correct safety violations is a breach of this Contract and, as such, shall be grounds for an order from the Safety Officer, Inspector or Engineer to cease further work and remove from the job site until the condition is corrected. Time and wages lost due to such safety shutdowns shall not relieve the Contractor of any provisions of Section 3.14 of this Specification and shall be at the sole cost of the Contractor. The purpose of this authority to stop work is to enforce the contract and not to assume control except to the extent necessary to ensure compliance with the provisions of this contract.

Any of the above actions by employees of the City of Tacoma shall in no way relieve the Contractor of his/her responsibility to provide for the safety of all persons, including his/her employees.

## B. Work Hazard Analysis Report

The Contractor will be required to complete a work hazard analysis report. This report shall outline how the Contractor proposes to satisfy all safety laws and regulations involved in performing the work. This report shall be completed and submitted to the City Safety Officer before the pre-construction conference. A copy of the report shall be maintained at the work site (accessible to the supervisor).

#### 3.06 PROTECTION OF WORKERS AND PROPERTY

The Contractor shall erect and maintain good and sufficient guards, barricades and signals at all unsafe places at or near the work and shall, in all cases, maintain safe passageways at all road crossings, and crosswalks, and shall do all other things necessary to prevent accident or loss of any kind.

The Contractor shall protect from damage all utilities, improvements, and all other property that is likely to become displaced or damaged by the execution of the work under this Contract.

The Contractor is responsible for all roads and property damaged by his/her operations as shall be determined by the Engineer administering this Contract. The Contractor shall be responsible for repairing all damage to roads caused by his/her operations to the satisfaction of the particular governmental body having jurisdiction over the road.

#### 3.07 CONTRACTOR - SUPERVISION AND CHARACTER OF EMPLOYEES

## A. Superintendent to Supervise Contractor's Employees

The Contractor shall keep on his/her work, during its progress, a competent superintendent and any necessary assistants, all of whom must be satisfactory to the City of Tacoma. The Contractor's superintendent shall not be changed except with the consent of the City of Tacoma, unless the Contractor's superintendent proves to be unsatisfactory to the Contractor and ceases to be in his/her employ. The Contractor's superintendent shall represent the Contractor in his/her absence and all directions given to him/her shall be binding as if given to the Contractor directly. The Contractor shall give efficient supervision to the work, using his/her best skill and attention.

### B. Character of Contractor's Employees

The Contractor shall employ only competent, skillful, faithful and orderly persons to do the work, and whenever the Engineer administering the Contract shall notify the Contractor in writing that any person on the work is, in his or her opinion, incompetent, unfaithful, disorderly or otherwise unsatisfactory, the Contractor shall forthwith discharge such persons from the work and shall not again employ him or her on this Contract.

#### 3.08 CONTRACTOR'S COMPLIANCE WITH THE LAW

#### A. Hours of Labor

The Contractor and Subcontractors shall be bound by the provisions of RCW Chapter 49.28 (as amended) relating to hours of labor. Except as set forth in the Special Provisions, eight (8) hours in any calendar day shall constitute a day's work on a job performed under this Contract.

In the event that the work is not performed in accordance with this provision and in accordance with the laws of the State of Washington, then this Contract may be terminated by the City of Tacoma for the reason that the same is not performed in accordance with the public policy of the State of Washington as defined in said statutes.

#### **B. Prevailing Wages**

If federal, state, local, or any applicable law requires Supplier to pay prevailing wages in connection with a Contract, and Supplier is so notified by the City, then Supplier shall pay applicable prevailing wages.

If applicable, a Schedule of Prevailing Wage Rates and/or the current prevailing wage determination made by the Secretary of Labor for the locality or localities where the Contract will be performed is attached and made of part of the Contract by this reference. If prevailing wages do apply to the Contract, Supplier and its subcontractors shall:

- 1. Be bound by and perform all transactions regarding the Contract relating to prevailing wages and the usual fringe benefits in compliance with the provisions of Chapter 39.12 RCW, as amended, the Washington State Prevailing Wage Act and/or the Davis-Bacon Act (40 U.S.C. 3141- 3144, and 3146-3148) and the requirements of 29 C.F.R. pt. 5 as may be applicable, including the federal requirement to pay wages not less than once a week,
- 2. Ensure that no worker, laborer or mechanic employed in the performance of any part of the Contract shall be paid less than the prevailing rate of wage specified on that Schedule and/or specified in a wage determination made by the Secretary of Labor (unless specifically preempted by federal law, the higher of the Washington state prevailing wage or federal Davis-Bacon rate of wage must be paid)and Additionally, in compliance with applicable federal law, contractors are required to pay wages not less than once a week.
- 3. Immediately upon award of the Contract, contact the Department of Labor and Industries, Prevailing Wages section, Olympia, Washington and/or the federal Department of Labor, to obtain full information, forms and procedures relating to these matters. Per such procedures, a Statement of Intent to Pay Prevailing Wages and/or other or additional documentation required by applicable federal law, must be submitted by Contractor and its subcontractors to the City, in the manner requested by the City, prior to any payment by the City hereunder, and an Affidavit of Wages Paid and/or other or additional documentation required by federal law must be received or verified by the City prior to final Contract payment. In the event any dispute arises as to what are the prevailing rates of wages for work of a similar nature and such dispute cannot be adjusted by the parties in interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the State of Washington, Department of Labor and industries whose decision shall be final, conclusive and binding on all parties involved in the dispute.

#### 3.09 COPELAND ANTI-KICKBACK ACT

For contracts subject to Davis Bacon Act the following clauses will be incorporated into the Contract:

- **A. Contractor.** The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract.
- **B. Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as FEMA may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.
- **C. Breach.** A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

#### 3.10 CHANGES

#### A. In Plans or Quantities

The City of Tacoma, without invalidating this Contract, or any part of this Contract, may order extra work or make reasonable changes by altering, adding to or deducting from the materials, work and labor and the Contract sum will be adjusted accordingly. All such work and labor shall be executed under the conditions of the original Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change. When work or bid items are deducted, reduced or eliminated, it is agreed that no payment will be made to Contractor for anticipated profit.

#### **B. Extra Work**

Any claim or order for extra materials, work and labor made necessary by alterations or additions to the plans or by other reasons for which no price is provided in this Contract, shall not be valid unless the Contractor and Engineer administering the Contract have agreed upon a price prior to commencing extra work, and the agreement has been signed by the Contractor and approved by the Superintendent or his/her designee, and approved by the payment and performance bond surety.

## C. Extra Work - No Agreed Price

If it is impracticable to fix an increase in price definitely in advance, the order may fix a maximum price which shall not under any circumstances, be exceeded, and subject to such limitation, such alteration, modification, or extra shall be paid for at the actual necessary cost as determined by the City of Tacoma, which cost (including an allowance for profit) shall be determined as the sum of the following items (1) to (7) inclusive:

- (1) Labor, computed at regular wage scale, including premium on compensation insurance and charge for social security taxes, and other taxes, pertaining to labor; no charge for premium pay shall be allowed unless authorized by the Engineer administering the Contract;
- (2) The proportionate cost of premiums on comprehensive general liability and other insurance applicable to the extra work involved and required under this Contract;
- (3) Material, including sales taxes pertaining to materials;
- (4) Plant and equipment rental, to be agreed upon in writing before the work is begun; no charge for the cost of repairs to plant or equipment will be allowed;
- (5) Superintendence, general expense and profit computed at 20 percent of the total of paragraphs (1) to (4) inclusive;
- (6) The proportionate cost of premiums on bonds required by this Contract, computed by 1 1/2 percent of the total of paragraphs (1) to (5) inclusive.
- (7) The City of Tacoma reserves the right to furnish such materials as it may deem expedient, and no allowance will be made for profit thereon.

Whenever any extra work is in progress, for which the definite price has not been agreed on in advance, the Contractor shall each day, report to the Engineer the amount and cost of the labor and material used, and any other expense incurred in such extra work on the preceding day, and no claim for compensation for such extra work will be allowed unless such report shall have been made.

The above-described methods of determining the payment for work and materials shall not apply to the performance of any work or the furnishing of any material, which, in the judgment of the Engineer administering the Contract, may properly be classified under items for which prices are established in the Contract.

#### D. Claims for Extra Work

If the Contractor claims that any instructions by drawings or otherwise, involve extra cost under this Contract, he/she shall give the City of Tacoma written notice thereof within 30 days after receipt of such instruction, and in any event before proceeding to execute the work, except in an emergency endangering life or property, and the procedures governing the same shall be as provided for immediately above in this paragraph. The method in these paragraphs is the only method available to the Contractor for payment of claims for extra work performed under the terms of this Contract.

#### 3.11 CLEANING UP

The Contractor shall at all times, at his/her own expense, keep the premises free from accumulation of waste materials or debris caused by any workers or the work, at the completion of the work the Contractor shall remove all his waste materials from and about the site and all his/her equipment, sanitary facilities and surplus materials. In the case of dispute, the City of Tacoma may remove the debris and charge the cost to the Contractor as the City of Tacoma shall determine to be just. All material that is deposited or placed elsewhere than in places designated or approved by the Engineer administering the Contract will not be paid for and the Contractor may be required to remove such material and deposit or place it where directed.

#### 3.12 PROGRESS PAYMENT

Progress payments will be made up to the amount of ninety-five percent (95%) of the actual work completed as shall be determined by the Engineer administering the Contract.

The Contractor may request that an escrow account be established as permitted by law, in which event the Contractor will earn interest on the retained funds.

When the time for construction, services and/or installation will exceed thirty (30) days, the Contractor may request, by invoice, to be paid a progress payment based on percentage of work completed. The Engineer will review and approve the progress payment request on a monthly basis.

#### 3.13 FINAL PAYMENT

The final payment of five percent (5%) of the Contract price shall be approved on final acceptance of the work under this Contract by the Superintendent or his/her designee. In addition, before final payment is made, the Contractor shall be required to:

- A. Provide a certificate from the Washington State Department of Revenue that all taxes due from the Contractor have been paid or are collectible in accordance with the provisions of Chapter 60.28 and Title 82 of the Revised Code of Washington;
- B. Provide the General Release to the City of Tacoma on the form set forth in these Contract documents;
- C. Provide a release of any outstanding liens that have been otherwise filed against any monies held or retained by the City of Tacoma;
- D. File with the City Director of Finance, and with the Director of the Washington State Department of Labor and Industries, on the state form to be provided, an affidavit of wages paid;
- E. File with the City Director of Finance, on the state form to be provided, a statement from the State of Washington, Department of Labor and Industries, certifying that the prevailing wage requirements have been satisfied.
- F. File with the City Director of Finance, on the state form to be provided, a statement of release from the Public Works Contracts Division of the State of Washington, Department of Labor and Industries, verifying that all industrial insurance and medical aid premiums have been paid.

If there is a fee assessed to the City for any certificate, release or other form required by law, the contractor agrees that the fee amount may be passed on to the Contractor and deducted from the monies paid to the Contractor.

#### 3.14 FAILURE TO COMPLETE THE WORK ON TIME

Should the completion of the work required under the Contract be delayed beyond the expiration of the period herein set for the completion of said work, or such extension of said period as may be allowed by reason of unavoidable delays, there shall be deducted from the total Contract price of work, for each calendar day by which such completion shall be delayed beyond said period of such extension thereof the sum of \$300 or a sum of money as set forth hereinafter in these Specifications, as the amount of such deduction per calendar day.

Said sum shall be considered not as a penalty, but as liquidated damages, which the City will suffer by reason of the failure of the Contractor to perform and complete the work within the period, herein fixed or such extensions of said period as may be allowed by reason of unavoidable delays.

Any money due or to become due the Contractor may be retained by the City to cover said liquidated damages, and should such money not be sufficient to cover such damages, the City shall have the right to recover the balance from the Contractor or his/her Sureties.

The filing of any bid for the work herein contemplated shall constitute acknowledgment by the Respondent that he/she understands, agrees and has ascertained that the City will actually suffer damages to the amount hereinabove fixed for each and every calendar day during which the completion of the work herein required shall be delayed beyond the expiration of the period herein fixed for such completion or such extension of said period as may be allowed by reason of unavoidable delays.

## 3.15 CITY RESERVES RIGHT TO USE FACILITIES PRIOR TO ACCEPTANCE

The City of Tacoma hereby reserves the right to use the facilities herein contracted prior to final acceptance under this Contract. The use of said facilities, as mentioned herein, shall not be construed as a waiver or relinquishment of any rights that the City of Tacoma has under this Contract.

#### 3.16 LIST OF SUBCONTRACTORS

Bid proposals for construction, alteration or repair of any building or other public works that may exceed \$1,000,000 including tax shall satisfy the following requirement: Respondent shall submit as part of the bid, the names of the subcontractors, with whom the respondent, if awarded the contract, will subcontract performance of the work of heating, ventilation and air conditioning, plumbing as described in chapter 18.106 RCW, and electrical as described in chapter 19.28 RCW, or to name itself for the work. The respondent shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the respondent must indicate which subcontractor will be used for which alternate. Failure to comply with this provision or the naming of two or more subcontractors to perform the same work shall require the City (pursuant to state law RCW 39.30.060) to determine that respondent's bid is nonresponsive; therefore, the bid will be rejected.

# **Main Library Remodel** SPECIFICATION NO.: LB23-0178F

### **BID PROPOSAL**

# **City of Tacoma**

Tacoma Public Library	
Name of Firm:	
(Write in company name)	
In compliance with the contract documents, the following bid proposa	al is submitted:
BASE BID:	
Lump sum base bid is inclusive of the Scope of Work described in sheet G250 for delineation of Library and Tenant areas.	the Contract Documents. See
BASE BID – LIBRARY IMPROVEMENTS:	\$
BASE BID – TENANT IMPROVEMENTS:	
SUBTOTAL:	\$
WA STATE SALES TAX @ 10.3%:	\$
GRAND TOTAL:	\$
BID ALTERNATES: (do not include Washington State Sales	Гах)
The undersigned proposes to modify the contract requirements and the Contract Documents and as described in the Project Manual, for added to the Base Bid. The Owner reserves the right to accept or (90) days of the bid date.	or the following amounts to be
CARNEGIE RESTROOM RENOVATION	\$

## Main Library Remodel

SPECIFICATION NO.: LB23-0178F

#### **BID PROPOSAL**

#### INTENT AND AFFIDAVIT OF WAGES PAID:

In compliance with Chapter 296-127 WAC the Contractor shall pay all fees associated with the Intent and Affidavit of Wages Paid to the Department of Labor and Industries. These costs shall be included in the base bid.

#### **CITY OF TACOMA PROGRAMS:**

The City of Tacoma's Equity In Contracting (EIC) and Local Employment & Apprenticeship (LEAP) Program requirements apply to this project. Refer to the Section "City Programs".

- The EIC utilization requirement is <u>2%</u> MBE, <u>3%</u> WBE and <u>7%</u> SBE businesses certified by WA State Office of Minority and Women's Business Enterprise (OMWBE).
- The LEAP requirement is <u>15%</u> Local Employee Utilization and additional <u>15%</u> Apprentice Utilization.

#### TIME FOR COMPLETION:

The undersigned hereby agrees to substantially complete all the work under the Base Bid (and accepted alternates and/or unit prices) within <u>150</u> calendar days after the Notice to Proceed.

#### **LIQUIDATED DAMAGES:**

The undersigned agrees to pay the Owner as liquidated damages the sum of \$300 for each consecutive calendar day beyond the SUBSTANTIAL COMPLETION date. Liquidated damages shall be deducted from the contract by change order.

### Main Library Remodel SPECIFICATION NO.: LB23-0178F

## BID PROPOSAL

SUSTAINABILITY:
Have you incorporated sustainability into your everyday business practices? Yes / No  Please Describe:
2) Have you taken measures to minimize impacts to the environment in the delivery of proposed goods and services? Yes / No Please Describe:
3) Will you be incorporating and implementing sustainable practices during the construction of this project? <b>Yes / No Please Describe:</b>

#### **SIGNATURE PAGE**

#### **TACOMA PUBLIC LIBRARY**

All submittals must be in ink or typewritten, executed by a duly authorized officer or representative of the bidding/proposing entity, and received and time stamped as directed in the **Request for Bid page near the beginning of the specification**. If the bidder/proposer is a subsidiary or doing business on behalf of another entity, so state, and provide the firm name under which business is hereby transacted.

# REQUEST FOR BID SPECIFICATION NO. LB23-0178F Main Library Remodel

The undersigned bidder/proposer hereby agrees to execute the proposed contract and furnish all materials, labor, tools, equipment and all other facilities and services in accordance with these specifications.

The bidder/proposer agrees, by submitting a bid/proposal under these specifications, that in the event any litigation should arise concerning the submission of bids/proposals or the award of contract under this specification, Request for Bids, Request for Proposals or Request for Qualifications, the venue of such action or litigation shall be in the Superior Court of the State of Washington, in and for the County of Pierce.

#### **Non-Collusion Declaration**

The undersigned bidder/proposer hereby certifies under penalty of perjury that this bid/proposal is genuine and not a sham or collusive bid/proposal, or made in the interests or on behalf of any person or entity not herein named; and that said bidder/proposer has not directly or indirectly induced or solicited any contractor or supplier on the above work to put in a sham bid/proposal or any person or entity to refrain from submitting a bid/proposal; and that said bidder/proposer has not, in any manner, sought by collusion to secure to itself an advantage over any other contractor(s) or person(s).

Bidder/Proposer's Registered Name		_		son Authorize r Bidder/Propo		Date
Address						
		Printe	d Name an	d Title		
City, State, Zip						
		(Area	Code) Tele	ephone Numb	er / Fax Numb	er
Authorized Signatory E-Mail Address						
				icense Numb	er siness Identifier) N	Number
E.I.No. / Federal Social Security Number Used on Quarterly Federal Tax Return, U.S. Treasury Dept. Form 941		III <b>VV</b> /1,	aiso kilowii a	obi (offilied bu	Sine 33 Identifier) i	varibei
			Contractor Ch. 18.27,	's License Nu R.C.W.)	mber	
E-Mail Address for Communications						
ddendum acknowledgement #1	#2_		#3	#4	#5	

THIS PAGE MUST BE SIGNED AND RETURNED WITH SUBMITTAL.

Form No. SPEC-080A Revised: 06/01/2021

Herewith find deposit in the form of a cashier's che amount is not less than 5-percent of the total bid.	which	
	SIGN HERE	
В	ID BOND	
KNOW ALL MEN BY THESE PRESENTS: That we,		, as Principal, and , as Surety, are held
and firmly bound unto the City of Tacoma, as Obligand the Surety bind themselves, their heirs, execuseverally, by these presents.	gee, in the penal sum of dollars, for the p	payment of which the Principal
The condition of this obligation is such that if the O	bligee shall make any awar	d to the Principal for
according to the terms of the proposal or bid made and enter into a contract with the Obligee in according shall give bond for faithful performance thereof, Principal shall, in case of failure to do so, pay a specified in the call for bids, then this obligation is force and effect and the Surety shall forthwith damages, the amount of this bond.	rdance with the terms of sai with Surety or Sureties ap and forfeit to the Obligee t hall be null and void; other	d proposal or bid and award and proved by the Obligee; or if the he penal amount of the deposit wise it shall be and remain in full
SIGNED, SEALED AND DATED THIS	DAY OF	, 20
PRINCIPAL:	SURETY:	
Received return of deposit in the sum of \$		, 20
,		

Form No. SPEC-090A Revised: 08/2004



### Certification of Compliance with Wage Payment Statutes

The bidder hereby certifies that, within the three-year period immediately preceding the bid solicitation date (August 29, 2023), that the bidder is not a "willful" violator, as defined in RCW 49.48.082, of any provision of chapters 49.46, 49.48, or 49.52 RCW, as determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction.

I certify under penalty of perjury under the laws of the state of Washington that the foregoing is true and correct.

Bidder			
Signature of Aut	horized Official*		
Printed Name			
Title			
Date	City		State
Check One:			
Individual $\square$	Partnership □	Joint Venture □	Corporation □
State of Incorpo formed:	ration, or if not a corpor	ation, the state where b	ousiness entity was
If a co-partnersh	nip, give firm name unde	er which business is tra	nsacted:

<sup>\*</sup> If a corporation, proposal must be executed in the corporate name by the president or vice-president (or any other corporate officer accompanied by evidence of authority to sign). If a co-partnership, proposal must be executed by a partner.

Specification No.
Name of Bidder:
Bid Preference Information

# State Responsibility and Reciprocal Bid Preference Information

Certificate of registration as a contractor	Number:
(Must be in effect at the time of bid submittal):	Effective Date:
	Expiration Date:
Current Washington Unified Business Identifier (UBI) Number:	Number:
Do you have industrial insurance (workers' compensation) Coverage nor your employees working in Washington?	☐ Yes ☐ No ☐ Not Applicable
Washington Employment Security Department Number	Number:
	☐ Not Applicable
Washington Department of Revenue state excise tax Registration number:	Number: Not Applicable
Have you been disqualified from bidding any public works contracts under RCW 39.06.010 or 39.12.065(3)?	☐ Yes ☐ No If yes, provide an explanation of your disqualification on a separate page.
Do you have a physical office located in the state of Washington?	□ Yes □ No
If incorporated, in what state were you incorporated?	State: Not Incorporated
If not incorporated, in what state was your business entity formed?	State:
Have you completed the training required by RCW 39.04.350, or are you on the list of exempt businesses maintained by the Department of Labor and Industries?	□ Yes □ No

Revised: 07/20/2007, 04/12/2012, 06/21/2019

# **List of Subcontractor Categories of Work**

Revised: 07/08/2022

Project Name	
and/or plumbing, as des RCW must be listed bel	re proposed to perform the work of heating, ventilation and air conditioning, scribed in Chapter 18.106 RCW, and electrical as described in Chapter 19.28 low. This information must be submitted with the bid proposal or within shed bid submittal time via email to bids@cityoftacoma.org.
installation must be liste	re proposed to perform the work of structural steel installation and/or rebared below. This information must be submitted with the bid proposal or rs of the published bid submittal time via email to rg.
result in your bid being	actors or naming more than one subcontractor to perform the same work will non-responsive. Contractors self-performing must list themselves below. The is to be listed below the subcontractor(s) name.
Subcontractor Name Work to be Performed	

#### Main Library Remodel

#### SPECIFICATION NO.: LB23-0178F

#### GENERALCONTRACTOR QUALIFICATIONS SUBMITTAL

This form shall be completed in its entirety, submitted with the bid, and shall be used to demonstrate the General Contractor's minimum experience. Failure to submit this form may be grounds for bid rejection.

The City shall be the sole judge in determining if the prospective Contractor meets the bidder minimum experience requirements. The City reserves the right to take whatever action it deems necessary to ascertain the ability of the bidder to perform the work satisfactorily.

Qualification of General Contractor: General Contractor shall have a minimum of five (5) projects, of similar size and scope within the last five (5) years, demonstrating an ability to meet the contract schedule and requirements. General Contractor shall meet all Local and State Certifications and License requirements prior to bidding. Copies of the required Certificates and Licenses shall be made available upon request.

Phone:	
	Phone:

## Main Library Remodel

# SPECIFICATION NO.: LB23-0178F GENERALCONTRACTOR QUALIFICATIONS SUBMITTAL

Project No. 3 Name:
Project Owner:
Owner Contact / Phone No.:
Date Work Completed:
Description of Work:
Project No. 4 Name:
Project No. 4 Name:  Owner Contact / Phone No.:
Contact Person:
Date Work Completed:
Description of Work:
Project No. 5 Name:
Owner Contact / Phone No.:
Contact Person:
Date Work Completed:
Description of Work:

# **EIC REQUIREMENT FORM**

#### **EQUITY IN CONTRACTING REQUIREMENTS & PROCEDURES:**

All bidders must complete and submit with their bid the following solicitation form contained in the bid submittal package:

City of Tacoma – EIC Utilization Form

#### **IMPORTANT NOTE:**

It is the bidder's responsibility to ensure that the subcontractor(s) listed on the EIC Utilization Form are currently certified by the State of Washington's Office of Minority and Women Business Enterprises (OMWBE) at the time of bid opening. This may be verified by contacting the EIC Office at 253-591-5075 between 8 AM and 5 PM, Monday through Friday or the <a href="OMWBE">OMWBE</a> Office at (866) 208-1064. Please refer to the City of Tacoma EIC code.

#### **EQUITY IN CONTRACTING REQUIREMENTS**

Minority Business Enterprise Requirement	Women Business Enterprise Requirement	Small Business Enterprise Requirement
2%	3%	7%

A list of EIC-eligible companies is available on the following web site addresses:

www.omwbe.diversitycompliance.com\*

MATERIAL MISSTATEMENTS CONCERNING COMPLETED ACTIONS BY THE BIDDER IN ANY SWORN STATEMENT OR FAILURE TO MEET COMMITMENTS AS INDICATED ON THE EIC UTILIZATION FORM MAY RENDER THE BIDDER IN DEFAULT OF CITY ORDINANCE 1.07

CCD/SBE: SR4069295919 Date of Record: 08/03/2023 Project Spec#: LB23-0178F

Project Title: Tacoma Public Library Main Branch Remodel

\*For the OMWBE list, be sure to look for businesses in Pierce, King, Lewis, Mason, Grays Harbor, Thurston, or any counties adjacent to the county in which the work is performed per 1.07.050(2)(b-c). Contact the EIC Office if you have any questions.



City of Tacoma Community & Economic Development Office of Equity in Contracting 747 Market Street, Rm 900 Tacoma WA 98402 253-591-5826

Email: EICOffice@cityoftacoma.org

**EQUITY IN CONTRACTING UTILIZATION FORM** 

This form is to document **only** the contractors, subcontractors, material suppliers or other types of firms that are intended to be used to meet the stated EIC requirements for the contract awarded from this solicitation. This information will be used to determine contract award. Additional forms may be used if needed.

- You must include this form with your bid submittal in order for your bid to be responsive.
- Prime contractors are **required** to solicit bids from Businesses that are "Certified" by the Office of Minority and Women's Business Enterprises (OMWBE) www.omwbe.wa.gov as a MBE, WBE, and SBE to be know as "Certified Business".
- It is the Prime contractor's responsibility to verify the certification status of the business(s) intended to be utilized prior to the submittal deadline.

Address:_			(	City/State/Zip:				
Spec. No.	Base Bid '							fied Businesses
Busi	a. ness Name and Certification Number(s)	b. MBE, WBE, or SBE (Write all that apply)	c. NAICS code(s)	d. Contractor Bid Amount (100%)	e. Material Supplier Bid Amount (20%)	f. Estimated MBE Usage Dollar Amount	g. Estimated WBE Usage Dollar Amount	h. Estimated SBE Usage Dollar Amount
	Utilization %	<b>j.</b> WBE Utilization			lization %			
By signing	g and submitting this form the bide	der certifies that the	OMWBE Certified	Business(s) listed will	be used on this project	including all applic	able change orders.	
Type or Pr	rint Name of Responsible Officer / T	Fitle	Signature o	f Responsible Officer		Date		

# INSTRUCTIONS FOR COMPLETING EIC UTILIZATION FORM

The purpose of these instructions is to assist bidders in properly completing the EIC Utilization Form.

This form when submitted with your bid, provides information to the City of Tacoma to accurately review and evaluate your proposed EIC usage.

- 1. \* Base Bid is the prime contractor's bid, plus any alternates, additives and deductibles selected by the City of Tacoma. Also, please refer to Items #10-12 below.
- 2. Column "a" List all **Certified Business(s)** that you will be awarding a contract to if you are the successful bidder.
- 3. Column "b" Identify if the **Certified Business(s)** is being utilized as an MBE, WBE, or SBE. (Businesses may count towards multiple requirements).
- 4. Column "c" List the appropriate NAICS code(s) for the scope of work, services, or materials/supplies for each **Certified Business**.
- 5. Column "d" The bid amount must be indicated for *all* listed **Certified Businesses** that you plan on doing business with. This quote is the price that you and the **Certified Businesses** have negotiated prior to bid opening.
- 6. Column "e" The bid amount must be indicated for **all** listed **Certified Businesses** that you plan on doing business with. This quote is the price that you and the material supplier have negotiated prior to bid opening.
- 7. Column "f" Estimated MBE Usage Dollar Amount: For all MBE firms used, multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 8. Column "g" Estimated WBE Usage Dollar Amount: For all WBE firms used, multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 9. Column "h" Estimated SBE Usage Dollar Amount: For all MBE, WBE, or SBE firms used, Multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 10. Block "i" The percentage of actual MBE utilization calculated on the Base Bid only. (Divide the sum of Estimated MBE Usage Dollar Amount (Column "f") by your Base Bid (\*) then multiply by 100 to get a percentage: \$ amounts from column "f" divided by Base Bid (\*) x 100 = MBE usage as a percentage of the Base Bid.)
- 11. Block "j" The percentage of actual WBE utilization calculated on the Base Bid only. (Divide the sum of Estimated WBE Usage Dollar Amount (Column "g") by your Base Bid (\*) then multiply by 100 to get a percentage: \$ amounts from column "g" divided by Base Bid (\*) x 100 = WBE usage as a percentage of the Base Bid).

12. Block "k" – The percentage of actual SBE utilization calculated on the Base Bid only. (Divide the sum of Estimated SBE Usage Dollar Amount (Column "h") by your Base Bid (\*) then multiply by 100 to get a percentage: \$ amounts from column "h" divided by Base Bid (\*) x 100 = SBE usage as a percentage of the Base Bid.)

It is the prime contractor's responsibility to check the status of **Certified Businesses** prior to bid opening. Call the EIC Office at 253-591-5826 or email at EICOffice@cityoftacoma.org for additional information.

#### CONTRACT

Resolution No. Contract No.

This Contract is made and entered into effective as of [Month], [Day], [Year] ("Effective Date") by and between the City of Tacoma, a Municipal Corporation of the State of Washington ("City"), and [supplier name as it appears in Ariba, including dbas or trade names] ("Contractor").

That in consideration of the mutual promises and obligations hereinafter set forth the Parties hereto agree as follows:

- I. Contractor shall fully execute and diligently and completely perform all work and provide all services and deliverables described herein and in the items listed below each of which are fully incorporated herein and which collectively are referred to as "Contract Documents":
  - 1. Specification No. [Spec Number] [Spec Title] together with all authorized addenda.
  - 2. Contractor's submittal [or specifically described portions thereof] dated [Enter Submittal Date] submitted in response to Specification No. [Spec Number] [Spec Title].
  - 3. Describe with specific detail and list separately any other documents that will make up the contract (fee schedule, work schedule, authorized personnel, etc.) or any other additional items mutually intended to be binding upon the parties.
- II. If federal funds will be used to fund, pay or reimburse all or a portion of the services provided under the Contract, the terms and conditions set forth at this Appendix A are incorporated into and made part of this Contract and CONTRACTOR will comply with all applicable provisions of Appendix A and with all applicable federal laws, regulations, executive orders, policies, procedures, and directives in the performance of this Contract.
  - If CONTRACTOR's receipt of federal funds under this Contract is as a sub-recipient, a fully completed Appendix B, "Sub-recipient Information and Requirements" is incorporated into and made part of this Contract.
- III. In the event of a conflict or inconsistency between the terms and conditions contained in this document entitled Contract and any terms and conditions contained the above referenced Contract Documents the following order of precedence applies with the first listed item being the most controlling and the last listed item the least controlling:
  - 1. Contract, inclusive of Appendices A and B.
  - 2. List remaining Contract Documents in applicable controlling order.
- IV. The Contract terminates on xxxxx, and may be renewed for xxxxxxxx
- V. The total price to be paid by City for Contractor's full and complete performance hereunder, including during any authorized renewal terms, may not exceed:
   \$[Dollar Amount], plus any applicable taxes.
- VI. Contractor agrees to accept as full payment hereunder the amounts specified herein and in Contract Documents, and the City agrees to make payments at the times and in the manner and upon the terms and conditions specified. Except as may be otherwise provided herein or in Contract Documents Contractor shall provide and bear the expense of all equipment, work and labor of any sort whatsoever that may be required for the transfer of materials and for constructing and completing the work and providing the services and deliverables required by this Contract.
- VII. The City's preferred method of payment is by ePayables (Payment Plus), followed by credit card (aka procurement card), then Electronic Funds Transfer (EFT) by Automated Clearing House (ACH), then check or other cash equivalent. CONTRACTOR may be required to have the capability of accepting the City's ePayables or credit card methods of payment. The City of Tacoma will not accept price changes or pay additional fees when ePayables (Payment Plus) or credit card is used. The City, in its sole discretion, will determine the method of payment for this Contract.

- VIII. Failure by City to identify a deficiency in the insurance documentation provided by Contractor or failure of City to demand verification of coverage or compliance by Contractor with the insurance requirements contained in the Contract Documents shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- IX. Contractor and for its heirs, executors, administrators, successors, and assigns, does hereby agree to the full performance of all the requirements contained herein and in Contract Documents.

It is further provided that no liability shall attach to City by reason of entering into this Contract, except as expressly provided herein.

IN WITNESS WHEREOF, the Parties hereto have accepted and executed this Contract, as of the Effective Date stated above, which shall be Effective Date for bonding purposes as applicable.

CITY OF TACOMA:	CONTRACTOR:	
Signature:	Signature:	
Name:	Name:	
Title:	Title:	
	(City of Tacoma use only - blank lines are intentional)	
Director of Finance:		
Deputy/City Attorney (	approved as to form):	<del></del>
Approved By:		
дрргочец Бу		
Approved By:		
Approved By:		
Approved By:		
Approved Dur		
Арргочец ву		
Approved By:		

# APPENDIX A FEDERAL FUNDING

#### 1. Termination for Breach

CITY may terminate this Contract in the event of any material breach of any of the terms and conditions of this Contract if CONTRACTOR's breach continues in effect after written notice of breach and 30 days to cure such breach and fails to cure such breach.

#### 2. Prevailing Wages

- If federal, state, local, or any applicable law requires CONTRACTOR to pay prevailing wages in connection with this Contract, and CONTRACTOR is so notified by the CITY, then CONTRACTOR shall pay applicable prevailing wages and otherwise comply with the Washington State Prevailing Wage Act (RCW 39.12) in the performance of this Contract.
- 2. If applicable, a Schedule of Prevailing Wage Rates and/or the current prevailing wage determination made by the Secretary of Labor for the locality or localities where the Contract will be performed is made of part of the Contract by this reference. If prevailing wages apply to the Contract, CONTRACTOR and its subcontractors shall:
  - i. Be bound by and perform all transactions regarding the Contract relating to prevailing wages and the usual fringe benefits in compliance with the provisions of Chapter 39.12 RCW, as amended, the Washington State Prevailing Wage Act and/or the Davis-Bacon Act (40 U.S.C. 3141- 3144, and 3146-3148) and the requirements of 29 C.F.R. pt. 5 as may be applicable, including the federal requirement to pay wages not less than once a week.
  - ii. Ensure that no worker, laborer or mechanic employed in the performance of any part of the Contract shall be paid less than the prevailing rate of wage specified on that Schedule and/or specified in a wage determination made by the Secretary of Labor (unless specifically preempted by federal law, the higher of the Washington state prevailing wage or federal Davis-Bacon rate of wage must be paid.
  - iii. Immediately upon award of the Contract, contact the Department of Labor and Industries, Prevailing Wages section, Olympia, Washington and/or the federal Department of Labor, to obtain full information, forms and procedures relating to these matters. Per such procedures, a Statement of Intent to Pay Prevailing Wages and/or other or additional documentation required by applicable federal law, must be submitted by CONTRACTOR and its subcontractors to the CITY, in the manner requested by the CITY, prior to any payment by the CITY hereunder, and an Affidavit of Wages Paid and/or other or additional documentation required by federal law must be received or verified by the CITY prior to final Contract payment.

#### 3. COPELAND ANTI-KICKBACK ACT

For Contracts subject to Davis Bacon Act the following clauses will be incorporated into the Contract:

- A. CONTRACTOR shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this Contract.
- B. CONTRACTOR or subcontractor shall insert in any subcontracts the clause above and such other clauses federal agencies may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts.

Supplies\_PurchasedServices\_PW Form No. SPEC-120A CW#######
Template Revised: 02/03/2022 Page 3 of 9

The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these Contract clauses.

C. Breach. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

#### 4. EQUAL EMPLOYMENT OPPORTUNITY

During the performance of this Contract, CONTRACTOR will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. If the CONTRACTOR does over \$10,000 in business a year that is funded, paid or reimbursed with federal funds, CONTRACTOR will take specific and affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

- A. Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. CONTRACTOR agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
- B. CONTRACTOR will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
- C. CONTRACTOR will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the Contractor's legal duty to furnish information.
- D. CONTRACTOR will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- E. CONTRACTOR will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- F. In the event of CONTRACTOR's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the CONTRACTOR may be declared ineligible for further federally funded contracts in accordance with procedures

- authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- G. CONTRACTOR will include the portion of the sentence immediately preceding paragraph (A) and the provisions of paragraphs (A) through (G) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. CONTRACTOR will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event CONTRACTOR becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the CONTRACTOR may request the United States to enter into such litigation to protect the interests of the United States.

#### 5. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

- A. Overtime requirements. Neither CONTRACTOR or subcontractor contracting for any part of the Contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- B. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (3)(A) of this section the CONTRACTOR and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such CONTRACTOR and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (3)(A) of this section, in the sum of \$27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (3)(A) of this section.
- C. Withholding for unpaid wages and liquidated damages. The CITY shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the CONTRACTOR or subcontractor under any such contract or any other Federal

contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such CONTRACTOR or sub-contractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (3)(B) of this section.

D. Subcontracts. The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (3)(A) through (D) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime CONTRACTOR shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (3)(A) through (D) of this section.

#### 6. CLEAN AIR ACT

- A. CONTRACTOR agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.
- B. CONTRACTOR agrees to report each violation to the CITY and understands and agrees that the CITY will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

CONTRACTOR agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with federal funds.

#### 7. FEDERAL WATER POLLUTION CONTROL ACT

- A. CONTRACTOR agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seg.
- B. CONTRACTOR agrees to report each violation to the CITY and understands and agrees that the CITY will, in turn, report each violation as required to assure notification to the appropriate federal agency.
- C. CONTRACTOR agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with federal funding.

#### 8. DEBARMENT AND SUSPENSION

- A. This Contract is a Covered Transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the CONTRACTOR is required to verify that none of the contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).
- B. CONTRACTOR must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier Covered Transaction it enters into.

- C. This certification is a material representation of fact relied upon by the CITY. If it is later determined that the CONTRACTOR did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to CITY, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.
- D. CONTRACTOR agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C throughout the period of this Contract and to include a provision requiring such compliance in its lower tier covered transactions.

#### 9. BYRD ANTI-LOBBYING AMENDMENT

- A. Contractors who apply or bid for an award of \$100,000 or more shall file the required certification with CITY. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the CITY.
- B. If applicable, CONTRACTOR must sign and submit to the CITY the certification required by Appendix A to 44 CFR Part 18 contained at Appendix A-1 to this Contract.

#### 10. PROCUREMENT OF RECOVERED MATERIALS

- A. In the performance of this Contract, CONTRACTOR shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired:
  - i. Competitively within a timeframe providing forcompliance with the contract performance schedule;
  - ii. Meeting contract performance requirements; or
  - iii. At a reasonable price.
- B. Information about this requirement, along with the list of EPA- designated items, is available at EPA's Comprehensive Procurement Guidelines web site, https://www.epa.gov/smm/comprehensive- procurement-guideline-cpg-program.
- C. CONTRACTOR also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

#### **APPENDIX A-1**

# APPENDIX A to 44 C.F.R. PART 18 – CERTIFICATION REGARDING LOBBYING Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- 1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- 2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- 3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The Contractor,, certifies or affirms the truthfulness and accuracy of each statement of its
certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 3
U.S.C. Chap.38, Administrative Remedies for
False Claims and Statements, apply to this certification and disclosure, if any.
Signature of Contractor's Authorized Official
<b>3</b>
Name and Title of Contractor's Authorized Official
Date

### **APPENDIX B—Sub-recipient information and requirements**

Pursuant to 2 CFR 200.332(a)(1) Federal Award Identification

(i) Agency Name (must match the name associated with its unique entity identifier)		(ii) Unique Entity Identifier (i.e., DUNS)		City of Tacoma Number for This Agreement
(iii) Federal Award Identification Number (FAIN)	(iv) Federal Award Date	Performance Start and End		(vi) Federal Budget Period Start and End Date
(vii) Amount of Federal Funds <i>Obligated</i> to the agency <i>by this action</i> :				Amount of the Federal mmitted to the agency
(x) Federal Award Project I CORONAVIRUS STATE AND		ERY FUNDS— City	y of Tacoma	
(xi) Federal Awarding Ager cy: DEPARTMENT OF THE TREASURY	Pass-Through Entity City of Tacoma		Awarding Offi and Contact In	
identify the dollar amount made available under each Federal award and				(xiii) Identification of Whether the Award is R&D
(xiv) Indirect Cost Rate for the Federal Award	Award Payment Me sum payment or rein REIMBURSEMENT	- ·		

This Insurance Requirements shall serve as an attachment and/or exhibit form to the Contract. The Agency entering a Contract with City of Tacoma, whether designated as a Supplier, Contractor, Vendor, Proposer, Bidder, Respondent, Seller, Merchant, Service Provider, or otherwise referred to as "Contractor".

#### GENERAL REQUIREMENTS

The following General Requirements apply to Contractor and to Subcontractor(s) performing services and/or activities pursuant to the terms of this Contract. Contractor acknowledges and agrees to the following insurance requirements:

- 1.1. Contractor shall not begin work under the Contract until the required insurance has been obtained and approved by the City of Tacoma.
- 1.2. Contractor shall keep in force during the entire term of the Contract, at no expense to the City of Tacoma, the insurance coverage and limits of liability listed below and for Thirty (30) calendar days after completion of all work required by the Contract, unless otherwise provided herein.
- 1.3. Liability insurance policies, except for Professional Liability and Workers' Compensation, shall:
  - 1.3.1. Name the City of Tacoma and its officers, elected officials, employees, and agents as additional insured
  - 1.3.2. Be considered primary and non-contributory for all claims with any insurance or selfinsurance or limits of liability maintained by the City of Tacoma
  - 1.3.3. Contain a "Waiver of Subrogation" clause in favor of City of Tacoma
  - 1.3.4. Include a "Separation of Insureds" clause that applies coverage separately to each insured and additional insured
  - 1.3.5. Name the "City of Tacoma" on certificates of insurance and endorsements and not a specific person or department
  - 1.3.6. Be for both ongoing and completed operations using Insurance Services Office (ISO) form CG 20 10 04 13 and CG 20 37 04 13 or the equivalent
  - 1.3.7. Be satisfied by a single primary limit or by a combination of a primary policy and a separate excess umbrella
- 1.4. A notation of coverage enhancements on the Certificate of Insurance shall not satisfy these requirements below. Verification of coverage shall include:
  - 1.4.1. An ACORD certificate or equivalent
  - 1.4.2. Copies of requested endorsements
- 1.5. Contractor shall provide to City of Tacoma Procurement & Payable Division, prior to the execution of the Contract, Certificate(s) of Insurance and endorsements from the insurer certifying the coverage of all insurance required herein. Contract or Permit number and the City of Tacoma Department must be shown on the Certificate of Insurance.
- 1.6. A renewal Certificate of Insurance shall be provided electronically prior to coverage

expiration via email sent annually to coi@cityoftacoma.org.

- 1.7. Contractor shall send a notice of cancellation or non-renewal of this required insurance within Thirty (30) calendar days to coi@cityoftacoma.org.
- 1.8. "Claims-Made" coverages, except for pollution coverage, shall be maintained for a minimum of three years following the expiration or earlier termination of the Contract. Pollution coverage shall be maintained for six years following the expiration of the Contract. The retroactive date shall be prior to or coincident with the effective date of the Contract.
- 1.9. Each insurance policy must be written by companies licensed or authorized (or issued as surplus line by Washington surplus line broker) in the State of Washington pursuant to RCW 48 with an (A-) VII or higher in the A.M. Best key rating guide.
- 1.10. Contractor shall not allow any insurance to be cancelled, voided, suspended, or reduced in coverage/limits, or lapse during any term of this Contract. Otherwise, it shall constitute a material breach of the Contract.
- 1.11. Contractor shall be responsible for the payment of all premiums, deductibles and self-insured retentions, and shall indemnify and hold the City of Tacoma harmless to the extent such a deductible or self-insured retained limit may apply to the City of Tacoma as an additional insured. Any deductible or self-insured retained limits in excess of Twenty Five Thousand Dollars (\$25,000) must be disclosed and approved by City of Tacoma Risk Manager and shown on the Certificate of Insurance.
- 1.12. City of Tacoma reserves the right to review insurance requirements during any term of the Contract and to require that Contractor make reasonable adjustments when the scope of services changes.
- 1.13. All costs for insurance are included in the initial Contract and no additional payment will be made by City of Tacoma to Contractor.
- 1.14. Insurance coverages specified in this Contract are not intended and will not be interpreted to limit the responsibility or liability of Contractor or Subcontractor(s).
- 1.15. Failure by City of Tacoma to identify a deficiency in the insurance documentation or to verify coverage or compliance by Contractor with these insurance requirements shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- 1.16. If Contractor is a government agency or self-insured for any of the above insurance requirements, Contractor shall be liable for any self-insured retention or deductible portion of any claim for which insurance is required. A certification of self-insurance shall be attached and incorporated by reference and shall constitute compliance with this Section.

#### 2. SUBCONTRACTORS

It is Contractor's responsibility to ensure that each subcontractor obtain and maintain adequate liability insurance coverage that applies to the service provided. Contractor shall provide evidence of such insurance upon City of Tacoma's request. Failure of any subcontractor to comply with insurance requirements does not limit Contractor's liability or responsibility.

#### 3. REQUIRED INSURANCE AND LIMITS

The insurance policies shall provide the minimum coverages and limits set forth below. Providing coverage in these stated minimum limits shall not be construed to relieve Contractor from liability in excess of such limits.

#### 3.1 Commercial General Liability Insurance

Contractor shall maintain Commercial General Liability Insurance policy with limits not less than One Million Dollars (\$1,000,000) each occurrence and Two Million Dollars (\$2,000,000) annual aggregate. This policy shall be written on ISO form CG 00 01 04 13 or its equivalent and shall include product liability especially when a Contract is solely for purchasing supplies. It includes Products and Completed Operations for three years following the completion of work related to performing construction services. It shall be endorsed to include: A per project aggregate policy limit (using ISO form CG 25 03 05 09 or equivalent endorsement)

#### 3.2 Commercial (Business) Automobile Liability Insurance

Contractor shall maintain Commercial Automobile Liability policy with limits not less than One Million Dollars (\$1,000,000) each accident for bodily injury and property damage and bodily injury and property damage coverage for owned (if any), non-owned, hired, or leased vehicles. Commercial Automobile Liability Insurance shall be written using ISO form CA 00 01 or equivalent. Contractor must also maintain MCS 90 and CA 99 48 endorsements or equivalent if "Pollutants" are to be transported unless in-transit Pollution coverage is covered under required Contractor's Pollution Liability Insurance.

#### 3.3 Workers' Compensation

Contractor shall comply with Workers' Compensation coverage as required by the Industrial Insurance laws of the State of Washington, as well as any other similar coverage required for this work by applicable federal laws of other states. Contractor must comply with their domicile State Industrial Insurance laws if it is outside the State of Washington.

#### 3.4 Employers' Liability Insurance

Contractor shall maintain Employers' Liability coverage with limits not less than One Million Dollars (\$1,000,000) each employee, One Million Dollars (\$1,000,000) each accident, and One Million Dollars (\$1,000,000) policy limit.

#### 3.5 Excess or Umbrella Liability Insurance

Contractor shall provide Excess or Umbrella Liability Insurance with limits not less than Three Million Dollars (\$3,000,000) per occurrence and in the aggregate. This coverage shall apply, at a minimum, in excess of primary underlying Commercial General Liability, Employer's Liability, Pollution Liability, Marine General Liability, Protection and Indemnity, and Automobile Liability if required herein.

#### 3.6 Pollution Liability Insurance

Contractor shall maintain Pollution Liability or Environmental Liability Insurance with limits not less than One Million Dollars (\$1,000,000) each occurrence and Two Million Dollars (\$2,000,000) in the aggregate. Coverage shall include investigation and defense costs for bodily injury and property damage, loss of use of damaged or destroyed property, Natural Resource

Damage, and Hazardous Substance Removal. Such coverage shall provide both on-site and off-site cleanup costs, cover gradual and sudden pollution, and include in its scope of coverage the City of Tacoma damage claims for loss arising out of Contractor's work.

#### 3.7 Commercial Property Insurance

Contractor shall provide Commercial Property Insurance for loss or damage to any and all equipment owned by City of Tacoma while in the care, custody, or control of Contractor, Subcontractors, or their agents. The coverage shall be provided on an ISO **Special Form Causes of Loss** CP10 30 06 07 or equivalent and shall provide full replacement cost coverage. The deductible shall not exceed Two Thousand Five Hundred Dollars (\$2,500). Contractor shall be responsible for paying the deductible for the applicable coverage.

#### 3.8 <u>Installation Floater Insurance</u>

Contractor shall maintain during the term of the Contract, at its own expense, Installation Floater Insurance covering Contractor's labor, materials, and equipment to be used for completion of the work performed under this Contract against all risks of direct physical loss, excluding earthquake and flood, for an amount equal to the full amount of the Contract improvements.

#### 3.9 Builder's Risk Insurance

Contractor shall maintain during the term of the Contract and until final acceptance of the work by the City of Tacoma, a policy of Builder's Risk Insurance providing coverage for all-risk of physical injury to all structures to be constructed according to the Contract. City of Tacoma shall be included as a named insured (not named as additional insured) on the policy. Builder's Risk Insurance policy shall:

- 3.9.1 Have a deductible of no more than Five Thousand Dollars (\$5,000) for each occurrence, the payment of which will be the responsibility of Contractor. Any increased deductibles accepted by City of Tacoma will remain the responsibility of Contractor
- 3.9.2 Be on an ISO Special Form Causes of Loss or the equivalent and also include coverage for Collapse, Earthquake and Flood. The deductible for Earthquake and Flood may be higher than the \$5,000 deductible required in 3.18.1
- 3.9.3 Include coverage for temporary buildings, debris removal, and damage to materials in transit or stored off-site
- 3.9.4 Be written in the amount of the completed value of the structures, with no coinsurance provisions exposure on the part of Contractor or City of Tacoma
- 3.9.5 Contain a Waiver of Subrogation provision whereby each insured waives their subrogation rights to the extent the loss is covered by this insurance
- 3.9.6 Grant permission to occupy, allowing the building or structure to be partially occupied prior to completion, without detrimental effect to the coverage provided
- 3.9.7 Include coverage for the testing and startup of the building's operating systems
- 3.9.8 Include coverage for City of Tacoma's loss of use or business interruption arising out of a covered loss which delays completion
- 3.9.9 Include resultant damage coverage for loss due to faulty workmanship and defective material
- 3.9.10 Include coverage for startup and testing
- 3.9.11 Include coverage for resultant damage coverage for loss due to faulty workmanship and defective material

Contractor and City of Tacoma waive all rights against each other, their respective subcontractors, agents, and representatives for damages caused by fire or other perils to the extent covered by Builder's Risk Insurance or other property insurance applicable to the work. The policies shall provide such waivers by endorsement or otherwise.

#### 3.10 Other Insurance

Other insurance may be deemed appropriate to cover risks and exposures related to the scope of work or changes to the scope of work required by City of Tacoma. The costs of such necessary and appropriate Insurance coverage shall be borne by Contractor.

Insurance Requirements
Template Revised 04/17/2023

Spec/Contract Number: LB23-0178F

Page **5** of **5** 



# PERFORMANCE BOND TO THE CITY OF TACOMA

Resolution No. Bond No.

	BOHQ NO.
That we, the undersigned,	
as principal, and	
as a surety, are jointly and severally held and firmly bound to the	•
	whereof Contractor and Surety bind themselves,
their executors, administrators, legal representatives, successo	
This obligation is entered into in pursuance of the statutes Tacoma.	
WHEREAS, under and pursuant to the City Charter and ge about to enter with the above bounden principal, a contract, pro	eneral ordinances of the City of Tacoma, the said City has or is oviding for
Specification No.	
Specification Title:	
Contract No.	
(which contract is referenced to herein and is made a part here	of as though attached hereto), and
	eact, and undertake to perform the work therein provided for in
This statutory performance bond shall become null and void, if successors, or assigns shall well and faithfully perform all of the and conditions of all duly authorized modifications, additions and time and in the manner therein specified; and if such performant force and effect.	e Principal's obligations under the Contract and fulfill all terms and changes to said Contract that may hereafter be made, at the
The Surety for value received agrees that no change, extension specifications accompanying the Contract, or to the work to be obligation on this bond, and waives notice of any change, exter or the work performed. The Surety agrees that modifications ar increase the total amount to be paid the Principal shall automat notice to Surety is not required for such increase.	performed under the Contract shall in any way affect its nsion of time, alteration or addition to the terms of the Contract and changes to the terms and conditions of the Contract that
If the City shall commence suit and obtain judgment against the such judgement, shall pay all costs and attorney's fees incurred any action arising out of in in connection with this bond shall be	by the City in enforcement of its rights hereunder. Venue for
Surety companies executing bonds must be authorized to trans in the current list of "Surety Companies Acceptable in Federal E Bureau of Accounts, U.S. Department of the Treasury.	
One original bond shall be executed, and signed by the parties' accompanied by a fully executed power of attorney for the office	duly authorized officers. This bond will only be accepted if it is e executing on behalf of the surety.
Principal: Enter Vendor Legal Name	
Ву:	
Surety:	
Ву:	
Agent's Name:	
Agent's Address:	

Form No. SPEC-100A 04/09/2020



# PAYMENT BOND TO THE CITY OF TACOMA

Resolution No.

That we, the undersigned,		
as principal, and		
as a surety, are jointly and several	ly held and firmly bound to the CITY OF TAC	OMA, in the penal sum of,
\$	, for the payment whereof Contrac	tor and Surety bind themselves,
their executors, administrators, leg	al representatives, successors and assigns, j	ointly and severally, firmly by these presents.
This obligation is entered into Tacoma.	in pursuance of the statutes of the State of W	ashington, the Ordinances of the City of
	ant to the City Charter and general ordinances nden principal, a contract, providing for	s of the City of Tacoma, the said City has or is
Specification No.		
Specification Title:		
Contract No.		

(which contract is referenced to herein and is made a part hereof as though attached hereto), and

WHEREAS, the said principal has accepted, the said contract, and undertake to perform the work therein provided for in the manner and within the time set forth.

This statutory payment bond shall become null and void, if and when the Principal, its heirs, executors, administrators, successors, or assigns shall pay all persons in accordance with RCW 39.08, 39.12, and 60.28, including all workers, laborers, mechanics, subcontractors, and materialmen, and all person who shall supply such contractor or subcontractor with provisions and supplies for the carrying on of such work, and all taxes incurred on said Contract under Titles 50 and 51 RCW and all taxes imposed on the Principal under Title 82 RCW; and if such payment obligations have not been fulfilled, this bond shall remain in full force and effect.

The Surety for value received agrees that no change, extension of time, alteration or addition to the terms of the Contract shall in any way affect its obligation on this bond, and waivers notice of any changes, extension of time, alteration or addition to the terms of the Contract or the work performed. The Surety agrees that modifications and changes to the terms and conditions of the Contract that increase the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this bond and notice to Surety is not required for such increased obligation.

No suit or action shall be commenced hereunder by any claimant unless claimant shall have given the written notices to the City, and where required, the Contractor, in accordance with RCW 39.08.030.

The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of claims which may be properly filed in accordance with RCW 39.08 whether or not suit is commenced under and against this bond.

If any claimant shall commence suit and obtain judgment against the Surety for recovery hereunder, then the Surety, in addition to such judgment and attorney fees as provided by RCW 39.08.030, shall also pay such costs and attorney fees as may be incurred by the City as a result of such suit. Venue for any action arising out of or in connection with this bond shall be in Pierce County, WA.

Surety companies executing bonds must be authorized to transact business in the State of Washington as surety and named in the current list of "Surety Companies Acceptable in Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Department of the Treasury.

Form No. SPEC-100B 04/09/2020

Resolution No.

Bond No.

Specification No.

Contract No.

One original bond shall be executed, and be signed by the parties' duly authorized officers. This bond will only be accepted if it is accompanied by a fully executed power of attorney for the office executing on behalf of the surety.

Principal: Enter Vendor Legal Name	
Ву:	
Surety:	
By:	
Agent's Name:	
Agent's Address:	

Form No. SPEC-100B 04/09/2020

### GENERAL RELEASE TO THE CITY OF TACOMA

rne	undersigned,	named	as	tne	contractor	101	tne
			between _			and the	City
of Tacoma, Co	ontract No.		_ dated _		<u>, 20</u> , her	eby releases	s the
City of Tacon	na, its departmenta	al officers	and agen	its from	any and all	claim or cla	aims
whatsoever in	any manner what	soever at	any time	whatso	ever arising of	out of and/o	or in
connection wi	ith and/or relating	g to said	contract,	except	ing only the	e equity of	the
undersigned in	the amount now	retained b	by the City	y of Tac	oma under s	aid contract	, to-
wit the sum of					exclu	uding sales	tax.
Signed at	, Washin	gton this _	d	ay of		, 20	)
				Contract	or		
				By Title			
STATE OF W	ASHINGTON)		)				
COUNTY OF	) ss						
executed the wathe free and v	this, day ovithin and foregoing oluntary act and od on oath stated that	g instrum deed of sa	ent, and a aid compa	cknowle ny, for	dged the said the uses and	l instrument purposes tl	to be
	WHEREOF, I han this certificate fire			hand ar	nd affixed my	y official se	al the
	Notary Public in an My appointment ex		State of W	ashingto	on		

#### PREVAILING WAGE RATES

This project requires prevailing wages under <u>39.12 RCW</u>. Any worker, laborer, or mechanic employed in the performance of any part of the work shall be paid not less than the applicable prevailing rate of wage.

The project site is located in Pierce County.

The effective date for prevailing wages on this project will be the **submittal deadline** with these exceptions:

- a. If the project is not awarded within six months of the submittal deadline, the award date is the effective date.
- b. If the project is not awarded pursuant to a competitive solicitation, the date the contract is executed is the effective date.
- c. Janitorial contracts follow WAC 296-127-023.

Except for janitorial contracts, these rates shall apply for the duration of the contract unless otherwise noted in the solicitation.

Look up prevailing rates of pay, benefits, and overtime codes from this link: https://secure.lni.wa.gov/wagelookup/

#### REQUIRED FILINGS

The contractor and all subcontractors covered under <u>39.12 RCW</u> shall submit to the Department of Labor and Industries (L&I) for work provided under this contract:

- 1. A Statement of Intent to Pay Prevailing Wages must be filed with and approved by L&I upon award of contract.
- 2. An Affidavit of Wages Paid must be filed with and approved by L&I upon job completion.

Payments cannot be released by the City until verification of these filings are received by the engineer. Additional information regarding these filings can be obtained by calling the Department of Labor & Industries, Prevailing Wage at 360-902-5335, <a href="https://www.lni.wa.gov/">https://www.lni.wa.gov/</a> or by visiting their MY L&I account.

### City Programs

- Equity in Contracting (EIC) Program
   Local Employment and Apprenticeship (LEAP) Training Program

# **EIC REQUIREMENT FORM**

#### **EQUITY IN CONTRACTING REQUIREMENTS & PROCEDURES:**

All bidders must complete and submit with their bid the following solicitation form contained in the bid submittal package:

City of Tacoma – EIC Utilization Form

#### **IMPORTANT NOTE:**

It is the bidder's responsibility to ensure that the subcontractor(s) listed on the EIC Utilization Form are currently certified by the State of Washington's Office of Minority and Women Business Enterprises (OMWBE) at the time of bid opening. This may be verified by contacting the EIC Office at 253-591-5075 between 8 AM and 5 PM, Monday through Friday or the <a href="OMWBE">OMWBE</a> Office at (866) 208-1064. Please refer to the City of Tacoma EIC code.

#### **EQUITY IN CONTRACTING REQUIREMENTS**

Minority Business Enterprise Requirement	Women Business Enterprise Requirement	Small Business Enterprise Requirement
2%	3%	7%

A list of EIC-eligible companies is available on the following web site addresses:

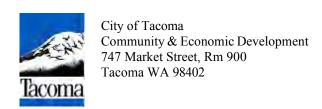
www.omwbe.diversitycompliance.com\*

MATERIAL MISSTATEMENTS CONCERNING COMPLETED ACTIONS BY THE BIDDER IN ANY SWORN STATEMENT OR FAILURE TO MEET COMMITMENTS AS INDICATED ON THE EIC UTILIZATION FORM MAY RENDER THE BIDDER IN DEFAULT OF CITY ORDINANCE 1.07

CCD/SBE: SR4069295919 Date of Record: 08/03/2023 Project Spec#: LB23-0178F

Project Title: Tacoma Public Library Main Branch Remodel

\*For the OMWBE list, be sure to look for businesses in Pierce, King, Lewis, Mason, Grays Harbor, Thurston, or any counties adjacent to the county in which the work is performed per 1.07.050(2)(b-c). Contact the EIC Office if you have any questions.



### CITY OF TACOMA EQUITY IN CONTRACTING (EIC) PROGRAM

### **Bidders Special Instructions**

As part of the City of Tacoma's ongoing work to address past disparities and to increase the City's contracting with and utilization of historically underutilized businesses, the Equity in Contracting (EIC) Program places requirements on City contracts for utilization of businesses certified by the Washington State Office of Minority and Women's Business Enterprise (OMWBE) and approved by the Equity in Contracting Program ("Certified Businesses"). The EIC Program also provides guidance and technical assistance to Certified Businesses who are interested in providing supplies, services and public works to the City of Tacoma.

The EIC Program requirements are contained in <u>Tacoma Municipal Code Chapter 1.07</u>.

Contractors bidding on City of Tacoma projects are required to meet the stated EIC requirements. Bids will be evaluated on an individual basis to determine EIC compliance. **A contractor who fails to meet the stated EIC requirements will be considered non-responsible.** Bidders are also subject to the City's Equal Employment Opportunity policies prohibiting discrimination.

The stated EIC requirements may be met by the contractor or by identified subcontractors. All EIC Requirements may be met by using MBEs, WBEs, DBEs or SBEs from the OMWBE certified list (<u>OMWBE website</u>). It is the bidder's responsibility to ensure that their firm or identified subcontractors are certified by OMWBE and approved by the City of Tacoma EIC Program at the time of bid submittal. Business certification may be verified by contacting the EIC Office\*.

For the OMWBE list, be sure to look for businesses in Pierce, King, Lewis, Mason, Grays Harbor, Thurston, or any counties adjacent to the county in which the work is performed per 1.07.050(2)(b-c). Contact the EIC Office\* if you have any questions.

The Equity in Contracting (EIC) forms included in these bid documents must be fully completed (including attachments) and included with bid submittals. Failure to include the required forms will result in the submittal being rejected as nonresponsive.

#### **Post-Award Important Information**

For all contracts that have requirements related to the EIC policy, the City of Tacoma is utilizing a cloud-based software system:

**B2Gnow** - Contractors and subcontractors must report payment information in the B2Gnow System on a monthly basis. The EIC Staff will monitor/audit that retainage is paid by the prime contractor to the subcontractor(s) within 10 [working] days after the subcontractors' work is satisfactorily completed. This will be monitored/audited using the B2Gnow System.

(updated 05/2023) Page 1 of 2

The system is monitored/audited by EIC staff to ensure contract compliance, proactively identify potential issues, and track contract progress.

#### \*EIC STAFF Contact Information

For questions regarding Certifications, EIC Compliance and B2GNow support, contact EIC Staff:

- Call EIC Office at (253) 591-5630 or (253) 591-5826
- Email EIC Office at EICOffice@cityoftacoma.org

(updated 05/2023) Page 2 of 2



City of Tacoma Community & Economic Development Office of Equity in Contracting 747 Market Street, Rm 900 Tacoma WA 98402 253-591-5826

Email: EICOffice@cityoftacoma.org

**EQUITY IN CONTRACTING UTILIZATION FORM** 

This form is to document **only** the contractors, subcontractors, material suppliers or other types of firms that are intended to be used to meet the stated EIC requirements for the contract awarded from this solicitation. This information will be used to determine contract award. Additional forms may be used if needed.

- You must include this form with your bid submittal in order for your bid to be responsive.
- Prime contractors are **required** to solicit bids from Businesses that are "Certified" by the Office of Minority and Women's Business Enterprises (OMWBE) www.omwbe.wa.gov as a MBE, WBE, and SBE to be know as "Certified Business".
- It is the Prime contractor's responsibility to verify the certification status of the business(s) intended to be utilized prior to the submittal deadline.

Address:_			(	City/State/Zip:				
Spec. No.	Base Bid '	* \$		Complete business name	es and phone numbers a	re required to verify	your usage of Certif	fied Businesses
Busi	a. ness Name and Certification Number(s)	b. MBE, WBE, or SBE (Write all that apply)	c. NAICS code(s)	d. Contractor Bid Amount (100%)	e. Material Supplier Bid Amount (20%)	f. Estimated MBE Usage Dollar Amount	g. Estimated WBE Usage Dollar Amount	h. Estimated SBE Usage Dollar Amount
	Utilization %	<b>j.</b> WBE Utilization			lization %			
By signing	g and submitting this form the bide	der certifies that the	OMWBE Certified	Business(s) listed will	be used on this project	including all applic	able change orders.	
Type or Pr	rint Name of Responsible Officer / T	Fitle	Signature o	f Responsible Officer		Date		

## INSTRUCTIONS FOR COMPLETING EIC UTILIZATION FORM

The purpose of these instructions is to assist bidders in properly completing the EIC Utilization Form.

This form when submitted with your bid, provides information to the City of Tacoma to accurately review and evaluate your proposed EIC usage.

- 1. \* Base Bid is the prime contractor's bid, plus any alternates, additives and deductibles selected by the City of Tacoma. Also, please refer to Items #10-12 below.
- 2. Column "a" List all **Certified Business(s)** that you will be awarding a contract to if you are the successful bidder.
- 3. Column "b" Identify if the **Certified Business(s)** is being utilized as an MBE, WBE, or SBE. (Businesses may count towards multiple requirements).
- 4. Column "c" List the appropriate NAICS code(s) for the scope of work, services, or materials/supplies for each **Certified Business**.
- 5. Column "d" The bid amount must be indicated for *all* listed **Certified Businesses** that you plan on doing business with. This quote is the price that you and the **Certified Businesses** have negotiated prior to bid opening.
- 6. Column "e" The bid amount must be indicated for **all** listed **Certified Businesses** that you plan on doing business with. This quote is the price that you and the material supplier have negotiated prior to bid opening.
- 7. Column "f" Estimated MBE Usage Dollar Amount: For all MBE firms used, multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 8. Column "g" Estimated WBE Usage Dollar Amount: For all WBE firms used, multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 9. Column "h" Estimated SBE Usage Dollar Amount: For all MBE, WBE, or SBE firms used, Multiply the amount in Column "d" by 1.0 plus the amount in Column "e" by 0.20. Insert the total amount in this column.
- 10. Block "i" The percentage of actual MBE utilization calculated on the Base Bid only. (Divide the sum of Estimated MBE Usage Dollar Amount (Column "f") by your Base Bid (\*) then multiply by 100 to get a percentage: \$ amounts from column "f" divided by Base Bid (\*) x 100 = MBE usage as a percentage of the Base Bid.)
- 11. Block "j" The percentage of actual WBE utilization calculated on the Base Bid only. (Divide the sum of Estimated WBE Usage Dollar Amount (Column "g") by your Base Bid (\*) then multiply by 100 to get a percentage: \$ amounts from column "g" divided by Base Bid (\*) x 100 = WBE usage as a percentage of the Base Bid).

12. Block "k" – The percentage of actual SBE utilization calculated on the Base Bid only. (Divide the sum of Estimated SBE Usage Dollar Amount (Column "h") by your Base Bid (\*) then multiply by 100 to get a percentage: \$ amounts from column "h" divided by Base Bid (\*) x 100 = SBE usage as a percentage of the Base Bid.)

It is the prime contractor's responsibility to check the status of **Certified Businesses** prior to bid opening. Call the EIC Office at 253-591-5826 or email at EICOffice@cityoftacoma.org for additional information.

## CHAPTER 1.07 EQUITY IN CONTRACTING

Sections:	
1.07.010	Policy and purpose.
1.07.020	Definitions.
1.07.030	Discrimination prohibited.
1.07.040	Program administration.
1.07.050	Approval as a Certified Business.
1.07.060	Program requirements.
1.07.070	Evaluation of submittals.
1.07.080	Contract compliance.
1.07.090	Program monitoring.
1.07.100	Enforcement.
1.07.110	Remedies.
1.07.120	Unlawful acts.
1.07.130	Severability.
1.07.140	Review of program.

#### 1.07.010 Policy and purpose.

It is the policy of the City of Tacoma that citizens be afforded an opportunity for full participation in our free enterprise system and that historically underutilized business enterprises shall have an equitable opportunity to participate in the performance of City contracts. The City finds that in its contracting for supplies, services and public works, there has been historical underutilization of small and minority-owned businesses located in certain geographically and economically disfavored locations and that this underutilization has had a deleterious impact on the economic well-being of the City. The purpose of this chapter is to remedy the effects of such underutilization through use of narrowly tailored contracting requirements to increase opportunities for historically underutilized businesses to participate in City contracts. It is the goal of this chapter to facilitate a substantial procurement, education, and mentorship program designed to promote equitable participation by historically underutilized businesses in the provision of supplies, services, and public works to the City. It is not the purpose of this chapter to provide any person or entity with any right, privilege, or claim, not shared by the public, generally, and this chapter shall not be construed to do so. This chapter is adopted in accordance with Chapter 35.22 RCW and RCW 49.60.400.

(Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### **1.07.020 Definitions.**

Terms used in this chapter shall have the following meanings unless defined elsewhere in the Tacoma Municipal Code ("TMC"), or unless the context in which they are used clearly indicates a different meaning.

1.07.020.B

A. "Bid" means an offer submitted by a Respondent to furnish Supplies, Services, and/or Public Works in conformity with the Specifications and any other written terms and conditions included in a City request for such offer.

B. "Bidder" means an entity or individual who submits a Bid, Proposal or Quote. See also "Respondent."

1.07.020.C

"Certified Business" means an entity that has been certified as a Disadvantaged Business Enterprise ("DBE"), Small Business Enterprise ("SBE"), Minority Business Enterprise ("MBE"), Women Business Enterprise ("WBE"), or Minority and Women's Business Enterprise ("MWBE") by the Washington State Office of Minority and Women's Business Enterprise and meets the criteria set forth in Section 1.07.050 (2) of this chapter and has been approved as meeting that criteria by the Community and Economic Development Department Program Manager.

"City" means all Departments, Divisions and agencies of the City of Tacoma.

"Contract" means any type of legally binding agreement regardless of form or title that governs the terms and conditions for procurement of Public Works and Improvements and/or Non-Public Works and Improvements Supplies and Services. Contracts include the terms and conditions found in Specifications, Bidder or Respondent Submittals, and purchase orders issued by the City. A "Contract" as used in this chapter shall include an agreement between the City and a non-profit entity to perform construction-related services for Public Works. A "Contract" does not include: (1) awards made by the City with

federal/state grant or City general funds monies to a non-profit entity where the City offers assistance, guidance, or supervision on a project or program, and the recipient of the grant awards uses the grant moneys to provide services to the community; (2) sales transactions where the City sells its personal or real property; (3) a loan transaction where the City is acting as a debtor or a creditor; (4) lease, franchise; (5) agreements to use City real property (such as Licenses, Permits and Easements) and, (6) banking and other financial or investment services.

"Contractor" means any Person that presents a Submittal to the City, enters into a Contract with the City, and/or performs all or any part of a Contract awarded by the City, for the provision of Public Works, or Non-Public Works and Improvements, Supplies or Services.

#### 1.07.020.G

"Goals" means the annual level of participation by Certified Businesses in City Contracts as established in this chapter, the Program Regulations, or as necessary to comply with applicable federal and state nondiscrimination laws and regulations. Goals for individual Contracts may be adjusted as provided for in this chapter and shall not be construed as a minimum for any particular Contract or for any particular geographical area.

#### 1.07.020.N

"Non-Public Works and Improvements" means all competitively solicited procurement of Supplies and/or Services by the City not solicited as Public Works.

#### 1.07.020.P

"Person" means individuals, companies, corporations, partnerships, associations, cooperatives, any other legally recognized business entity, legal representative, trustee, or receivers.

"Program Manager" means the individual appointed, from time to time, by the City's Community and Economic Development Director to administer the Program Regulations.

"Program Regulations" means the written regulations and procedures adopted pursuant to this chapter for procurement of Supplies, Services and Public Works.

"Proposal" means a written offer to furnish Supplies or Services in response to a Request for Proposals. This term may be further defined in the Purchasing Policy Manual and/or in competitive solicitations issued by the City.

"Public Works (or "Public Works and Improvements)" means all work, construction, alteration, repair, or improvement other than ordinary maintenance, executed at the cost of the City, or that is by law a lien or charge on any property therein. This term includes all Supplies, materials, tools, and equipment to be furnished in accordance with the Contract for such work, construction, alteration, repair, or improvement.

#### 1.07.020.Q

"Quote" means a competitively solicited written offer to furnish Supplies or Services by a method of procurement that is less formalized than a Bid or a Proposal. This term may be further defined in the Purchasing Policy Manual.

#### 1.07.020.R

"Respondent" means any entity or Person, other than a City employee, that provides a Submittal in response to a request for Bids, Request for Proposals, Request for Qualifications, request for quotes or other request for information, as such terms are defined in Section 1.06.251 TMC. This term includes any such entity or Person whether designated as a supplier, seller, vendor, proposer, Bidder, Contractor, consultant, merchant, or service provider that; (1) assumes a contractual responsibility to the City for provision of Supplies, Services, and/or Public Works; (2) is recognized by its industry as a provider of such Supplies, Services, and/or Public works; (3) has facilities similar to those commonly used by Persons engaged in the same or similar business; and/or (4) distributes, delivers, sells, or services a product or performs a Commercially Useful Function.

#### 1.07.020.S

"Services" means non-Public Works and Improvements services and includes professional services, personal services, and purchased services, as such terms are defined in Section 1.06.251 TMC and/or the City's Purchasing Policy Manual.

"Submittal" means Bids, Proposals, Quotes, qualifications or other information submitted in response to requests for Bids, Requests for Proposals, Requests for Qualifications, requests for Quotations, or other City requests for information, as such terms are defined in Section 1.06.251 TMC.

"Supplies" means materials, Supplies, and other products that are procured by the City through a competitive process for either Public Works procurement or Non-Public Works and Improvements procurement unless an approved waiver has been granted by the appropriate authority.

1.07.020.T

"Tacoma Public Utilities Service Area" means any ZIP code in which Tacoma Public Utilities maintains infrastructure or provides retail services.

1.07.020.W

"Waiver" means a discretionary decision by the City that the one or more requirements of this chapter will not be applied to a Contract or Contracts.

(Ord. 28766 Ex. A; passed June. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28274 Ex. A; passed Dec. 16, 2014: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.030 Discrimination prohibited.

- A. No person that is engaged in the construction of public works for the City, engaged in the furnishing of laborers or craftspeople for public works of the City, or is engaged for compensation in the provision of non-public works and improvements supplies and/or services to the City, shall discriminate against any other person on the basis of race, religion, color, national origin or ancestry, sex, gender identity, sexual orientation, age, marital status, familial status, or the presence of any sensory, mental or physical disability, or "pregnancy outcomes" under TMC 1.29.040, in employment. Such discrimination includes the unfair treatment or denial of normal privileges to a person as manifested in employment upgrades, demotions, transfers, layoffs, termination, rates of pay, recruitment of employees, or advertisement for employment.
- B. The violation of the terms of RCW 49.60 or Chapter 1.29 TMC by any person that is engaged in the construction of public works for the City, is engaged in the furnishing of laborers or craftspeople for public works of the City, or is engaged for compensation in the provision of non-public works and improvements supplies and/or services shall result in the rebuttable presumption that the terms of this chapter have also been violated. Such violation may result in termination of any City contract the violator may have with the City and/or the violator's ineligibility for further City Contracts.

(Ord. 28859 Ex. A; passed Nov. 22, 2022: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.040 Program administration.

- A. The Community and Economic Development Director, or their designated Program Manager, shall be responsible for administering this chapter and obtaining compliance with respect to contracts entered into by the City and/or its contractors. It shall be the duty of the Director to pursue the objectives of this chapter by conference, conciliation, persuasion, investigation, or enforcement action, as may be necessary under the circumstances. The Director is authorized to implement an administrative and compliance program to meet these responsibilities and objectives.
- B. The Director is hereby authorized to adopt and to amend administrative regulations known as the Program Regulations, to properly implement and administer the provisions of this chapter. The Program Regulations shall be in conformance with City of Tacoma policies and state and federal laws and be designed to encourage achievement of the Goals set forth herein.

(Ord. 28766 Ex. A; passed June. 8, 2021; Ord. 28141 Ex. A; passed Mar. 26, 2013; Ord. 28110 Ex. B; passed Dec. 4, 2012; Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.050 Approval as a Certified Business.

- A. The Program Manager shall approve an entity as a Certified Business if all of the following criteria are satisfied:
- 1. The entity is certified as a DBE, SBE, MBE, WBE, or MWBE through the state of Washington's Office of Minority & Women Business Enterprises; and
- 2. The entity can demonstrate that it also meets at least one of the following additional requirements:
- a. The personal residence of the owner is located within the City of Tacoma or Tacoma Public Utilities Service Area, or
- b. The entity's business offices are located in any county of the Tacoma Public Utilities Service Area or any county adjacent to Pierce County, or
- c. When the work is performed outside of Pierce County, the entity's business offices may be located in an adjacent county in which the work is performed, or
- d. Such additional information as the Program Manager or designee may require.
- 3. When another governmental entity has an equivalent business classification process, the City may enter into an interlocal cooperative agreement for mutual recognition of certifications.

#### B. Appeals.

The applicant may appeal any approval determination by the Program Manager under this chapter to the Director. The appeal must be made in writing and must set forth the specific reasons for the appeal. The Director shall make a decision on the appeal request within a reasonable time, which decision shall be final unless further appeal is made to the Hearing Examiner. In that event, the Hearing Examiner Rules of Procedure for Hearings, Chapter 1.23 TMC, shall be applicable to that appeal proceeding.

(Ord. 28766 Ex. A; passed June. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28274 Ex. A; passed Dec. 16, 2014: Ord. 28147 Ex. A; passed May 7, 2013: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 28110 Ex. B; passed Dec. 4, 2012: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.060 Program requirements.

A. The program shall meet the following requirements:

#### 1. Establishment of Annual Goals.

The Program Regulations adopted pursuant to this chapter shall state reasonably achievable cumulative annual goals for utilization of Certified Businesses in the provision of supplies, services, and public works procured by the City. Cumulative annual goals for the participation of Certified Businesses in City contracts shall be based on the number of qualified Certified Businesses operating within the Tacoma Public Utilities Service Area. The dollar value of all contracts awarded by the City to Certified Businesses in the procurement of supplies, services, and public works shall be counted toward the accomplishment of the applicable goal.

#### 2. Application of Annual Goals to Contracts.

The Program Manager shall consult with City departments/divisions to establish department/division specific goals for competitively solicited contracts in accordance with this chapter and the Program Regulations.

#### B. Exceptions:

City departments/divisions or the Program Manager may request an exception to one or more of the requirements of this chapter as they apply to a particular Contract or Contracts. Exceptions may be granted in any one or more of the following circumstances:

#### 1. Emergency:

The supplies, services and/or public works must be provided with such immediacy that neither the City nor the contractor can comply with the requirements herein. Such emergency will be deemed documented whenever a waiver of competitive solicitation for emergency situations is authorized under Tacoma Municipal Code Chapter 1.06.257 or as may be hereinafter amended.

#### 2. Not Practicable:

The Contract involves special facilities or market conditions or specially tailored or performance criteria-based products, such that compliance with the requirements of this chapter would cause financial loss to the City or an interruption of vital services to the public. Such circumstances must be documented by the department/division awarding the Contract and approved by the senior financial manager or, for Contracts where the estimated cost is over \$500,000 (excluding sales tax), approved by the Board of Contracts and Awards ("C&A Board").

#### 3. Sole source:

The supplies, services, and/or public works are available from only one feasible source, and subcontracting possibilities do not reasonably exist as documented by the department/division awarding the Contract and approved by the senior financial manager or, for Contracts where the estimated cost is over \$500,000 (excluding sales tax), approved by the C&A Board.

#### 4. Government purchasing.

The Contract or Contracts are the result of a federal, state or inter-local government purchasing agreement and the use of such agreement in lieu of a bid solicitation conducted by the City is approved by the senior financial manager.

#### 5. Lack of certified contractors:

An insufficient number of qualified contractors exist to create any utilization opportunities as documented by the Program Manager.

#### C. Waiver:

If, after receipt of Submittals but prior to Contract award, it is determined that due to unforeseen circumstances, waiver of goals is in the best interests of the City, the Director or Superintendent of the department/division awarding the Contract may request in writing that the City Manager or designee, on behalf of General Government, or the Director of Utilities or designee, on behalf of the Department of Public Utilities, approve such waiver..

Waivers may be granted only after determination by the City Manager or Director of Utilities that compliance with the requirements of this chapter would impose unwarranted economic burden on, or risk to, the City of Tacoma as compared with the degree to which the purposes and policies of this chapter would be furthered by requiring compliance.

(Ord. 28766 Ex. A; passed June. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.070 Evaluation of submittals.

- A. All submittals for a supplies, services, or public works and improvements contracts shall be evaluated for attainment of the Certified Business requirements established for that contract in accordance with this chapter and the Program Regulations.
- B. The determination of Certified Business usage and the calculation of Certified Business requirements per this section shall include the following considerations:
- 1. General.

The dollar value of the contract awarded by the City to a Certified Business in the procurement of supplies, services, or public works shall be counted toward achievement of the respective goal.

#### 2. Supplies.

A public works and improvements contractor may receive credit toward attainment of the Certified Business requirement(s) for expenditures for supplies obtained from a Certified Business; provided such Certified Business assumes the actual and contractual responsibility for delivering the supplies with its resources. The contractor may also receive credit toward attainment of the Certified Business goal for the amount of the commission paid to a Certified Business resulting from a supplies contract with the City; provided the Certified Business performs a commercially useful function in the process.

3. Services and Public Works subcontracts.

Any bid by a Certified Business or a bidder that utilizes a Certified Business shall receive credit toward requirement attainment based on the percentage of Certified Business usage demonstrated in the bid. A contractor that utilizes a Certified Business as a subcontractor to provide services or public works shall receive a credit toward the contractor's attainment of the respective requirement based on the value of the subcontract with that firm.

4. Brokers, Fronts, or Similar Pass-Through Arrangements.

Certified Business acting as brokers, fronts, or similar pass-through arrangements (as such terms are defined in the Program Regulations) shall not count toward the requirement attainment unless the activity reflects normal industry practices and the broker performs a commercially useful function.

- C. Evaluation of competitively solicited submittals for public works and improvements and for services when a requirement has been established for the contract to be awarded shall be as follows:
- 1. When contract award is based on price.

The lowest priced bid submitted by a responsive and responsible bidder will be reviewed to determine if it meets the requirement. Certified Businesses may self-count utilization on such bids if they will perform the work for the scope the requirement is based upon.

- a. If the low bidder meets the requirements, the bid shall be presumed the lowest and best responsible bid for contract award.
- b. Any bidder that does not meet the stated Certified Business requirements shall be considered a non-responsible bidder unless a waiver of one or more of the requirements of this chapter is granted, in the City's sole discretion, pursuant to the criteria and processes in Tacoma Municipal Code 1.07.060.C.
- 2. When contract award is based on qualifications or other performance criteria in addition to price, solicitations shall utilize a scoring system that promotes participation by certified contractors. The Program Regulations may establish further requirements and procedures for final selection and contract award, including:
- a. Evaluation of solicitations for Architectural and Engineering (A&E) services;
- b. Evaluation and selection of submittals in response to requests for proposals; and

c. Selection of contractors from pre-qualified roster(s).

(Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.080 Contract compliance.

A. The contractor awarded a contract based on Certified Business participation shall, during the term of the contract, comply with the requirements established in said contract. To ensure compliance with this requirement following contract award, the following provisions apply:

- 1. Any substitutions for or failure to utilize Certified Business projected to be used must be approved in advance by the Program Manager. Substitution of one Certified Business with another shall be allowed where there has been a refusal to execute necessary agreements by the original Certified Business, a default on agreements previously made or other reasonable excuse; provided that the substitution does not increase the dollar amount of the bid.
- 2. Where it is shown that no other Certified Business is available as a substitute and that failure to secure participation by the Certified Business identified in the solicitation is not the fault of the respondent, substitution with a non-Certified Business shall be allowed; provided, that, the substitution does not increase the dollar amount of the bid.
- 3. If the Program Manager determines that the contractor has not reasonably and actively pursued the use of replacement Certified Business, such contractor shall be deemed to be in non-compliance.
- B. Record Keeping.

All contracts shall require contractors to maintain relevant records and information necessary to document compliance with this chapter and the contractor's utilization of Certified Businesses, and shall include the right of the City to inspect such records.

(Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.090 Program monitoring.

A. An Advisory Committee shall monitor compliance with all provisions of this chapter and the related Regulations. The Program Manager shall establish procedures to collect data and monitor the effect of the provisions of this chapter to assure, insofar as is practical, that the remedies set forth herein do not disproportionately favor one or more racial, gender, ethnic, or other protected groups, and that the remedies do not remain in effect beyond the point that they are required to eliminate the effects of under utilization in City contracting, unless such provisions are supported by a Disparity Study. The Program Manager shall have the authority to obtain from City departments/divisions, respondents, and contractors such relevant records, documents, and other information as is reasonably necessary to determine compliance.

B. The Program Manager shall submit an annual report to the Community and Economic Development Director, Director of Utilities, and the City Manager detailing performance of the program. The report shall document Certified Business utilization levels, waivers, proposed modifications to the program, and such other matters as may be specified in the Program Regulations.

(Ord. 28766 Ex. A; passed Jun. 8, 2021: Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 28110 Ex. B; passed Dec. 4, 2012: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### **1.07.100 Enforcement.**

The Director, or designee, may investigate the employment practices of contractors to determine whether or not the requirements of this chapter have been violated. Such investigation shall be conducted in accordance with the procedures established in the Program Regulations.

(Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 28110 Ex. B; passed Dec. 4, 2012: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.110 Remedies.

A. Upon receipt of a determination of contractor violation by the Program Manager, the City Manager or Director of Utilities, as appropriate, may take the following actions, singly or together, as appropriate:

1. Forfeit the contractor's bid bond and/or performance bond;

- 2. Publish notice of the contractor's noncompliance;
- 3. Cancel, terminate, or suspend the contractor's contract, or portion thereof;
- 4. Withhold funds due contractor until compliance is achieved; and/or
- 5. Recommend appropriate action including, but not limited to, disqualification of eligibility for future contract awards by the City (debarment) per Section 1.06.279 TMC;
- B. Prior to exercise of any of the foregoing remedies, the City shall provide written notice to the contractor specifying the violation and the City's intent to exercise such remedy or remedies. The notice shall provide that each specified remedy becomes effective within ten business days of receipt unless the contractor appeals said action to the Hearing Examiner pursuant to Chapter 1.23 TMC.
- C. When non-compliance with this chapter or the Program Regulations has occurred, the Program Manager and the department/division responsible for enforcement of the contract may allow continuation of the contract upon the contractor's development of a plan for compliance acceptable to the Director.

(Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 28110 Ex. B; passed Dec. 4, 2012: Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### **1.07.120** Unlawful acts.

It shall be unlawful for any Person to willfully prevent or attempt to prevent, by intimidation, threats, coercion, or otherwise, any Person from complying with the provisions of this chapter.

(Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.130 Severability.

If any section of this chapter or its application to any Person or circumstance is held invalid by a court of competent jurisdiction, then the remaining sections of this chapter, or the application of the provisions to other Persons or circumstances, shall not be affected.

(Ord. 27867 Ex. A; passed Dec. 15, 2009)

#### 1.07.140 Review of program.

This chapter shall be in effect through and until December 31, 2024, unless the City Council shall determine at an earlier date that the requirements of this chapter are no longer necessary. If this chapter has not been repealed by July 1, 2024, the City Council shall determine by the end of that year whether substantial effects or lack of opportunity of MWBEs and/or SBEs remain true in the relevant market and whether, and for how long, some or all of the requirements of this chapter should remain in effect.

(Ord. 28625 Ex. A; passed Nov. 5, 2019: Ord. 28274 Ex. A; passed Dec. 16, 2014: Ord. 28141 Ex. A; passed Mar. 26, 2013: Ord. 27867 Ex. A; passed Dec. 15, 2009)



City of Tacoma
Community and Economic Development Department
LEAP Office
747 Market Street, Room 900
Tacoma, WA 98402
(253) 591-5590
leap@cityoftacoma.org

#### LEAP

## LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM ABBREVIATED PROGRAM REQUIREMENTS

LEAP is a mandatory City of Tacoma program adopted to provide employment opportunities for City of Tacoma residents and residents of Economically Distressed Areas of the Tacoma Public Utilities Service Area. Based on the dollar amounts of projects, it requires Prime Contractors performing qualifying public works projects or service contracts ensure that a percentage of the total labor hours worked on the project are performed by LEAP-Qualified local employees and/or LEAP-Qualified apprentices approved by the Washington State Apprenticeship Council (SAC), residents of Tacoma, residents of surrounding Economically Distressed Areas, and/or TPU Service Areas (as outlined below). Compliance may be met through any combination LEAP-Qualified employees.

Prime Contractors may obtain further information by contacting the City of Tacoma's LEAP Coordinator, Deborah Trevorrow, at (253) 591-5590 or <a href="leap@cityoftacoma.org">leap@cityoftacoma.org</a>. The LEAP Coordinator can assist contractors in the recruitment of qualified entry-level workers to work on City of Tacoma Public Works projects. The LEAP Office is in the Tacoma Municipal Building, 747 Market Street, Rm 900.

\*NOTE – for projects bid on or after October 10, 2023, compliance with workforce requirements and payrolls will be strictly enforced.

#### **LEAP PROGRAM REQUIREMENTS:**

- 1. LOCAL EMPLOYMENT Requirement: The Prime Contractor is required to ensure that 15 percent of the total Labor Hours worked on the project are performed by residents of the City of Tacoma or Economically Distressed ZIP Codes for the following projects:
  - a) Civil Projects over \$250,000
  - b) Building Projects over \$750,000
- 2. APPRENTICE Requirement: The Contractor is required to ensure that an additional 15 percent of the total Labor Hours worked on any project over \$1,000,000 are performed by Apprentices who are residents of the Tacoma Public Utilities Service Area. This is in addition to the Local Employment Goal.
- 3. SUBCONTRACTOR NOTIFICATION: Prime Contractors shall notify all Subcontractors of the LEAP Program requirement(s). Subcontractor labor hours may be utilized towards achievement of the LEAP Requirements. Owner/Operator hours may be used for the Local Employment Requirement.
- 4. FAILURE TO MEET LEAP UTILIZATION REQUIREMENT: Contractors shall be assessed an amount for each hour that is not achieved. The amount per hour shall be based on the percent of the requirement that is met. All rounding shall be done down to the nearest whole percent. The amount per hour that shall be assessed is as follows:

100% achievement
 99% to 90% achievement
 89% to 75% achievement
 74% to 50% achievement
 49% to 1% achievement
 0% achievement
 0% achievement
 \$0.00 penalty
 \$2.00 penalty
 \$5.00 penalty
 \$7.50 penalty
 \$10.00 penalty

#### **LEAP DOCUMENT SUBMITTALS\*\*:**

- LEAP EMPLOYEE VERIFICATION FORM: upon request, the Contractor must provide the LEAP
   Office with a form for every person whom the contractor thinks will assist with attaining credit
   towards meeting the LEAP Utilization Requirements with at least one piece of verifying
   documentation. The LEAP Office staff will respond regarding whether or not the employee is LEAP Qualified.
- 2. WEEKLY CERTIFIED PAYROLL: In LCP Tracker: the Prime and Subcontractors must submit weekly Certified Payrolls that include, employee name, address, social security number, craft/trade, class, hours worked on this job, rate of pay, and gross wages paid including benefits for this job.
- 3. DEPARTMENT OF LABOR & INDUSTRIES (L&I): The Prime must enter the project in the L&I project site under the 'Tacoma, City of' account and notify the LEAP Office when this has been completed.

<sup>\*\*</sup>WITHHOLDING PROGRESS PAYMENTS: The LEAP Coordinator may withhold progress payments for failure to follow the above-outlined procedures



City of Tacoma LEAP Office 747 Market Street, Room 900 Tacoma, WA 98402 (253) 591-5590 or leap@cityoftacoma.org

#### **LEAP**

#### **Documents and Submittal Schedule**

In the attached packet, you will find the LEAP documentation and forms that are required to be submitted by the Prime and Sub Contractors.

- □ **LEAP Abbreviated Program Requirements**: brief overview of LEAP Program requirements
- □ **LEAP Employee Verification Form**: to be submitted, upon request, for each employee who may be a LEAP-qualified employee
- □ Tacoma Public Utilities Service Area Map and List, Economically Distressed ZIP Codes Map and List: for your reference on LEAP-qualified zoning areas

In addition, the City of Tacoma will also require from the Prime Contractor and all its Subcontractors:

- □ Weekly Certified Payrolls: to be submitted via LCP Tracker weekly, biweekly or monthly.
- □ Statement of Intent to Pay Prevailing Wages: to be submitted prior to commencing work
- □ Affidavit of Wages Paid: to be submitted upon completion of each contractor's work
- **Document Verification**: provide required information when requested from LEAP Office

Please submit above documents as instructed by the LEAP Coordinator.

If you have any questions or request further information, please feel free to contact the City of Tacoma's LEAP Program at (253) 591-5590 or leap@cityoftacoma.org

#### **CHAPTER 1.90**

#### LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM

Sections:	
1.90.010	Purpose.
1.90.020	Scope.
1.90.030	Definitions.
1.90.040	LEAP goals.
1.90.050	Repealed.
1.90.060	Effect of program on prime contractor/subcontractor relationship.
1.90.070	Apprentice utilization requirements – Bidding and contractual documents.
1.90.080	Enforcement.
1.90.090	Compliance with applicable law.
1.90.100	Review and reporting.
1.90.105	Authority
1.90.110	Interpretation.

#### 1.90.010 Purpose.

The purpose of this Chapter is to establish a means of providing for the development of a trained and capable workforce possessing the skills necessary to fully participate in the construction trades.

(Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.020 Scope.

The provisions of this Chapter shall apply to all Public Works or Improvements funded in whole or in part with City funds or funds which the City expends or administers in accordance with the terms of a grant.

(Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.030 Definitions.

As used in this chapter, the following terms shall have the following meanings:

- A. "Apprentice" shall mean a person enrolled in a course of training specific to a particular construction trade or craft, which training shall be approved by the Washington State Apprenticeship and Training Council established pursuant to RCW 49.04.010.
- B. "Building Projects" shall mean all Public Works or Improvements having an Estimated Cost greater than \$750,000.00, and for which a building permit must be issued pursuant to Chapter 1 of the current edition of the state building code (Uniform Building Code).
- C. "City" shall mean all divisions and departments of the City of Tacoma, and all affiliated agencies, provided, however, that the Tacoma Community Redevelopment Authority shall not be included within this definition.
- D. "Civil Projects" shall mean all Public Works or Improvements that are not defined as a "Building Project," provided that those projects having an Estimated Cost of less than \$250,000.00 shall not be included in this definition.
- E. "Contractor or Service Provider" means a person, corporation, partnership, or joint venture entering into a contract with the City to construct a Public Work or Improvement.
- F. "Director" shall mean the Director of Community and Economic Development, or the Director's Designee.
- G. "Economically Distressed ZIP Codes" shall mean ZIP codes in the Tacoma Public Utilities Service Area that meet two out of three (2/3) of the thresholds of:
- 1. High concentrations of residents living under 200% of the federal poverty line in terms of persons per acre (69th percentile)
- 2. High concentrations of unemployed people in terms of persons per acre (45th percentile)
- 3. High concentrations of people 25 years or older without a college degree in terms of persons per acre (75th percentile)

Said thresholds shall be updated within 30 days following any Prevailing Wage updates issued by the Washington State Labor and Industry. All updates are to be published on the first business day in August and in February of each calendar year.

- H. "Electrical Utility" and "Water Utility" shall mean, respectively, the Light Division of the Department of Public Utilities of the City of Tacoma, and shall include the electrical and telecommunications services of that Division, and the Water Division of the Department of Public Utilities of the City of Tacoma.
- I. "Estimated Cost" shall mean the anticipated cost of a Public Work or Improvement, as determined by the City, based upon the expected costs of materials, supplies, equipment, and labor, but excluding taxes and contingency funds.
- J. "Estimated Labor Hours" shall mean the anticipated number of Labor Hours determined by the City to be necessary to construct a Public Work or Improvement and set forth in the specifications for the project, or as may be subsequently revised due to contract or project adjustment, or pursuant to an agreed upon change order.
- K. "Existing Employee" shall mean an employee whom the Contractor or Service Provider can demonstrate was actively employed by the Contractor or Service Provider for at least 1000 hours in the calendar year prior to bid opening plus one month following bid opening, and who was performing work in the construction trades.
- L. "Labor Hours" shall mean the actual number of hours worked by workers receiving an hourly wage who are employed on the site of a Public Work or Improvement, and who are subject to state or federal prevailing wage requirements. The term "Labor Hours" shall include hours performed by workers employed by the Contractor or Service Provider and all Subcontractors, and shall include additional hours worked as a result of a contract or project adjustment or pursuant to an agreed upon change order. The term "Labor Hours" shall not include hours worked by workers who are not subject to the prevailing wage requirements set forth in either RCW 39.12 or the Davis-Bacon Act 40 U.S.C. 276 (a).
- M. "LEAP Coordinator" shall mean the City of Tacoma staff member who administers LEAP.
- N. "LEAP Program" or "Program" shall mean the City of Tacoma's Local Employment and Apprenticeship Training Program, as described in this chapter.
- O. "LEAP Regulations" or "Regulations" shall mean the rules and practices established in this document.
- P. "LEAP Utilization Plan" shall mean the document submitted by the Contractor to the LEAP Coordinator which outlines how the associated goals will be met on the project.
- Q. "Priority Hire Resident" shall mean any resident within the Economically Distressed ZIP Codes.
- R. "Project Engineer" shall mean the City employee who directly supervises the engineering or administration of a particular construction project subject to this chapter.
- S. "Public Work or Improvement" shall have the same meaning as provided in Section 39.04.010 RCW, as that Section may now exist or hereafter be amended.
- T. "Resident of Tacoma" shall mean any person, not defined as a Resident of the Community Empowerment Zone, who continues to occupy a dwelling within the boundaries of the City of Tacoma, has a present intent to continue residency within the boundaries of the City, and who demonstrates the genuineness of that intent by producing evidence that the person's presence is more than merely transitory in nature.
- U. "Service Area Electrical" or "Electrical Service Area" shall mean that area served with retail sales by the Electrical Utility of the City of Tacoma at the time a bid is published by the Electrical Utility for a Public Work or Improvement to be performed primarily for the Electrical Utility.
- V. "Service Area Water" or "Water Service Area" shall mean that area served with retail sales by the water utility of the City of Tacoma at the time a bid is published by the water utility for a Public Work or Improvement to be performed primarily for the water utility.
- W. "Service Contract" shall mean all City contracts relating to a Public Work or Improvement which utilize labor at a City site and which are not within the exceptions to nor defined as "Building Projects" or "Civil Projects."
- X. "Subcontractor" means a person, corporation, partnership, or joint venture that has contracted with the Contractor or Service Provider to perform all or part of the work to construct a Public Work or Improvement by a Contractor.
- Y. "Tacoma Public Utilities" means the City of Tacoma, Department of Public Utilities.
- Z. "Tacoma Public Utilities Service Area" shall mean every ZIP code listed by Tacoma Public Utilities as an area that either receives services or maintains infrastructure to provide services.
- AA. Washington State Labor and Industry Prevailing Wage shall mean the hourly wage, usual benefits and overtime, paid in the largest city in each county, to the majority of workers, laborers, and mechanics. Prevailing wages are established, by the Department of Labor & Industries, for each trade and occupation employed in the performance of public work. They are established separately for each county, and are reflective of local wage conditions.

(Ord. 28520 Ex. A; passed Jul. 17, 2018: Ord. 28147 Ex. B; passed May 7, 2013: Ord. 28110 Ex. C; passed Dec. 4, 2012: Ord. 27815 Ex. A; passed Jun. 30, 2009: Ord. 27368 § 1; passed Jun. 21, 2005: Ord. 26698 § 1; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.040 **LEAP** goals.

#### A. Utilization Goals.

- 1. All Contractors constructing Civil Projects or Building Projects, and all Service Providers involved with the construction of a Public Work or Improvement, shall ensure that at least 15 percent of the total Labor Hours actually worked on the Project are performed by persons having their residence within the boundaries of the City of Tacoma or Economically Distressed ZIP Codes, whether or not any such person is an Apprentice.
- a. The thresholds for this section shall be \$250,000.00 for Civil Projects and \$750,000.00 for Building Projects.
- 2. Fifteen percent (15%) of the Total Labor Hours on contracts above one-million dollars (\$1,000,000.00) shall have work performed by Apprentices who are residents of the Tacoma Public Utilities Service Area consistent with RCW 39.04.320(1)(a), subject to waiver based on exceptions as specified in RCW 39.04.320(2)(a), (b), and (c).
- 3. Labor Hours performed by non-residents of the State of Washington will be deducted from a project's total Labor Hours for purposes of determining compliance with the requirements of this chapter.
- 4. All Contractors and Service Providers shall submit a LEAP Utilization Plan as provided for in the regulations adopted under this chapter, and shall meet with the LEAP Coordinator to review said Plan prior to being issued a Notice to Proceed. Failure to submit a LEAP Utilization Plan may be grounds for the City to withhold remittance of a progress payment until such Plan is received from the responsible Contractor or Provider. A meeting with the LEAP Coordinator prior to issuance of a Notice to Proceed shall be excused only when the LEAP Coordinator is unavailable to meet prior to the scheduled date for issuance of the Notice to Proceed and the Contractor and the LEAP Coordinator have otherwise scheduled a meeting for the coordinator to review the Contractor's or Provider's plan.

The Contractor or Service Provider shall be responsible for meeting the LEAP utilization goal requirements of the contract, including all amendments and change orders thereto, and shall be responsible for overall compliance for all hours worked by Subcontractors. To the extent possible, the Contractor or Service Provider shall recruit Apprentices from multiple trades or crafts.

- B. Failure to Meet Utilization Goal.
- 1. Contracts for the construction of Building projects or Civil projects and Service Contracts shall provide that Contractors or Service Providers failing to meet the LEAP utilization goals shall be assessed an amount for each hour that is not achieved. The amount per hour shall be based on the extent the Contractor or Service Provider met its goal. The amount per hour that shall be assessed shall be as follows:

Percent of Goal Met	Assessment per unmet hour
100%	\$ 0.00
90% - 99%	\$ 2.00
75% to 89%	\$ 3.50
50% to 74%	\$ 5.00
1% to 49%	\$ 7.50
0%	\$10.00

When determining the percent of goal that is met, all rounding shall be down to the nearest whole percent. No penalty shall be waived by the City unless it is determined by the Director to be in the best interests of the City, which determination shall be made after consultation with the LEAP Coordinator.

2. Deposit of Assessments. All assessments imposed pursuant to this section shall be deposited into a separate account and utilized to support the City's pre-apprenticeship and training program. The policies and regulations adopted by the City Manager and Director of Utilities pursuant to this chapter shall address issues pertaining to a Contractor's existing workforce. Contributions need not be made for Labor Hours that have been adjusted in accordance with Section 1.90.040(E).

#### C. LEAP Reports.

Notwithstanding the provisions of TMC 1.90.100, the Director shall, not less than annually, publish a LEAP report setting forth Contractor compliance with this chapter. Said report shall include information on all contracts and all Contractors to which this chapter applies, and shall detail the level and nature of LEAP participation by contract and by Contractor, The

Director's LEAP report may include such other information as may be helpful to assuring fair and accurate representation of the contracts, Contractors or projects covered in the report. The Director's LEAP reports may be considered by the Board of Contracts and Awards in its determinations as to bidder responsibility.

#### D. LEAP Goal Adjustments.

- 1. LEAP utilization goals may be adjusted prior to bid opening and/or as a result of a contract amendment or change order on a Building Project, Civil Project, or Service Contract.
- a. If LEAP utilization goals are adjusted prior to bid opening, they shall be set forth in the bid or Request For Proposal advertisement and specification documents or in an addendum timely provided to prospective bidders, provided that such adjustment shall be based upon a finding by the Project Engineer that the reasonable and necessary requirements of the contract render LEAP utilization unfeasible at the required levels. The Director shall concur with the Project Engineer's finding, provided that should the Project Engineer and the Director fail to reach agreement on the Project Engineer's finding, then in that circumstance the matter shall be referred to the City Manager or the Director of Utilities, as appropriate, for ultimate resolution. Notwithstanding any other provision of this chapter to the contrary, the decision of the City Manager or the Director of Utilities with regard to LEAP goal adjustment may not be appealed.
- b. If LEAP utilization goals are adjusted due to contract amendment or change order, the amount of adjustment shall be consistent with the utilization goals set forth in this chapter and shall be determined pursuant to regulations adopted pursuant to this chapter for administration of LEAP utilization goal adjustments.
- 2. The methodology of determining the appropriate adjustments to LEAP utilization goals shall be determined in consultation with the LEAP Advisory Committee, established pursuant to this ordinance for so long as the LEAP Advisory Committee remains in existence.
- 3. LEAP utilization goals shall not apply to those portions of a project that are funded by sources other than (a) City funds, or (b) funds which the City expends or administers in accordance with the terms of a grant to the City, provided that the Project Engineer shall notify the Director of such non-application prior to bid advertisement. For the purposes of this paragraph, credits extended by another entity for the purpose of providing project funding shall not be considered to be City funds.
- E. Utilization Electrical Projects Outside Electrical Service Area.

Civil Projects or Building Projects that are constructed primarily for the benefit or use by the City's Electrical Utility, which are wholly situated outside the Electrical Service Area, and for which the estimated cost is less than \$1,000,000.00, are exempt from the requirements of this chapter.

F. Utilization - Water Projects Outside Water Service Area.

Civil Projects or Building Projects that are constructed primarily for the benefit or use by the City's water utility, which are wholly situated outside the Water Service Area, and for which the estimated cost is less than \$1,000,000.00 are exempt from the requirements of this chapter.

G. Utilization - Projects Outside Tacoma Public Utilities Service Area.

Civil Projects or Building Projects that are constructed primarily for the benefit or use by Tacoma Public Utilities, which are wholly situated outside the retail service area of the Tacoma Public Utilities Service Area, and for which the estimated cost is less than \$1,000,000.00 are exempt from the requirements of this chapter. Projects wholly situated outside the Tacoma Public Utilities Service Area, and for which the estimated cost is more than \$1,000,000.00, shall be exempt from 15% utilization goal specified in subsection A1. of this section. The 15% utilization goal specified in subsection A2. of this section may be met if project work is performed by Apprentices who are enrolled in a course of training specific to a particular construction trade or craft, provided such training has been approved by the Washington State Apprenticeship and Training Council in accordance with Chapter 49.04, RCW.

#### H. Emergency.

This chapter shall not apply in the event of an Emergency. For the purposes of this section, an "Emergency" means unforeseen circumstances beyond the control of the City that either: (a) present a real, immediate threat to the proper performance of essential functions; or (b) will likely result in material loss or damage to property, bodily injury, or loss of life if immediate action is not taken.

I. Conflict with State or Federal Requirements.

If any part of this chapter is found to be in conflict with federal or state requirements which are a prescribed condition to the allocation of federal or state funds to the City, then the conflicting part of this chapter is inoperative solely to the extent of the conflict and with respect to the City departments directly affected. This provision does not affect the operation of the

remainder of this chapter. Administrative rules or regulations adopted under this chapter shall meet federal and state requirements which are a necessary condition to the receipt of federal or state funds by the City.

(Ord. 28520 Ex. A; passed Jul. 17, 2018: Ord. 28147 Ex. B; passed May 7, 2013: Ord. 27815 Ex. A; passed Jun. 30, 2009: Ord. 27368 § 2; passed Jun. 21, 2005: Ord. 26992 § 1; passed Oct. 15, 2002: Ord. 26698 § 2; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.050 Repealed by Ord. 27368. Good faith efforts.

(Ord. 27368 § 3; passed Jun. 21, 2005; Ord. 26698 § 3; passed Sept. 12, 2000; Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.060 Effect of program on prime contractor/service provider - subcontractor relationship.

The LEAP Program shall not be construed so as to modify or interfere with any relationship between any Contractor or Service Provider and Subcontractor. The LEAP Program shall not grant the City any authority to control the manner or method of accomplishing any construction work that is additional to any authority retained by the City in a Public Works contract.

(Ord. 26698 § 4; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.070 Apprentice utilization requirements – Bidding and contractual documents.

All packages of bid documents for every Building Project and every Civil Project shall incorporate provisions satisfactory to the City Attorney so as to allow enforcement of the provisions contained in this Chapter. Such contractual provisions may include liquidated damages, calculated to reimburse the City for the Contractor's breach of these performance requirements, which shall be published with the City's call for bids.

(Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.080 Enforcement.

A. The Director shall review the Contractor's or Service Provider's and all Subcontractor's employment practices during the performance of the work for compliance with LEAP Program requirements. On-site visits may be conducted as necessary to verify compliance with the requirements of the LEAP Program. The Contractor, Service Provider, or Subcontractors shall not deny to the City the right to interview its employees, provided that the Director shall make reasonable efforts to coordinate employee interviews with employers.

- B. Any knowing failure or refusal to cooperate in compliance monitoring may disqualify the defaulting Contractor, Service Provider, or Subcontractor from eligibility for other City contracts.
- C. The making of any material misrepresentation may disqualify the defaulting Contractor, Service Provider, or Subcontractor from eligibility for other City contracts.
- D. Any action by the City, its officers and employees, under the provisions of this Chapter may be reviewed by the Board of Contracts and Awards, upon written application of the party so affected. Application shall be made within twenty (20) days of the date of the action upon which the appeal is based, and provided to the City by certified mail or by personal service. Any action taken by the Board of Contracts and Awards may be appealed to the City Council or Public Utility Board, as appropriate, and thereafter if desired, to the Superior Court of Pierce County, Washington, within fifteen (15) days of the previous decision.

(Ord. 26698 § 5; passed Sept. 12, 2000; Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.090 Compliance with applicable law.

Nothing in this Chapter shall excuse a Prime Contractor, Service Provider, or Subcontractor from complying with all relevant federal, state, and local laws.

(Ord. 26698 § 6; passed Sept. 12, 2000; Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.100 Review and reporting.

The City Manager and Director of Utilities shall review the Program on or before January 1, 2000, and every two (2) years thereafter, and shall report to the City Council and Public Utility Board the Manager's and Director's findings, conclusions, and recommendations as to the continued need for the Program, and any revisions thereto that should be considered by the Council and Board.

(Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.105 Authority.

The City Manager and the Director of Utilities shall have authority to jointly adopt policies and regulations consistent with this chapter to implement the LEAP program.

(Ord. 26698 § 7; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

#### 1.90.110 Interpretation.

This Chapter shall not be interpreted or construed so as to conflict with any state or federal law, nor shall this Chapter be enforced such that enforcement results in the violation of any applicable judicial order.

(Ord. 26301 § 1; passed Oct. 6, 1998)

### LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM (LEAP)

The LEAP office enforces post-award mandatory requirements. Bidders <u>do not</u> have to submit any information in the bid submittal package to be in compliance with LEAP.

#### Post-award:

- *Provide information to the LEAP Office (see LEAP contact information below).* Provide the name and email address of the person(s) who will oversee LEAP utilization and payrolls.
- *LEAP Employee Verification*. Proof of residency may be requested for employees who may be LEAP-Qualified and may be able to help meet the LEAP Requirements.
- *All certified payrolls*. Prime contractor is responsible for ensuring their, and their subcontractors', payrolls are submitted via LCP Tracker. By submitting payrolls in LCP Tracker before the Labor & Industry's website, you can reduce data entry.

The City of Tacoma's LEAP office enforces varying workforce utilization requirements on City projects based on certain monetary thresholds and project locations.

**Local Employment Utilization Requirement -** the Prime Contractor performing a qualifying public work or improvement must ensure that 15 percent of the total labor hours worked on the project are performed by journey or apprentice level craft workers who are residents of the City of Tacoma or Economically Distressed Zip Codes.

**Apprenticeship Utilization Requirement** – the Prime Contractor performing a qualifying public work or improvement must ensure that 15 percent of the total labor hours worked on the project are performed by apprentices who are residents of the Tacoma Public Utilities Service Area.

\*Exceptions: If the project is located outside of the retail service area of the Tacoma Public Utilities Service Area, then Apprentices may come from the county in which the work is performed.

#### This project is subject to the:

- 1. 15% Local Employment Utilization Requirement
- 2. 15% Apprentice Utilization Requirement

LEAP staff can assist contractors in identifying qualified City of Tacoma residents, Economically Distressed Area residents, and Apprentices. Contractors may obtain further information by contacting the City's LEAP Office at (253) 591-5590. The LEAP Office is located in the Tacoma Municipal Building, 747 Market Street, Room 900, Tacoma, WA 98402. <a href="www.cityoftacoma.org/leap">www.cityoftacoma.org/leap</a>



City of Tacoma LEAP Office 747 Market Street, Room 900 Tacoma, WA 98402 (253) 591-5590 or leap@cityoftacoma.org www.cityoftacoma.org/leap

#### **LEAP EMPLOYEE VERIFICATION FORM**

#### Submit upon request from LEAP Office

Contractor/Sub:	Specification Number:
Project Description:	
Employee Name:	
	Asian/Pac Isl. □ Black □ Hispanic □ Native American □ White □ Other
Gender ( <i>optional</i> ): ☐ MALE	□ FEMALE
Complete Physical Address (No	o PO Boxes):
	Zip:Telephone: Date of Hire:
	Apprentice Registration I.D. (if applicable):
Age: Copy of DD-214:_	
******Please fill out entire form	for tracking LEAP performance******
LEAP qualified employee categories	s: (check all that apply <u>and</u> provide evidence for each check)
a. Resident (journey level or	certified apprentice) within the geographic boundaries of the City of Tacoma
b. Resident (journey level or Utilities Service Area	certified apprentice) within Economically Distressed ZIP Codes of the Tacoma Public
c. WA State Approved Apprei \$1,000,000)	ntice living in the Tacoma Public Utilities Service Area (Only valid for projects over
d. WA State Approved Apprer County)	ntice *(Only valid for contracts where 100% of work is performed outside of Pierce
Signature of Employee:	Date:
Contractor Representative:	Date:

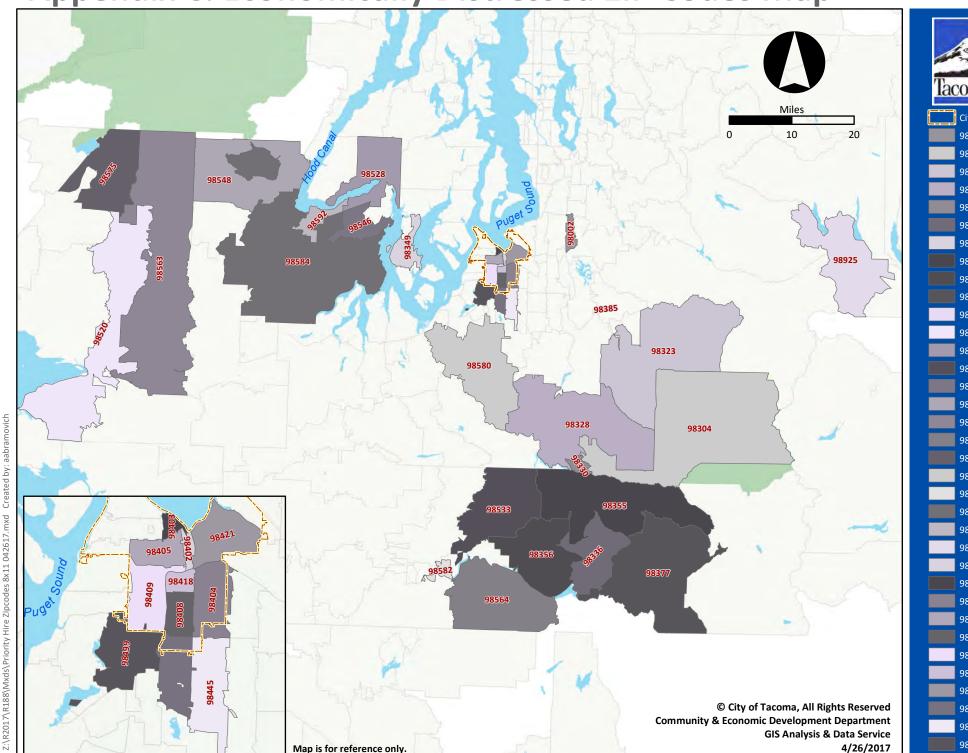
#### LEAP EMPLOYEE VERIFICATION FORM

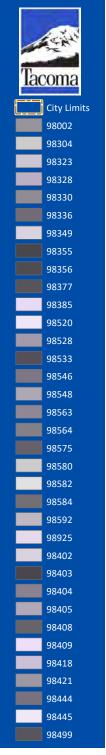
#### To be Completed by Contractor or Subcontractor

Please attach a legible copy of one or more of the following document(s) showing the address of residence as proof of local (Tacoma) and/or Economically Distressed Area and/or TPU Service Areas residency. For youth, see first line and for veteran status, see second line. Driver's License with current address Utility Bill/Phone Bill/Cell Bill/Cable Bill with current address Copy of current tax form W-4 Rental Agreement/Lease (residential) Computer Printout From Other Government Agencies **Property Tax Records** Apprentice Registration I.D. Food Stamp Award Letter Housing Authority Verification Insurance Policy (Residence/Auto) \*Any of the above must have a complete physical address verified by the www.govme.org website. No PO Boxes Contractor Representative: Date:

Title:

## **Appendix C: Economically Distressed ZIP Codes Map**





### **LOCAL EMPLOYEE REQUIREMENT ONLY**

## City of Tacoma

(Journeyman AND Apprentice)

98402	98421
98403	98422
98404 (some)	98424
98405	98444
98406	98445
98407	98465 (some)
98408	98466 (some)
98409	98467 (some)
98418	

#### Check addresses here:

https://tacoma.maps.arcgis.com/apps/webappviewer/index.html? id=38107f6b096a4b8280c0d9b8a05bc7eb

## LOCAL EMPLOYEE REQUIREMENT ONLY

# Economically Distressed Areas (Journeyman AND Apprentice)

Zip Code	200% Pov	Unemployed	25+ College	Area
98002	Y		Y	Auburn
98304	Y		Υ	Ashford/Rainier
98323	Y	Υ	Y	Carbonado
98328	Υ		Υ	Eatonville
98330	Y		Υ	Elbe
98336	Y		Y	Glenoma
98349	Y	Υ		Lakebay
98355		Υ	Y	Mineral
98356	Υ	Y	Υ	Morton
98377	Y	Y	Y	Randle
98385		Y	Y	South Prairie
98402	Y	Y		Downtown
98403	Y	Y		Stadium/St. Helens
98404	Y	Y		Eastside
98405	Υ	Υ		Hilltop/Central
98408	Y	-	Y	South End
98409	Y	Υ		South Tacoma
98418	Υ		Υ	Lincoln/South End
98421	Υ	Υ	Y	Port
98439	Υ	Υ	100	McChord AFB
98444	Y	Y	10-2	Parkland
98445	Υ		Y	Midland
98499	Υ	Y		Lakewood
98520	Y	Y	Y	Aberdeen
98528	Υ		Y	Belfair
98533		Υ	Y	Cinebar
98546	Υ	Υ	Y	Grapeview
98548	Υ	γ	Υ	Hoodsport
98563	Υ	Ý	Y	Montesano
98564	Υ	γ-	Y	Mossyrock
98575	Y		Y	Quinault
98580	Υ		Υ	Roy
98582	Υ		Υ	Salkum
98584	Υ		Υ	Shelton
98591	Υ		Υ	Toledo
98592		Y	Y	Union
98925	Y		Y	Easton

# ONLY FOR APPRENTICE UTILIZATION REQUIREMENT Tacoma Public Utilities Infrastructure and Service Area (Apprentices)

98001	Auburn	0.00%
98002	Auburn	0.00%
98003	Federal Way	0.00%
98010	Black Diamond	0.00%
98022	Enumclaw	0.00%
98023	Federal Way	0.00%
98030	Kent	0.00%
98032	Kent	0.00%
98038	Maple Valley	0.00%
98042	Kent	0.00%
98045	North Bend	0.00%
98051	Ravensdale	0.00%
98070	Vashon	0.00%
98092	Auburn	0.00%
98198	Seattle	0.00%
98304	Ashford	0.00%
98321	Buckley	0.27%
98323	Carbonado	0.05%
98327	DuPont	0.00%
98328	Eatonville	2.92%
98329	Gig Harbor	0.24%
98330	Elbe	0.00%
98332	Gig Harbor	0.00%
98333	Fox Island	0.00%
98335	Gig Harbor	0.05%
98336	Glenoma	0.00%
98338	Graham	0.79%
98349	Lakebay	0.06%
98354	Milton	0.01%
98355	Mineral	0.00%

98356	Morton	0.17%
98360	Orting	0.54%
98371	Puyallup	0.12%
98372	Puyallup	1.33%
98373	Puyallup	1.42%
98374	Puyallup	0.15%
98375	Puyallup	0.29%
98377	Randle	0.00%
98385	South Prairie	0.00%
98387	Spanaway	0.68%
98388	Spanaway	0.00%
98390	Sumner	0.12%
98391	Bonney	1.83%
98402	Tacoma	0.46%
98403	Tacoma	3.31%
98404	Tacoma	10.15%
98405	Tacoma	4.97%
98406	Tacoma	3.51%
98407	Tacoma	4.38%
98408	Tacoma	12.58%
98409	Tacoma	8.88%
98416	UPS	0.00%
98418	Tacoma	1.98%
98421	Tacoma	0.00%
98422	Tacoma	0.67%
98424	Tacoma	0.98%
98430	Camp Murray	0.00%
98433	Tacoma	0.00%
98438	McChord	0.00%
98439	Lakewood	0.00%
1		

98443	Tacoma	0.00%
98444	Tacoma	7.20%
98445	Tacoma	2.09%
98446	Tacoma	0.17%
98447	PLU	0.00%
98465	Tacoma	0.44%
98466	Tacoma	0.06%
98467	University Place	0.09%
98498	Lakewood	0.05%
98499	Lakewood	0.26%
98520	Aberdeen	0.00%
98524	Allyn	0.97%
98528	Belfair	0.31%
98533	Cinebar	0.00%
98546	Grapeview	0.00%
98548	Hoodsport	0.00%
98555	Lilliwaup	0.00%
98563	Montesano	0.21%
98564	Mossyrock	0.00%
98575	Quinault	0.20%
98580	Roy	2.02%
98582	Salkum	0.00%
98584	Shelton	10.31%
98585	Silver Creek	0.00%
98591	Toledo	1.93%
98592	Union	0.00%
98597	Yelm	0.00%
98925	Easton	0.00%

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#### **PART 1 - GENERAL PROVISIONS**

#### 1.01 DEFINITIONS

- A. <u>"Application for Payment"</u> means a written request submitted by Contractor to A/E for payment of Work completed in accordance with the Contract Documents and approved Schedule of Values, supported by such substantiating data as Owner or A/E may require.
- B. <u>"Architect," "Engineer," or "A/E"</u> means a person or entity lawfully entitled to practice architecture or engineering, representing Owner within the limits of its delegated authority.
- C. <u>"Change Order"</u> means a written instrument signed by Owner and Contractor stating their agreement upon all of the following: (1) a change in the Work; (2) the amount of the adjustment in the Contract Sum, if any, and (3) the extent of the adjustment in the Contract Time, if any.
- D. "Claim" means Contractor's exclusive remedy for resolving disputes with Owner regarding the terms of a Change Order or a request for equitable adjustment, as more fully set forth in Part 8.
- E. "Contract Award Amount" is the sum of the Base Bid and any accepted Alternates.
- F. <u>"Contract Documents"</u> means the Advertisement for Bids, Instructions for Bidders, completed Bid Form, General Conditions, Modifications to the General Conditions, Supplemental Conditions, Public Works Contract, other Special Forms, Drawings and Specifications, and all addenda and modifications thereof.
- G. <u>"Contract Sum"</u> is the total amount payable by Owner to Contractor, for performance of the Work in accordance with the Contract Documents, including all taxes imposed by law and properly chargeable to the Work, except Washington State sales tax.
- H. <u>"Contract Time"</u> is the number of calendar days allotted in the Contract Documents for achieving Substantial Completion of the Work.
- I. "Contractor" means the person or entity who has agreed with Owner to perform the Work in accordance with the Contract Documents.
- J. "Day(s): Unless otherwise specified, day(s) shall mean calendar day(s)."
- K. "<u>Drawings</u>" are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, and may include plans, elevations, sections, details, schedules, and diagrams.
- L. <u>"Final Acceptance"</u> means the written acceptance issued to Contractor by Owner after Contractor has completed the requirements of the Contract Documents, as more fully set forth in Section 6.09 B.
- M. "<u>Final Completion"</u> means that the Work is fully and finally complete in accordance with the Contract Documents, as more fully set forth in Section 6.09 A.
- N. <u>"Force Majeure"</u> means those acts entitling Contractor to request an equitable adjustment in the Contract Time, as more fully set forth in paragraph 3.05A.
- O. <u>"Notice"</u> means a written notice that has been delivered to the authorized representative or officer of the addressed party by registered or certified mail, or by email as a PDF attachment. Notices should clearly identify the project number and date of notice.

- P. <u>"Notice to Proceed"</u> means a notice from Owner to Contractor that defines the date on which the Contract Time begins to run.
- Q. <u>"Owner"</u> means the state agency, institution, or its authorized representative with the authority to enter into, administer, and/or terminate the Work in accordance with the Contract Documents and make related determinations and findings.
- R. <u>"Person"</u> means a corporation, partnership, business association of any kind, trust, company, or individual.
- S. <u>"Prior Occupancy"</u> means Owner's use of all or parts of the Project before Substantial Completion, as more fully set forth in Section 6.08 A.
- T. <u>"Progress Schedule"</u> means a schedule of the Work, in a form satisfactory to Owner, as further set forth in Section 3.02.
- U. <u>"Project"</u> means the total construction of which the Work performed in accordance with the Contract Documents may be the whole or a part and which may include construction by Owner or by separate contractors.
- V. <u>"Project Record"</u> means the separate set of Drawings and Specifications as further set forth in paragraph 4.02A.
- W. <u>"Schedule of Values"</u> means a written breakdown allocating the total Contract Sum to each principal category of Work, in such detail as requested by Owner.
- X. <u>"Specifications"</u> are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.
- Y. <u>"Subcontract"</u> means a contract entered into by Subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind for or in connection with the Work.
- Z. <u>"Subcontractor"</u> means any person, other than Contractor, who agrees to furnish or furnishes any supplies, materials, equipment, or services of any kind in connection with the Work.
- AA. <u>"Substantial Completion"</u> means that stage in the progress of the Work when the construction is sufficiently complete, as more fully set forth in Section 6.07.
- AB. <u>"Work"</u> means the construction and services required by the Contract Documents, and includes, but is not limited to, labor, materials, supplies, equipment, services, permits, and the manufacture and fabrication of components, performed, furnished, or provided in accordance with the Contract Documents.

#### 1.02 ORDER OF PRECEDENCE

Any conflict or inconsistency in the Contract Documents shall be resolved by giving the documents precedence in the following order:

- 1. Signed Public Works Contract, including any Change Orders.
- 2. Supplemental Conditions.
- 3. Modifications to the General Conditions.
- 4. General Conditions.
- 5. Specifications. Provisions in Division 1 shall take precedence over provisions of any other Division.

- 6. Drawings. In case of conflict within the Drawings, large-scale drawings shall take precedence over small-scale drawings.
- 7. Signed and Completed Bid Form.
- 8. Instructions to Bidders.
- 9. Advertisement for Bids.

#### 1.03 EXECUTION AND INTENT

Contractor Representations: Contractor makes the following representations to Owner:

- 1. <u>Contract Sum reasonable:</u> The Contract Sum is reasonable compensation for the Work and the Contract Time is adequate for the performance of the Work, as represented by the Contract Documents;
- 2. Contractor familiar with project: Contractor has carefully reviewed the Contract Documents, visited and examined the Project site, become familiar with the local conditions in which the Work is to be performed, and satisfied itself as to the nature, location, character, quality and quantity of the Work, the labor, materials, equipment, goods, supplies, work, services and other items to be furnished and all other requirements of the Contract Documents, as well as the surface and subsurface conditions and other matters that may be encountered at the Project site or affect performance of the Work or the cost or difficulty thereof;
- 3. <u>Contractor financially capable:</u> Contractor is financially solvent, able to pay its debts as they mature, and possesses sufficient working capital to complete the Work and perform Contractor's obligations required by the Contract Documents; and
- 4. <u>Contractor can complete Work:</u> Contractor is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform the obligations required by the Contract Documents and has sufficient experience and competence to do so.

#### PART 2 - INSURANCE AND BONDS

#### 2.01 CONTRACTOR'S LIABILITY INSURANCE

General insurance requirements: Prior to commencement of the Work, Contractor shall obtain all the insurance required by the Contract Documents and provide evidence satisfactory to Owner that such insurance has been procured. Review of the Contractor's insurance by Owner shall not relieve or decrease the liability of Contractor. Companies writing the insurance to be obtained by this part shall be licensed to do business under Chapter 48 RCW or comply with the Surplus Lines Law of the State of Washington. Contractor shall include in its bid the cost of all insurance and bond costs required to complete the base bid work and accepted alternates. Insurance carriers providing insurance in accordance with the Contract Documents shall be acceptable to Owner, and its A.M. Best rating shall be indicated on the insurance certificates.

- A. <u>Term of insurance coverage:</u> Contractor shall maintain the following insurance coverage during the Work and for one year after Final Acceptance. Contractor shall also maintain the following insurance coverage during the performance of any corrective Work required by Section 5.16.
  - 1. <u>General Liability Insurance:</u> Commercial General Liability (CGL) on an Occurrence Form. Coverage shall include, but not be limited to:
    - a. Completed operations/products liability;
    - b. Explosion, collapse, and underground; and
    - c. Employer's liability coverage.

- 2. <u>Automobile Liability Insurance:</u> Automobile liability
- B. <u>Industrial Insurance compliance:</u> Contractor shall comply with the Washington State Industrial Insurance Act and, if applicable, the Federal Longshoremen's and Harbor Workers' Act and the Jones Act.
- C. <u>Insurance to protect for the following:</u> All insurance coverages shall protect against claims for damages for personal and bodily injury or death, as well as claims for property damage, which may arise from operations in connection with the Work whether such operations are by Contractor or any Subcontractor.
- D. <u>Owner as Additional Insured:</u> All insurance coverages shall be endorsed to include Owner as an additional named insured for Work performed in accordance with the Contract Documents, and all insurance certificates shall evidence the Owner as an additional insured.

#### 2.02 COVERAGE LIMITS

A. Insurance Coverage Certificates and Policies

The Contractor shall furnish acceptable proof of insurance coverage on the state of Washington Certificate of Insurance form SF500A, dated 07/02/92 or ACORD form, as well as copies of insurance policies.

- B. Required Insurance Coverages
  - 1. For a contract less than \$100,000.00, the coverage required is:
    - a. Comprehensive General Liability Insurance The Contractor shall at all times during the term of this contract, at its cost and expense, carry and maintain general public liability insurance, including contractual liability, against claims for bodily injury, personal injury, death or property damage occurring or arising out of services provided under this contract. This insurance shall cover claims caused by any act, omission, or negligence of the Contractor or its officers, agents, representatives, assigns or servants. The limits of liability insurance, which may be increased as deemed necessary by the contracting parties, shall be:

Each Occurrence	\$1,000,000.00
General Aggregate Limits	\$1,000,000.00
(other than products – commercial operations)	
Products – Commercial Operations Limit	\$1,000,000.00
Personal and Advertising Injury Limit	\$1,000,000.00
Fire Damage Limit (any one fire)	\$50,000.00
Medical Expense Limit (any one person)	\$5,000.00

- If the contract is for underground utility work, then the Contractor shall provide proof of insurance for that above in the form of Explosion, Collapse and Underground (XCU) coverage.
- c. Employers Liability on an occurrence basis in an amount not less than \$1,000,000.00 per occurrence.
- 2. For contracts over \$100,000.00 but less than \$5,000,000.00 the contractor shall obtain the coverage limits as listed for contracts below \$100,000.00 and General Aggregate and Products Commercial Operations Limit of not less than \$2,000,000.00.

3. Coverage for Comprehensive General Bodily Injury Liability Insurance for a contract over \$5,000,000.00 is:

Each Occurrence \$2,000,000.00
General Aggregate Limits \$4,000,000.00
(other than products – commercial operations)
Products – Commercial Operations limit \$4,000,000.00
Personal and Advertising Injury Limit \$2,000,000.00
Fire Damage Limit (any one fire) \$50,000.00
Medical Expense Limit (any one Person) \$5,000.00

- 4. For all Contracts Automobile Liability: in the event that services delivered pursuant to this contract involve the use of vehicles or the transportation of clients, automobile liability insurance shall be required. If Contractor-owned personal vehicles are used, a Business Automobile Policy covering at a minimum Code 2 "owned autos only" must be secured. If Contractor employee's vehicles are used, the Contractor must also include under the Business Automobile Policy Code 9, coverage for non-owned autos. The minimum limits for automobile liability is: \$1,000,000.00 per occurrence, using a combined single limit for bodily injury and property damage.
- 5. For Contracts for Hazardous Substance Removal (Asbestos Abatement, PCB Abatement, etc.)
  - a. In addition to providing insurance coverage for the project as outlined above, the Contractor shall provide Pollution Liability insurance for the hazardous substance removal as follows:

EACH OCCURRENCE	<u>AGGREGATE</u>
\$500,000.00	\$1,000,000.00

or \$1,000,000.00 each occurrence/aggregate bodily injury and property damage combined single limit.

- Insurance certificate must state that the insurer is covering hazardous substance removal.
- ii. Should this insurance be secured on a "claims made" basis, the coverage must be continuously maintained for one year following the project's "final completion" through official completion of the project, plus one year following.

For Contracts where hazardous substance removal is a subcomponent of contracted work, the general contractor shall provide to the Owner a certificate of insurance for coverage as defined in 5a. above. The State of Washington must be listed as an additional insured. This certificate of insurance must be provided to the Owner prior to commencing work.

#### 2.03 INSURANCE COVERAGE CERTIFICATES

- A. <u>Certificate required:</u> Prior to commencement of the Work, Contractor shall furnish to Owner a completed certificate of insurance coverage.
- B. List Project info: All insurance certificates shall name Owner's Project number and Project title.
- C. <u>Cancellation provisions:</u> All insurance certificates shall specifically require 45 Days prior notice to Owner of cancellation or any material change, except 30 Days for surplus line insurance.

#### 2.04 PAYMENT AND PERFORMANCE BONDS

Conditions for bonds: Payment and performance bonds for 100% of the Contract Award Amount, plus state sales tax, shall be furnished for the Work, using the Payment Bond and Performance Bond form published by and available from the American Institute of Architects (AIA) – form A312. Prior to execution of a Change Order that, cumulatively with previous Change Orders, increases the Contract Award Amount by 15% or more, the Contractor shall provide either new payment and performance bonds for the revised Contract Sum, or riders to the existing payment and performance bonds increasing the amount of the bonds. The Contractor shall likewise provide additional bonds or riders when subsequent Change Orders increase the Contract Sum by 15% or more.

No payment or performance bond is required if the Contract Sum is \$150,000 or less and the Contractor or General Contractor/Construction Manager agrees that Owner may, in lieu of the bond, retain 10% of the Contract Sum for the period allowed by RCW 39.08.010.

#### 2.05 ALTERNATIVE SURETY

<u>When alternative surety required:</u> Contractor shall promptly furnish payment and performance bonds from an alternative surety as required to protect Owner and persons supplying labor or materials required by the Contract Documents if:

- A. Owner has a reasonable objection to the surety; or
- B. Any surety fails to furnish reports on its financial condition if required by Owner.

#### 2.06 BUILDER'S RISK

- A. <u>Contractor to buy Property Insurance:</u> Contractor shall purchase and maintain property insurance in the amount of the Contract Sum including all Change Orders for the Work on a replacement cost basis until Substantial Completion. For projects not involving New Building Construction, "Installation Floater" is an acceptable substitute for the Builder's Risk Insurance. The insurance shall cover the interest of Owner, Contractor, and any Subcontractors, as their interests may appear.
- B. <u>Losses covered:</u> Contractor property insurance shall be placed on an "all risk" basis and insure against the perils of fire and extended coverage and physical loss or damage including theft, vandalism, malicious mischief, collapse, false work, temporary buildings, debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for A/E's services and expenses required as a result of an insured loss.
- C. Waiver of subrogation rights: Owner and Contractor waive all subrogation rights against each other, any Subcontractors, A/E, A/E's subconsultants, separate contractors described in Section 5.20, if any, and any of their subcontractors, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this section or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by Owner as fiduciary. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

#### PART 3 - TIME AND SCHEDULE

#### 3.01 PROGRESS AND COMPLETION

<u>Contractor to meet schedule:</u> Contractor shall diligently prosecute the Work, with adequate forces, achieve Substantial Completion within the Contract Time, and achieve Final Completion within a reasonable period thereafter.

#### 3.02 CONSTRUCTION SCHEDULE

- A. <u>Preliminary Progress Schedule:</u> Unless otherwise provided in Division 1, Contractor shall, within 14 Days after issuance of the Notice to Proceed, submit a preliminary Progress Schedule. The Progress Schedule shall show the sequence in which Contractor proposes to perform the Work, and the dates on which Contractor plans to start and finish major portions of the Work, including dates for shop drawings and other submittals, and for acquiring materials and equipment.
- B. <u>Form of Progress Schedule</u>: The Progress Schedule shall be in the form of a Critical Path Method (CPM) logic network or, with the approval of the Owner, a bar chart schedule may be submitted. The scheduling of construction is the responsibility of the Contractor and is included in the contract to assure adequate planning and execution of the work. The schedule will be used to evaluate progress of the work for payment based on the Schedule of Values. The schedule shall show the Contractor's planned order and interdependence of activities, and sequence of work. As a minimum the schedule shall include:
  - 1. Date of Notice to Proceed;
  - 2. Activities (resources, durations, individual responsible for activity, early starts, late starts, early finishes, late finishes, etc.);
  - 3. Utility Shutdowns;
  - 4. Interrelationships and dependence of activities;
  - 5. Planned vs. actual status for each activity;
  - 6. Substantial completion;
  - 7. Punch list:
  - 8. Final inspection;
  - 9. Final completion, and
  - 10. Float time

The Schedule Duration shall be based on the Contract Time of Completion listed on the Bid Form. The Owner shall not be obligated to accept any Early Completion Schedule suggested by the Contractor. The Contract Time for Completion shall establish the Schedule Completion Date.

If the Contractor feels that the work can be completed in less than the Specified Contract Time, then the Surplus Time shall be considered Project Float. This Float time shall be shown on the Project Schedule. It shall be available to accommodate changes in the work and unforeseen conditions.

Neither the Contractor nor the Owner have exclusive right to this Float Time. It belongs to the project.

C. Owner comments on Progress Schedule: Owner shall return comments on the preliminary Progress Schedule to Contractor within 14 Days of receipt. Review by Owner of Contractor's schedule does not constitute an approval or acceptance of Contractor's construction means, methods, or sequencing, or its ability to complete the Work within the Contract Time. Contractor shall revise and resubmit its schedule, as necessary. Owner may withhold a portion of progress payments until a Progress Schedule has been submitted which meets the requirements of this section.

- D. Monthly updates and compliance with Progress Schedule: Contractor shall utilize and comply with the Progress Schedule. On a monthly basis, or as otherwise directed by Owner, Contractor shall submit an updated Progress Schedule at its own expense to Owner indicating actual progress. If, in the opinion of Owner, Contractor is not in conformance with the Progress Schedule for reasons other than acts of Force Majeure as identified in Section 3.05, Contractor shall take such steps as are necessary to bring the actual completion dates of its work activities into conformance with the Progress Schedule, and if directed by Owner, Contractor shall submit a corrective action plan or revise the Progress Schedule to reconcile with the actual progress of the Work.
- E. <u>Contractor to notify Owner of delays:</u> Contractor shall promptly notify Owner in writing of any actual or anticipated event which is delaying or could delay achievement of any milestone or performance of any critical path activity of the Work. Contractor shall indicate the expected duration of the delay, the anticipated effect of the delay on the Progress Schedule, and the action being or to be taken to correct the problem. Provision of such notice does not relieve Contractor of its obligation to complete the Work within the Contract Time.

# 3.03 OWNER'S RIGHT TO SUSPEND THE WORK FOR CONVENIENCE

- A. Owner may suspend Work: Owner may, at its sole discretion, order Contractor, in writing, to suspend all or any part of the Work for up to 90 Days, or for such longer period as mutually agreed.
- B. <u>Compliance with suspension; Owner's options:</u> Upon receipt of a written notice suspending the Work, Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of cost of performance directly attributable to such suspension. Within a period up to 90 Days after the notice is delivered to Contractor, or within any extension of that period to which the parties shall have agreed, Owner shall either:
  - 1. Cancel the written notice suspending the Work; or
  - 2. Terminate the Work covered by the notice as provided in the termination provisions of Part 9.
- C. <u>Resumption of Work</u>: If a written notice suspending the Work is cancelled or the period of the notice or any extension thereof expires, Contractor shall resume Work.
- D. <u>Equitable Adjustment for suspensions:</u> Contractor shall be entitled to an equitable adjustment in the Contract Time, or Contract Sum, or both, for increases in the time or cost of performance directly attributable to such suspension, provided Contractor complies with all requirements set forth in Part 7.

# 3.04 OWNER'S RIGHT TO STOP THE WORK FOR CAUSE

- A. Owner may stop Work for Contractor's failure to perform: If Contractor fails or refuses to perform its obligations in accordance with the Contract Documents, Owner may order Contractor, in writing, to stop the Work, or any portion thereof, until satisfactory corrective action has been taken.
- B. <u>No Equitable Adjustment for Contractor's failure to perform:</u> Contractor shall not be entitled to an equitable adjustment in the Contract Time or Contract Sum for any increased cost or time of performance attributable to Contractor's failure or refusal to perform or from any reasonable remedial action taken by Owner based upon such failure.

#### 3.05 DELAY

- A. Force Majeure actions not a default; Force Majeure defined: Any delay in or failure of performance by Owner or Contractor, other than the payment of money, shall not constitute a default hereunder if and to the extent the cause for such delay or failure of performance was unforeseeable and beyond the control of the party ("Force Majeure"). Acts of Force Majeure include, but are not limited to:
  - 1. Acts of God or the public enemy;
  - 2. Acts or omissions of any government entity;
  - 3. Fire or other casualty for which Contractor is not responsible;
  - 4. Quarantine or epidemic;
  - 5. Strike or defensive lockout;
  - 6. Unusually severe weather conditions which could not have been reasonably anticipated; and
  - 7. Unusual delay in receipt of supplies or products which were ordered and expedited and for which no substitute reasonably acceptable to Owner was available.
- B. Contract Time adjustment for Force Majeure: Contractor shall be entitled to an equitable adjustment in the Contract Time for changes in the time of performance directly attributable to an act of Force Majeure, provided it makes a request for equitable adjustment according to Section 7.03. Contractor shall not be entitled to an adjustment in the Contract Sum resulting from an act of Force Majeure.
- C. Contract Time or Contract Sum adjustment if Owner at fault: Contractor shall be entitled to an equitable adjustment in Contract Time, and may be entitled to an equitable adjustment in Contract Sum, if the cost or time of Contractor's performance is changed due to the fault or negligence of Owner, provided the Contractor makes a request according to Sections 7.02 and 7.03.
- D. <u>No Contract Time or Contract Sum adjustment if Contractor at fault:</u> Contractor shall not be entitled to an adjustment in Contract Time or in the Contract Sum for any delay or failure of performance to the extent such delay or failure was caused by Contractor or anyone for whose acts Contractor is responsible.
- E. <u>Contract Time adjustment only for concurrent fault:</u> To the extent any delay or failure of performance was concurrently caused by the Owner and Contractor, Contractor shall be entitled to an adjustment in the Contract Time for that portion of the delay or failure of performance that was concurrently caused, provided it makes a request for equitable adjustment according to Section 7.03, but shall not be entitled to an adjustment in Contract Sum.
- F. <u>Contractor to mitigate delay impacts:</u> Contractor shall make all reasonable efforts to prevent and mitigate the effects of any delay, whether occasioned by an act of Force Majeure or otherwise.

# 3.06 NOTICE TO OWNER OF LABOR DISPUTES

A. <u>Contractor to notify Owner of labor disputes:</u> If Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay timely performance in accordance with the Contract Documents, Contractor shall immediately give notice, including all relevant information, to Owner.

B. Pass through notification provisions to Subcontractors: Contractor agrees to insert a provision in its Subcontracts and to require insertion in all sub-subcontracts, that in the event timely performance of any such contract is delayed or threatened by delay by any actual or potential labor dispute, the Subcontractor or Sub-subcontractor shall immediately notify the next higher tier Subcontractor or Contractor, as the case may be, of all relevant information concerning the dispute.

#### 3.07 DAMAGES FOR FAILURE TO ACHIEVE TIMELY COMPLETION

#### A. Liquidated Damages

- Reason for Liquidated Damages: Timely performance and completion of the Work is essential to Owner and time limits stated in the Contract Documents are of the essence. Owner will incur serious and substantial damages if Substantial Completion of the Work does not occur within the Contract Time. However, it would be difficult if not impossible to determine the exact amount of such damages. Consequently, provisions for liquidated damages are included in the Contract Documents.
- 2. <u>Calculation of Liquidated Damages amount:</u> The liquidated damage amounts set forth in the Contract Documents will be assessed not as a penalty, but as liquidated damages for breach of the Contract Documents. This amount is fixed and agreed upon by and between the Contractor and Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain. This amount shall be construed as the actual amount of damages sustained by the Owner, and may be retained by the Owner and deducted from periodic payments to the Contractor.
- 3. <u>Contractor responsible even if Liquidated Damages assessed: Assessment of liquidated damages</u> shall not release Contractor from any further obligations or liabilities pursuant to the Contract Documents.

#### B. Actual Damages

<u>Calculation of Actual Damages:</u> Actual damages will be assessed for failure to achieve Final Completion within the time provided. Actual damages will be calculated on the basis of direct architectural, administrative, and other related costs attributable to the Project from the date when Final Completion should have been achieved, based on the date Substantial Completion is actually achieved, to the date Final Completion is actually achieved. Owner may offset these costs against any payment due Contractor.

# PART 4 - SPECIFICATIONS, DRAWINGS, AND OTHER DOCUMENTS

# 4.01 <u>DISCREPANCIES AND CONTRACT DOCUMENT REVIEW</u>

- A. <u>Specifications and Drawings are basis of the Work:</u> The intent of the Specifications and Drawings is to describe a complete Project to be constructed in accordance with the Contract Documents. Contractor shall furnish all labor, materials, equipment, tools, transportation, permits, and supplies, and perform the Work required in accordance with the Drawings, Specifications, and other provisions of the Contract Documents.
- B. Parts of the Contract Documents are complementary: The Contract Documents are complementary. What is required by one part of the Contract Documents shall be binding as if required by all. Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be of like effect as if shown or mentioned in both.

- C. Contractor to report discrepancies in Contract Documents: Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by Owner. If, during the performance of the Work, Contractor finds a conflict, error, inconsistency, or omission in the Contract Documents, it shall promptly and before proceeding with the Work affected thereby, report such conflict, error, inconsistency, or omission to A/E in writing.
- D. <u>Contractor knowledge of discrepancy in documents responsibility:</u> Contractor shall do no Work without applicable Drawings, Specifications, or written modifications, or Shop Drawings where required, unless instructed to do so in writing by Owner. If Contractor performs any construction activity, and it knows or reasonably should have known that any of the Contract Documents contain a conflict, error, inconsistency, or omission, Contractor shall be responsible for the performance and shall bear the cost for its correction.
- E. <u>Contractor to perform Work implied by Contract Documents:</u> Contractor shall provide any work or materials the provision of which is clearly implied and is within the scope of the Contract Documents even if the Contract Documents do not mention them specifically.
- F. <u>Interpretation questions referred to A/E:</u> Questions regarding interpretation of the requirements of the Contract Documents shall be referred to the A/E.

# 4.02 PROJECT RECORD

- A. Contractor to maintain Project Record Drawings and Specifications: Contractor shall legibly mark in ink on a separate set of the Drawings and Specifications all actual construction, including depths of foundations, horizontal and vertical locations of internal and underground utilities and appurtenances referenced to permanent visible and accessible surface improvements, field changes of dimensions and details, actual suppliers, manufacturers and trade names, models of installed equipment, and Change Order Proposals (COP). This separate set of Drawings and Specifications shall be the "Project Record."
- B. <u>Update Project Record weekly and keep on site:</u> The Project Record shall be maintained on the project site throughout the construction and shall be clearly labeled "PROJECT RECORD." The Project Record shall be updated at least weekly noting all changes and shall be available to Owner at all times.
- C. <u>Final Project Record to A/E before Final Acceptance:</u> Contractor shall submit the completed and finalized Project Record to A/E prior to Final Acceptance.

# 4.03 SHOP DRAWINGS

- A. <u>Definition of Shop Drawings:</u> "Shop Drawings" means documents and other information required to be submitted to A/E by Contractor pursuant to the Contract Documents, showing in detail: the proposed fabrication and assembly of structural elements; and the installation (i.e. form, fit, and attachment details) of materials and equipment. Shop Drawings include, but are not limited to, drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, samples, and similar materials furnished by Contractor to explain in detail specific portions of the Work required by the Contract Documents. For materials and equipment to be incorporated into the Work, Contractor submittal shall include the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the item. When directed, Contractor shall submit all samples at its own expense. Owner may duplicate, use, and disclose Shop Drawings provided in accordance with the Contract Documents.
- B. <u>Approval of Shop Drawings by Contractor and A/E:</u> Contractor shall coordinate all Shop Drawings, and review them for accuracy, completeness, and compliance with the Contract Documents and shall indicate its approval thereon as evidence of such coordination and review.

Where required by law, Shop Drawings shall be stamped by an appropriate professional licensed by the state of Washington. Shop Drawings submitted to A/E without evidence of Contractor's approval shall be returned for resubmission. Contractor shall review, approve, and submit Shop Drawings with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of Owner or separate contractors. Contractor's submittal schedule shall allow a reasonable time for A/E review. A/E will review, approve, or take other appropriate action on the Shop Drawings. Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings until the respective submittal has been reviewed and the A/E has approved or taken other appropriate action. Owner and A/E shall respond to Shop Drawing submittals with reasonable promptness. Any Work by Contractor shall be in accordance with reviewed Shop Drawings. Submittals made by Contractor which are not required by the Contract Documents may be returned without action.

- C. Contractor not relieved of responsibility when Shop Drawings approved: Approval, or other appropriate action with regard to Shop Drawings, by Owner or A/E shall not relieve Contractor of responsibility for any errors or omissions in such Shop Drawings, nor from responsibility for compliance with the requirements of the Contract Documents. Unless specified in the Contract Documents, review by Owner or A/E shall not constitute an approval of the safety precautions employed by Contractor during construction, or constitute an approval of Contractor's means or methods of construction. If Contractor fails to obtain approval before installation and the item or work is subsequently rejected, Contractor shall be responsible for all costs of correction.
- D. <u>Variations between Shop Drawings and Contract Documents:</u> If Shop Drawings show variations from the requirements of the Contract Documents, Contractor shall describe such variations in writing, separate from the Shop Drawings, at the time it submits the Shop Drawings containing such variations. If A/E approves any such variation, an appropriate Change Order will be issued. If the variation is minor and does not involve an adjustment in the Contract Sum or Contract Time, a Change Order need not be issued; however, the modification shall be recorded upon the Project Record.
- E. <u>Contractor to submit 5 copies of Shop Drawings:</u> Unless otherwise provided in Division 1, Contractor shall submit to A/E for approval 5 copies of all Shop Drawings. Unless otherwise indicated, 3 sets of all Shop Drawings shall be retained by A/E and 2 sets shall be returned to Contractor.

#### 4.04 ORGANIZATION OF SPECIFICATIONS

<u>Specification organization by trade:</u> Specifications are prepared in sections which conform generally with trade practices. These sections are for Owner and Contractor convenience and shall not control Contractor in dividing the Work among the Subcontractors or in establishing the extent of the Work to be performed by any trade.

# 4.05 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER DOCUMENTS

- A. A/E, not Contractor, owns Copyright of Drawings and Specifications: The Drawings, Specifications, and other documents prepared by A/E are instruments of A/E's service through which the Work to be executed by Contractor is described. Neither Contractor nor any Subcontractor shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by A/E, and A/E shall be deemed the author of them and will, along with any rights of Owner, retain all common law, statutory, and other reserved rights, in addition to the copyright. All copies of these documents, except Contractor's set, shall be returned or suitably accounted for to A/E, on request, upon completion of the Work.
- B. <u>Drawings and Specifications to be used only for this Project:</u> The Drawings, Specifications, and other documents prepared by the A/E, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor

on other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner and A/E. Contractor and Subcontractors are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications, and other documents prepared by A/E appropriate to and for use in the execution of their Work.

- C. <u>Shop Drawing license granted to Owner:</u> Contractor and all Subcontractors grant a non-exclusive license to Owner, without additional cost or royalty, to use for its own purposes (including reproduction) all Shop Drawings, together with the information and diagrams contained therein, prepared by Contractor or any Subcontractor. In providing Shop Drawings, Contractor and all Subcontractors warrant that they have authority to grant to Owner a license to use the Shop Drawings, and that such license is not in violation of any copyright or other intellectual property right. Contractor agrees to defend and indemnify Owner pursuant to the indemnity provisions in Section 5.03 and 5.22 from any violations of copyright or other intellectual property rights arising out of Owner's use of the Shop Drawings hereunder, or to secure for Owner, at Contractor's own cost, licenses in conformity with this section.
- D. Shop Drawings to be used only for this Project: The Shop Drawings and other submittals prepared by Contractor, Subcontractors of any tier, or its or their equipment or material suppliers, and copies thereof furnished to Contractor, are for use solely with respect to this Project. They are not to be used by Contractor or any Subcontractor of any tier, or material or equipment supplier, on other projects or for additions to this Project outside the scope of the Work without the specific written consent of Owner. The Contractor, Subcontractors of any tier, and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Shop Drawings and other submittals appropriate to and for use in the execution of their Work under the Contract Documents.

# PART 5 - PERFORMANCE

# 5.01 CONTRACTOR CONTROL AND SUPERVISION

- A. Contractor responsible for Means and Methods of construction: Contractor shall supervise and direct the Work, using its best skill and attention, and shall perform the Work in a skillful manner. Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work, unless the Contract Documents give other specific instructions concerning these matters. Contractor shall disclose its means and methods of construction when requested by Owner.
- B. Competent Superintendent required: Performance of the Work shall be directly supervised by a competent superintendent who has authority to act for Contractor. The superintendent must be satisfactory to the Owner and shall not be changed without the prior written consent of Owner. Owner may require Contractor to remove the superintendent from the Work or Project site, at no cost to the Owner for delay or any other claim, if Owner reasonably deems the superintendent incompetent, negligent, or otherwise objectionable, provided Owner has first notified Contractor in writing and allowed a reasonable period for transition. Noncompliance with the Owner's request to remove and replace the superintendent for a material reason shall also be grounds for terminating the Contract for cause.
- C. <u>Contractor responsible for acts and omissions of self and agents</u>: Contractor shall be responsible to Owner for acts and omissions of Contractor, Subcontractors, and their employees and agents.
- D. Contractor to employ competent and disciplined workforce: Contractor shall enforce strict discipline and good order among all of the Contractor's employees and other persons performing the Work. Contractor shall not permit employment of persons not skilled in tasks assigned to them. Contractor's employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons. Owner may, by written notice, require

Contractor to remove from the Work or Project site, at no cost to the Owner for delay or any other claim, any employee Owner reasonably deems incompetent, negligent, or otherwise objectionable. Noncompliance with the Owner's request to remove and replace personnel at any level for a material reason shall also be grounds for terminating the Contract for cause.

- E. <u>Contractor to keep project documents on site:</u> Contractor shall keep on the Project site a copy of the Drawings, Specifications, addenda, reviewed Shop Drawings, and permits and permit drawings.
- F. Contractor to comply with ethical standards: Contractor shall ensure that its owner(s) and employees, and those of its Subcontractors, comply with the Ethics in Public Service Act RCW 42.52, which, among other things, prohibits state employees from having an economic interest in any public works contract that was made by, or supervised by, that employee. Contractor shall remove, at its sole cost and expense, any of its, or its Subcontractors' employees, if they are in violation of this act.

# 5.02 PERMITS, FEES, AND NOTICES

- A. <u>Contractor to obtain and pay for permits:</u> Unless otherwise provided in the Contract Documents, Contractor shall pay for and obtain all permits, licenses, and inspections necessary for proper execution and completion of the Work. Prior to Final Acceptance, the approved, signed permits shall be delivered to Owner.
- B. Allowances for permit fees: The actual cost of the general building permit (only) and the public utility hook-up fees will be a direct reimbursement to the Contractor or paid directly to the permitting agency by the Owner. Fees for these permits should not be included by the Contractor in his bid amount.
- C. <u>Contractor to comply with all applicable laws:</u> Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.
- D. <u>Contractor to submit copies:</u> The General Contractor shall submit copies of each valid permit required on the project to the Owner's representative. Nothing in this part shall be construed as imposing a duty upon the Owner or A/E to secure permits.

# 5.03 PATENTS AND ROYALTIES

<u>Payment, indemnification, and notice:</u> Contractor is responsible for, and shall pay, all royalties and license fees. Contractor shall defend, indemnify, and hold Owner harmless from any costs, expenses, and liabilities arising out of the infringement by Contractor of any patent, copyright, or other intellectual property right used in the Work; however, provided that Contractor gives prompt notice, Contractor shall not be responsible for such defense or indemnity when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents. If Contractor has reason to believe that use of the required design, process, or product constitutes an infringement of a patent or copyright, it shall promptly notify Owner of such potential infringement.

#### 5.04 PREVAILING WAGES

A. Contractor to pay Prevailing Wages or applicable Federal Wages: Contractor shall pay the prevailing rate of wages to all workers, laborers, or mechanics employed in the performance of any part of the Work in accordance with RCW 39.12 and the rules and regulations of the Department of Labor and Industries (L&I). The schedule of prevailing wage rates for the locality or localities of the Work, is determined by the Industrial Statistician of the Department of Labor and Industries. It is the Contractor's responsibility to verify the applicable prevailing wage rate. If applicable, the Contractor shall comply with all Federal Funding requirements of the Davis

Bacon Act that will be addressed in a separate "DIVISION 00 SPECIAL CONDITIONS" specification section that will be based on the specific requirements of the funding source.

- B. <u>Statement of Intent to Pay Prevailing Wages:</u> Before payment is made by the Owner to the Contractor for any work performed by the Contractor and subcontractors whose work is included in the application for payment, the Contractor shall submit, or shall have previously submitted to the Owner for the Project, a Statement of Intent to Pay Prevailing Wages, approved by the L&I, certifying the rate of hourly wage paid and to be paid each classification of laborers, workers, or mechanics employed upon the Work by Contractor and Subcontractors. Such rates of hourly wage shall not be less than the prevailing wage rate.
- C. <u>Affidavit of Wages Paid:</u> Prior to release of retainage, the Contractor shall submit to the Owner an Affidavit of Wages Paid, approved by the L&I, for the Contractor and every subcontractor, of any tier, that performed work on the Project.
- D. <u>Disputes:</u> Disputes regarding prevailing wage rates shall be referred for arbitration to the Director of the L&I. The arbitration decision shall be final and conclusive and binding on all parties involved in the dispute as provided for by RCW 39.12.060.
- E. <u>Statement with pay application; Post Statements of Intent at job site:</u> Each Application for Payment submitted by Contractor shall state that prevailing wages have been paid in accordance with the prefiled statement(s) of intent, as approved. Copies of the approved intent statement(s) shall be posted on the job site with the address and telephone number of the Industrial Statistician of the L&I where a complaint or inquiry concerning prevailing wages may be made.
- F. Contractor to pay for Statements of Intent and Affidavits: In compliance with chapter 296-127 WAC, Contractor shall pay to the L&I the currently established fee(s) for each statement of intent and/or affidavit of wages paid submitted to the L&I for certification.
- G. <u>Certified Payrolls:</u> Consistent with RCW 31.12.120, contractors, subcontractors, or employers shall file a copy of its certified payroll records using the L&I' online system at least once per month. If the L&I' online system is not used, a contractor, subcontractor, or employer shall file a copy of its certified payroll records directly with the L&I in a format approved by the L&I at least once per month. A contractor, subcontractor, or employer's noncompliance with this section constitutes a violation of RCW 39.12.050.
- H. Compliance with Federal Funding requirements: If applicable, the Contractor shall comply with all Federal Funding requirements of the Davis Bacon Act that will be addressed in a separate "DIVISION 00 SPECIAL CONDITIONS" specification section that will be based on the specific requirements of the funding source.

#### 5.05 HOURS OF LABOR

- A. <a href="Overtime:">Overtime:</a> Contractor shall comply with all applicable provisions of RCW 49.28 and they are incorporated herein by reference. Pursuant to that statute, no laborer, worker, or mechanic employed by Contractor, any Subcontractor, or any other person performing or contracting to do the whole or any part of the Work, shall be permitted or required to work more than eight hours in any one calendar day, provided, that in cases of extraordinary emergency, such as danger to life or property, the hours of work may be extended, but in such cases the rate of pay for time employed in excess of eight hours of each calendar day shall be not less than one and one-half times the rate allowed for this same amount of time during eight hours of service.
- B. <u>4-10 Agreements:</u> Notwithstanding the preceding paragraph, RCW 49.28 permits a contractor or subcontractor in any public works contract subject to those provisions, to enter into an agreement with its employees in which the employees work up to ten hours in a calendar day. No such agreement may provide that the employees work ten-hour days for more than four

calendar days a week. Any such agreement is subject to approval by the employees. The overtime provisions of RCW 49.28 shall not apply to the hours, up to forty hours per week, worked pursuant to any such agreement.

# 5.06 NONDISCRIMINATION

A. <u>Discrimination prohibited by applicable laws</u>: The Contractor and all Subcontractors shall comply with all applicable federal and state non-discrimination laws, regulations, and policies. No person shall, on the grounds of age, race, creed, color, sex, sexual orientation, religion, national origin, marital status, honorably discharged veteran or military status, or disability (physical, mental, or sensory) be denied the benefits of, or otherwise be subjected to discrimination under any project, program, or activity, funded, in whole or in part, under this Agreement

#### B. During performance of the Work:

- 1. <u>Protected Classes:</u> Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, age, marital status, or the presence of any physical, sensory, or mental disability, Vietnam era veteran status, or disabled veteran status, nor commit any other unfair practices as defined in RCW 49.60.
- 2. <u>Advertisements to state nondiscrimination:</u> Contractor shall, in all solicitations or advertisements for employees placed by or for it, state that all qualified applicants will be considered for employment, without regard to race, creed, color, national origin, sex, age, marital status, or the presence of any physical, sensory, or mental disability.
- 3. Contractor to notify unions and others of nondiscrimination: Contractor shall send to each labor union, employment agency, or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice advising the labor union, employment agency, or workers' representative of Contractor's obligations according to the Contract Documents and RCW 49.60.
- 4. Owner and State access to Contractor records: Contractor shall permit access to its books, records, and accounts, and to its premises by Owner, and by the Washington State Human Rights Commission, for the purpose of investigation to ascertain compliance with this section of the Contract Documents.
- 5. <u>Pass through provisions to Subcontractors:</u> Contractor shall include the provisions of this section in every Subcontract.

# 5.07 SAFETY PRECAUTIONS

- A. In performing this contract, the Contractor shall provide for protecting the lives and health of employees and other persons; preventing damage to property, materials, supplies, and equipment; and avoid work interruptions. For these purposes, the Contractor shall:
  - Follow Washington Industrial Safety and Health Act (WISHA) regional directives and provide a site-specific safety program that will require an accident prevention and hazard analysis plan for the contractor and each subcontractor on the work site. The Contractor shall submit a site-specific safety plan to the Owner's representative prior to the initial scheduled construction meeting.
  - 2. Provide adequate safety devices and measures including, but not limited to, the appropriate safety literature, notice, training, permits, placement and use of barricades, signs, signal lights, ladders, scaffolding, staging, runways, hoist, construction elevators, shoring, temporary lighting, grounded outlets, wiring, hazardous materials, vehicles, construction

processes, and equipment required by all applicable state, federal, and local laws and regulations.

- 3. Comply with the State Environmental Policy Act (SEPA), Clean Air Act, Shoreline Management Act, and other applicable federal, state, and local statutes and regulations dealing with the prevention of environmental pollution and the preservation of public natural resources.
- 4. Post all permits, notices, and/or approvals in a conspicuous location at the construction site.
- 5. Provide any additional measures that the Owner determines to be reasonable and necessary for ensuring a safe environment in areas open to the public. Nothing in this part shall be construed as imposing a duty upon the Owner or A/E to prescribe safety conditions relating to employees, public, or agents of the Contractors.
- B. Contractor safety responsibilities: In carrying out its responsibilities according to the Contract Documents, Contractor shall protect the lives and health of employees performing the Work and other persons who may be affected by the Work; prevent damage to materials, supplies, and equipment whether on site or stored off-site; and prevent damage to other property at the site or adjacent thereto. Contractor shall comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss; shall erect and maintain all necessary safeguards for such safety and protection; and shall notify owners of adjacent property and utilities when prosecution of the Work may affect them.
- C. Contractor to maintain safety records: Contractor shall maintain an accurate record of exposure data on all incidents relating to the Work resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. Contractor shall immediately report any such incident to Owner. Owner shall, at all times, have a right of access to all records of exposure.
- D. <u>Contractor to provide HazMat training:</u> Contractor shall provide all persons working on the Project site with information and training on hazardous chemicals in their work at the time of their initial assignment, and whenever a new hazard is introduced into their work area.
  - 1. Information. At a minimum, Contractor shall inform persons working on the Project site of:
    - a. <u>WAC:</u> The requirements of chapter 296-62 WAC, General Occupational Health Standards;
    - b. <u>Presence of hazardous chemicals:</u> Any operations in their work area where hazardous chemicals are present; and
    - c. <u>Hazard communications program:</u> The location and availability of written hazard communication programs, including the required list(s) of hazardous chemicals and material safety data sheets required by chapter 296-62 WAC.
  - 2. <u>Training</u>. At a minimum, Contractor shall provide training for persons working on the Project site which includes:
    - a. <u>Detecting hazardous chemicals:</u> Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

- b. <u>Hazards of chemicals:</u> The physical and health hazards of the chemicals in the <u>work</u> area:
- c. <u>Protection from hazards:</u> The measures such persons can take to protect themselves from these hazards, including specific procedures Contractor, or its Subcontractors, or others have implemented to protect those on the Project site from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and
- d. <u>Hazard communications program:</u> The details of the hazard communications program developed by Contractor, or its Subcontractors, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.
- E. <u>Hazardous, toxic or harmful substances:</u> Contractor's responsibility for hazardous, toxic, or harmful substances shall include the following duties:
  - 1. <u>Illegal use of dangerous substances:</u> Contractor shall not keep, use, dispose, transport, generate, or sell on or about the Project site, any substances now or hereafter designated as, or which are subject to regulation as, hazardous, toxic, dangerous, or harmful by any federal, state or local law, regulation, statute or ordinance (hereinafter collectively referred to as "hazardous substances"), in violation of any such law, regulation, statute, or ordinance, but in no case shall any such hazardous substance be stored more than 90 Days on the Project site.
  - 2. Contractor notifications of spills, failures, inspections, and fines: Contractor shall promptly notify Owner of all spills or releases of any hazardous substances which are otherwise required to be reported to any regulatory agency and pay the cost of cleanup. Contractor shall promptly notify Owner of all failures to comply with any federal, state, or local law, regulation, or ordinance; all inspections of the Project site by any regulatory entity concerning the same; all regulatory orders or fines; and all responses or interim cleanup actions taken by or proposed to be taken by any government entity or private party on the Project site.
- F. <u>Public safety and traffic:</u> All Work shall be performed with due regard for the safety of the public. Contractor shall perform the Work so as to cause a minimum of interruption of vehicular traffic or inconvenience to pedestrians. All arrangements to care for such traffic shall be Contractor's responsibilities. All expenses involved in the maintenance of traffic by way of detours shall be borne by Contractor.
- G. <u>Contractor to act in an emergency:</u> In an emergency affecting the safety of life or the Work or of adjoining property, Contractor is permitted to act, at its discretion, to prevent such threatened loss or injury, and Contractor shall so act if so authorized or instructed.
- H. No duty of safety by Owner or A/E: Nothing provided in this section shall be construed as imposing any duty upon Owner or A/E with regard to, or as constituting any express or implied assumption of control or responsibility over, Project site safety, or over any other safety conditions relating to employees or agents of Contractor or any of its Subcontractors, or the public.

# 5.08 OPERATIONS, MATERIAL HANDLING, AND STORAGE AREAS

- A. <u>Limited storage areas:</u> Contractor shall confine all operations, including storage of materials, to Owner-approved areas.
- B. <u>Temporary buildings and utilities at Contractor expense:</u> Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be provided by Contractor only with the consent of Owner

- and without expense to Owner. The temporary buildings and utilities shall be removed by Contractor at its expense upon completion of the Work.
- C. Roads and vehicle loads: Contractor shall use only established roadways or temporary roadways authorized by Owner. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by federal, state, or local law or regulation.
- D. Ownership and reporting by Contractor of demolished materials: Ownership and control of all materials or facility components to be demolished or removed from the Project site by Contractor shall immediately vest in Contractor upon severance of the component from the facility or severance of the material from the Project site. Contractor shall be responsible for compliance with all laws governing the storage and ultimate disposal. Contractor shall provide Owner with a copy of all manifests and receipts evidencing proper disposal when required by Owner or applicable law.
- E. Contractor responsible for care of materials and equipment on-site: Contractor shall be responsible for the proper care and protection of its materials and equipment delivered to the Project site. Materials and equipment may be stored on the premises subject to approval of Owner. When Contractor uses any portion of the Project site as a shop, Contractor shall be responsible for any repairs, patching, or cleaning arising from such use.
- F. Contractor responsible for loss of materials and equipment: Contractor shall protect and be responsible for any damage or loss to the Work, or to the materials or equipment until the date of Substantial Completion, and shall repair or replace without cost to Owner any damage or loss that may occur, except damages or loss caused by the acts or omissions of Owner. Contractor shall also protect and be responsible for any damage or loss to the Work, or to the materials or equipment, after the date of Substantial Completion, and shall repair or replace without cost to Owner any such damage or loss that might occur, to the extent such damages or loss are caused by the acts or omissions of Contractor, or any Subcontractor.

#### 5.09 PRIOR NOTICE OF EXCAVATION

A. Excavation defined; Use of locator services: "Excavation" means an operation in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means, except the tilling of soil less than 12 inches in depth for agricultural purposes, or road ditch maintenance that does not change the original road grade or ditch flow line. Before commencing any excavation, Contractor shall provide notice of the scheduled commencement of excavation to all owners of underground facilities or utilities, through locator services.

# 5.10 UNFORESEEN PHYSICAL CONDITIONS

- A. Notice requirement for concealed or unknown conditions: If Contractor encounters conditions at the site which are subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents, or unknown physical conditions of an unusual nature which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then Contractor shall give written notice to Owner promptly and in no event later than 7 Days after the first observance of the conditions. Conditions shall not be disturbed prior to such notice.
- B. <u>Adjustment in Contract Time and Contract Sum:</u> If such conditions differ materially and cause a change in Contractor's cost of, or time required for, performance of any part of the Work, the Contractor may be entitled to an equitable adjustment in the Contract Time or Contract Sum, or both, provided it makes a request therefore as provided in Part 7.

# 5.11 PROTECTION OF EXISTING STRUCTURES, EQUIPMENT, VEGETATION, UTILITIES AND IMPROVEMENTS

- A. <u>Contractor to protect and repair property:</u> Contractor shall protect from damage all existing structures, equipment, improvements, utilities, and vegetation: at or near the Project site; and on adjacent property of a third party, the locations of which are made known to or should be known by Contractor. Contractor shall repair any damage, including that to the property of a third party, resulting from failure to comply with the requirements of the Contract Documents or failure to exercise reasonable care in performing the Work. If Contractor fails or refuses to repair the damage promptly, Owner may have the necessary work performed and charge the cost to Contractor.
- B. <u>Tree and vegetation protection:</u> Contractor shall only remove trees when specifically authorized to <u>do</u> so, and shall protect vegetation that will remain in place.

# 5.12 LAYOUT OF WORK

- A. <u>Advanced planning of the Work:</u> Contractor shall plan and lay out the Work in advance of operations so as to coordinate all work without delay or revision.
- B. <u>Layout responsibilities</u>: Contractor shall lay out the Work from Owner-established baselines and bench marks indicated on the Drawings, and shall be responsible for all field measurements in connection with the layout. Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the Work. Contractor shall be responsible for executing the Work to the lines and grades that may be established. Contractor shall be responsible for maintaining or restoring all stakes and other marks established.

# 5.13 MATERIAL AND EQUIPMENT

- A. Contractor to provide new and equivalent equipment and materials: All equipment, material, and articles incorporated into the Work shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in the Contract Documents. References in the Specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard quality and shall not be construed as limiting competition. Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of A/E, is equal to that named in the specifications, unless otherwise specifically provided in the Contract Documents.
- B. <u>Use of asbestos-containing building materials</u>: The use of asbestos-containing building materials in new construction or renovation work is strictly prohibited. For the determination of asbestos-containing building materials, the following shall apply:
  - Until January 1, 2025, asbestos deliberately added in any concentration that contains more than one percent asbestos by weight or area as determined using the United States environmental protection agency method for the determination of asbestos in bulk building materials, EPA/600/R-93/116, July 1993.
  - 2. Following January 1, 2025, asbestos building material deliberately added in any concentration that contains more than 1/10th of one percent asbestos by weight or area for the determination of asbestos in bulk building materials, EPA/600/R-93/116, July 1993.
- C. <u>Contractor responsible for fitting parts together:</u> Contractor shall do all cutting, fitting, or patching that may be required to make its several parts fit together properly, or receive or be received by work of others set forth in, or reasonably implied by, the Contract Documents. Contractor shall

not endanger any work by cutting, excavating, or otherwise altering the Work and shall not cut or alter the work of any other contractor unless approved in advance by Owner.

D. Owner may reject defective Work: Should any of the Work be found defective, or in any way not in accordance with the Contract Documents, this work, in whatever stage of completion, may be rejected by Owner.

#### 5.14 AVAILABILITY AND USE OF UTILITY SERVICES

- A. Owner to provide and charge for utilities: Owner shall make all reasonable utilities available to Contractor from existing outlets and supplies, as specified in the Contract Documents. Unless otherwise provided in the Contract Documents, the utility service consumed shall be charged to or paid for by Contractor at prevailing rates charged to Owner or, where the utility is produced by Owner, at reasonable rates determined by Owner. Contractor will carefully conserve any utilities furnished.
- B. Contractor to install temporary connections and meters: Contractor shall, at its expense and in a skillful manner satisfactory to Owner, install and maintain all necessary temporary connections and distribution lines, together with appropriate protective devices, and all meters required to measure the amount of each utility used for the purpose of determining charges. Prior to the date of Final Acceptance, Contractor shall remove all temporary connections, distribution lines, meters, and associated equipment and materials.

# 5.15 TESTS AND INSPECTION

- A. <u>Contractor to provide for all testing and inspection of Work:</u> Contractor shall maintain an adequate testing and inspection program and perform such tests and inspections as are necessary or required to ensure that the Work conforms to the requirements of the Contract Documents. Contractor shall be responsible for inspection and quality surveillance of all its Work and all Work performed by any Subcontractor. Unless otherwise provided, Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. Contractor shall give Owner timely notice of when and where tests and inspections are to be made. Contractor shall maintain complete inspection records and make them available to Owner.
- B. Owner may conduct tests and inspections: Owner may, at any reasonable time, conduct such inspections and tests as it deems necessary to ensure that the Work is in accordance with the Contract Documents. Owner shall promptly notify Contractor if an inspection or test reveals that the Work is not in accordance with the Contract Documents. Unless the subject items are expressly accepted by Owner, such Owner inspection and tests are for the sole benefit of Owner and do not:
  - 1. Constitute or imply acceptance;
  - Relieve Contractor of responsibility for providing adequate quality control measures;
  - 3. Relieve Contractor of responsibility for risk of loss or damage to the Work, materials, or equipment;
  - 4. Relieve Contractor of its responsibility to comply with the requirements of the Contract Documents; or
  - 5. Impair Owner's right to reject defective or nonconforming items, or to avail itself of any other remedy to which it may be entitled.

- C. <u>Inspections or inspectors do not modify Contract Documents:</u> Neither observations by an inspector retained by Owner, the presence or absence of such inspector on the site, nor inspections, tests, or approvals by others, shall relieve Contractor from any requirement of the Contract Documents, nor is any such inspector authorized to change any term or condition of the Contract Documents.
- D. <u>Contractor responsibilities on inspections</u>: Contractor shall promptly furnish, without additional charge, all facilities, labor, material and equipment reasonably needed for performing such safe and convenient inspections and tests as may be required by Owner. Owner may charge Contractor any additional cost of inspection or testing when Work is not ready at the time specified by Contractor for inspection or testing, or when prior rejection makes reinspection or retest necessary. Owner shall perform its inspections and tests in a manner that will cause no undue delay in the Work.

#### 5.16 CORRECTION OF NONCONFORMING WORK

- A. <u>Work covered by Contractor without inspection:</u> If a portion of the Work is covered contrary to the requirements in the Contract Documents, it must, if required in writing by Owner, be uncovered for Owner's observation and be replaced at the Contractor's expense and without change in the Contract Time.
- B. Payment provisions for uncovering covered Work: If, at any time prior to Final Completion, Owner desires to examine the Work, or any portion of it, which has been covered, Owner may request to see such Work and it shall be uncovered by Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an adjustment in the Contract Sum for the costs of uncovering and replacement, and, if completion of the Work is thereby delayed, an adjustment in the Contract Time, provided it makes such a request as provided in Part 7. If such Work is not in accordance with the Contract Documents, the Contractor shall pay the costs of examination and reconstruction.
- C. Contractor to correct and pay for non-conforming Work: Contractor shall promptly correct Work found by Owner not to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. Contractor shall bear all costs of correcting such nonconforming Work, including additional testing and inspections.
- D. Contractor's compliance with warranty provisions: If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or within one year after the date for commencement of any system warranties established under Section 6.08, or within the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, Contractor shall correct it promptly after receipt of written notice from Owner to do so. Owner shall give such notice promptly after discovery of the condition. This period of one year shall be extended, with respect to portions of Work first performed after Substantial Completion, by the period of time between Substantial Completion and the actual performance of the Work. Contractor's duty to correct with respect to Work repaired or replaced shall run for one year from the date of repair or replacement. Obligations under this paragraph shall survive Final Acceptance.
- E. <u>Contractor to remove non-conforming Work:</u> Contractor shall remove from the Project site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by Contractor nor accepted by Owner.
- F. Owner may charge Contractor for non-conforming Work: If Contractor fails to correct nonconforming Work within a reasonable time after written notice to do so, Owner may replace, correct, or remove the nonconforming Work and charge the cost thereof to the Contractor.

- G. <u>Contractor to pay for damaged Work during correction:</u> Contractor shall bear the cost of correcting destroyed or damaged Work, whether completed or partially completed, caused by Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.
- H. No Period of limitation on other requirements: Nothing contained in this section shall be construed to establish a period of limitation with respect to other obligations which Contractor might have according to the Contract Documents. Establishment of the time period of one year as described in Section 5.16D relates only to the specific obligation of Contractor to correct the Work, and has no relationship to the time within which the Contractor's obligation to comply with the Contract Documents may be sought to be enforced, including the time within which such proceedings may be commenced.
- I. Owner may accept non-conforming Work and charge Contractor: If Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, Owner may do so instead of requiring its removal and correction, in which case the Contract Sum may be reduced as appropriate and equitable.

# 5.17 CLEAN UP

Contractor to keep site clean and leave it clean: Contractor shall at all times keep the Project site, including hauling routes, infrastructures, utilities, and storage areas, free from accumulations of waste materials. Before completing the Work, Contractor shall remove from the premises its rubbish, tools, scaffolding, equipment, and materials. Upon completing the Work, Contractor shall leave the Project site in a clean, neat, and orderly condition satisfactory to Owner. If Contractor fails to clean up as provided herein, and after reasonable notice from Owner, Owner may do so and the cost thereof shall be charged to Contractor.

# 5.18 ACCESS TO WORK

Owner and A/E access to Work site: Contractor shall provide Owner and A/E access to the Work in progress wherever located.

#### 5.19 OTHER CONTRACTS

Owner may award other contracts; Contractor to cooperate: Owner may undertake or award other contracts for additional work at or near the Project site. Contractor shall reasonably cooperate with the other contractors and with Owner's employees and shall carefully adapt scheduling and perform the Work in accordance with these Contract Documents to reasonably accommodate the other work.

# 5.20 SUBCONTRACTORS AND SUPPLIERS

- A. <u>Subcontractor Responsibility:</u> The Contractor shall include the language of this paragraph in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. Upon request of the Owner, the Contractor shall promptly provide documentation to the Owner demonstrating that the subcontractor meets the subcontractor responsibility criteria below. The requirements of this paragraph apply to all subcontractors regardless of tier. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:
  - 1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;
  - 2. Have a current Washington Unified Business Identifier (UBI) number;

#### 3. If applicable, have:

- a. Industrial Insurance (workers' compensation) coverage for the subcontractor's employees working in Washington, as required in Title 51 RCW;
- b. A Washington Employment Security Department number, as required in Title 50 RCW;
- A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
- d. An electrical contractor license, if required by Chapter 19.28 RCW;
- e. An elevator contractor license, if required by Chapter 70.87 RCW.
- 4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065 (3).
- 5. On a project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the date of the Owner's first advertisement of the project.
- 6. Within the three-year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by the L&I or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of chapter 49.46, 49.48, or 49.52 RCW.
- B. <u>Provide names of Subcontractors and use qualified firms:</u> Contractor shall utilize Subcontractors and suppliers which are experienced and qualified, and meet the requirements of the Contract Documents, if any. Contractor shall not utilize any Subcontractor or supplier to whom the Owner has a reasonable objection, and shall obtain Owner's written consent before making any substitutions or additions. Substitutions of subcontractors listed on Forms A and B are only allowable according to RCW 39.30.060.
- C. <u>Subcontracts in writing and pass through provision:</u> All Subcontracts must be in writing. By appropriate written agreement, Contractor shall require each Subcontractor, so far as applicable to the Work to be performed by the Subcontractor, to be bound to Contractor by terms of the Contract Documents, and to assume toward Contractor all the obligations and responsibilities which Contractor assumes toward Owner in accordance with the Contract Documents. Each Subcontract shall preserve and protect the rights of Owner in accordance with the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. However, nothing in this paragraph shall be construed to alter the contractual relations between Contractor and its Subcontractors with respect to insurance or bonds.
- D. <u>Coordination of Subcontractors; Contractor responsible for Work:</u> Contractor shall schedule, supervise, and coordinate the operations of all Subcontractors. No Subcontracting of any of the Work shall relieve Contractor from its responsibility for the performance of the Work in accordance with the Contract Documents or any other obligations of the Contract Documents.
- E. <u>Automatic assignment of subcontracts</u>: Each subcontract agreement for a portion of the Work is hereby assigned by Contractor to Owner provided that:

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- 1. <u>Effective only after termination and Owner approval:</u> The assignment is effective only after termination by Owner for cause pursuant to Section 9.01 and only for those Subcontracts which Owner accepts by notifying the Subcontractor in writing; and
- 2. <u>Owner assumes Contractor's responsibilities:</u> After the assignment is effective, Owner will assume all future duties and obligations toward the Subcontractor which Contractor assumed in the Subcontract.
- 3. <u>Impact of bond:</u> The assignment is subject to the prior rights of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.

#### 5.21 WARRANTY OF CONSTRUCTION

- A. <u>Contractor warranty of Work:</u> In addition to any special warranties provided elsewhere in the Contract Documents, Contractor warrants that all Work conforms to the requirements of the Contract Documents and is free of any defect in equipment, material, or design furnished, or workmanship performed by Contractor.
- B. <u>Contractor responsibilities:</u> With respect to all warranties, express or implied, for Work performed or materials furnished according to the Contract Documents, Contractor shall:
  - 1. Obtain warranties: Obtain all warranties that would be given in normal commercial practice;
  - 2. <u>Warranties for benefit of Owner:</u> Require all warranties to be executed, in writing, for the benefit of Owner:
  - 3. <u>Enforcement of warranties:</u> Enforce all warranties for the benefit of Owner, if directed by Owner; and
  - 4. <u>Contractor responsibility for subcontractor warranties:</u> Be responsible to enforce any subcontractor's, manufacturer's, or supplier's warranties should they extend beyond the period specified in the Contract Documents.
- C. <u>Warranties beyond Final Acceptance:</u> The obligations under this section shall survive Final Acceptance.

# 5.22 INDEMNIFICATION

- A. <u>Contractor to indemnify Owner:</u> Contractor shall defend, indemnify, and hold Owner and A/E harmless from and against all claims, demands, losses, damages, or costs, including but not limited to damages arising out of bodily injury or death to persons and damage to property, caused by or resulting from:
  - 1. <u>Sole negligence of Contractor:</u> The sole negligence of Contractor or any of its Subcontractors:
  - 2. <u>Concurrent negligence:</u> The concurrent negligence of Contractor, or any Subcontractor, but only to the extent of the negligence of Contractor or such Subcontractor; and
  - 3. <u>Patent infringement:</u> The use of any design, process, or equipment which constitutes an <u>infringement of any United States patent presently issued, or violates any other proprietary interest, including copyright, trademark, and trade secret.</u>
- B. <u>Employee action and RCW Title 51:</u> In any action against Owner and any other entity indemnified in accordance with this section, by any employee of Contractor, its Subcontractors, Subsubcontractors, agents, or anyone directly or indirectly employed by any of them, the indemnification obligation of this section shall not be limited by a limit on the amount or type of damages, compensation, or benefits payable by or for Contractor or any Subcontractor under RCW Title 51, the Industrial Insurance Act, or any other employee benefit acts. In addition, Contractor waives immunity as to Owner and A/E only, in accordance with RCW Title 51.

#### PART 6 – PAYMENTS AND COMPLETION

# 6.01 CONTRACT SUM

Owner shall pay Contract Sum: Owner shall pay Contractor the Contract Sum plus state sales tax for performance of the Work, in accordance with the Contract Documents.

#### 6.02 SCHEDULE OF VALUES

Contractor to submit Schedule of Values: Before submitting its first Application for Payment, Contractor shall submit to Owner for approval a breakdown allocating the total Contract Sum to each principal category of work, in such detail as requested by Owner ("Schedule of Values"). The approved Schedule of Values shall include appropriate amounts for demobilization, record drawings, O&M manuals, and any other requirements for Project closeout, and shall be used by Owner as the basis for progress payments. Payment for Work shall be made only for and in accordance with those items included in the Schedule of Values.

# 6.03 APPLICATION FOR PAYMENT

- A. <u>Monthly Application for Payment with substantiation:</u> At monthly intervals, unless determined otherwise by Owner, Contractor shall submit to Owner an itemized Application for Payment for Work completed in accordance with the Contract Documents and the approved Schedule of Values. Each application shall be supported by such substantiating data as Owner may require.
- B. <u>Contractor certifies Subcontractors paid:</u> By submitting an Application for Payment, Contractor is certifying that all Subcontractors have been paid, less earned retainage in accordance with RCW 60.28.011, as their interests appeared in the last preceding certificate of payment. By submitting an Application for Payment, Contractor is recertifying that the representations set forth in Section 1.03, are true and correct, to the best of Contractor's knowledge, as of the date of the Application for Payment.
- C. <u>Reconciliation of Work with Progress Schedule:</u> At the time it submits an Application for Payment, Contractor shall analyze and reconcile, to the satisfaction of Owner, the actual progress of the Work with the Progress Schedule.
- D. Payment for material delivered to site or stored off-site: If authorized by Owner, the Application for Payment may include request for payment for material delivered to the Project site and suitably stored, or for completed preparatory work. Payment may similarly be requested for material stored off the Project site, provided Contractor complies with or furnishes satisfactory evidence of the following:
  - 1. <u>Suitable facility or location:</u> The material will be placed in a facility or location that is structurally sound, dry, lighted and suitable for the materials to be stored;
  - 2. <u>Facility or location within 10 miles of Project:</u> The facility or location is located within a 10-mile radius of the Project. Other locations may be utilized, if approved in writing, by Owner;
  - 3. <u>Facility or location exclusive to Project's materials:</u> Only materials for the Project are stored within the facility or location (or a secure portion of a facility or location set aside for the Project);
  - 4. <u>Insurance provided on materials in facility or location:</u> Contractor furnishes Owner a certificate of insurance extending Contractor's insurance coverage for damage, fire, and theft to cover the full value of all materials stored, or in transit;

- 5. <u>Facility or location locked and secure:</u> The facility or location (or secure portion thereof) is continuously under lock and key, and only Contractor's authorized personnel shall have access:
- 6. Owner right of access to facility or location: Owner shall at all times have the right of access in company of Contractor;
- 7. <u>Contractor assumes total responsibility for stored materials:</u> Contractor and its surety assume total responsibility for the stored materials; and
- 8. Contractor provides documentation and Notice when materials moved to site: Contractor furnishes to Owner certified lists of materials stored, bills of lading, invoices, and other information as may be required, and shall also furnish Notice to Owner when materials are moved from storage to the Project site.

# **6.04 PROGRESS PAYMENTS**

- A. Owner to pay within 30 Days: Owner shall make progress payments, in such amounts as Owner determines are properly due, within 30 Days after receipt of a properly executed Application for Payment. Owner shall notify Contractor in accordance with chapter 39.76 RCW if the Application for Payment does not comply with the requirements of the Contract Documents.
- B. Withholding retainage; Options for retainage: Owner shall retain 5% of the amount of each progress payment until 45 Days after Final Acceptance and receipt of all documents required by law or the Contract Documents, including, at Owner's request, consent of surety to release of the retainage. In accordance with chapter 60.28 RCW, Contractor may request that monies reserved be retained in a fund by Owner, deposited by Owner in a bank or savings and loan, or placed in escrow with a bank or trust company to be converted into bonds and securities to be held in escrow with interest to be paid to Contractor. Owner may permit Contractor to provide an appropriate bond in lieu of the retained funds.
- C. <u>Title passes to Owner upon payment:</u> Title to all Work and materials covered by a progress payment shall pass to Owner at the time of such payment free and clear of all liens, claims, security interests, and encumbrances. Passage of title shall not, however, relieve Contractor from any of its duties and responsibilities for the Work or materials, or waive any rights of Owner to insist on full compliance by Contractor with the Contract Documents.
- D. <u>Interest on unpaid balances:</u> Payments due and unpaid in accordance with the Contract Documents shall bear interest as specified in chapter 39.76 RCW.

# 6.05 PAYMENTS WITHHELD

- A. Owner's right to withhold payment: Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any payment to such extent as may be necessary to protect Owner from loss or damage for reasons including but not limited to:
  - 1. Non-compliant Work: Work not in accordance with the Contract Documents;
  - 2. Remaining Work to cost more than unpaid balance: Reasonable evidence that the Work required by the Contract Documents cannot be completed for the unpaid balance of the Contract Sum;
  - 3. Owner correction or completion Work: Work by Owner to correct defective Work or complete the Work in accordance with Section 5.16;

- 4. <u>Contractor's failure to perform:</u> Contractor's failure to perform in accordance with the Contract Documents; or
- Contractor's negligent acts or omissions: Cost or liability that may occur to Owner as the result of Contractor's fault or negligent acts or omissions.
- B. Owner to notify Contractor of withholding for unsatisfactory performance: In any case where part or all of a payment is going to be withheld for unsatisfactory performance, Owner shall notify Contractor in accordance with chapter 39.76 RCW.

#### 6.06 RETAINAGE AND BOND CLAIM RIGHTS

<u>Chapters 39.08 RCW and 60.28 RCW incorporated by reference:</u> Chapters 39.08 RCW and 60.28 RCW, concerning the rights and responsibilities of Contractor and Owner with regard to the performance and payment bonds and retainage, are made a part of the Contract Documents by reference as though fully set forth herein.

# 6.07 SUBSTANTIAL COMPLETION

<u>Substantial Completion defined:</u> Substantial Completion is the stage in the progress of the Work (or portion thereof designated and approved by Owner) when the construction is sufficiently complete, in accordance with the Contract Documents, so Owner has full and unrestricted use and benefit of the facilities (or portion thereof designated and approved by Owner) for the use for which it is intended. All Work other than incidental corrective or punch list work shall be completed. Substantial Completion shall not have been achieved if all systems and parts are not functional, if utilities are not connected and operating normally, if all required occupancy permits have not been issued, or if the Work is not accessible by normal vehicular and pedestrian traffic routes. The date Substantial Completion is achieved shall be established in writing by Owner. Contractor may request an early date of Substantial Completion which must be approved by Change Order. Owner's occupancy of the Work or designated portion thereof does not necessarily indicate that Substantial Completion has been achieved.

#### 6.08 PRIOR OCCUPANCY

- A. <a href="Prior Occupancy defined">Prior Occupancy defined</a>; Restrictions: Owner may, upon written notice thereof to Contractor, take possession of or use any completed or partially completed portion of the Work ("Prior Occupancy") at any time prior to Substantial Completion. Unless otherwise agreed in writing, Prior Occupancy shall not: be deemed an acceptance of any portion of the Work; accelerate the time for any payment to Contractor; prejudice any rights of Owner provided by any insurance, bond, guaranty, or the Contract Documents; relieve Contractor of the risk of loss or any of the obligations established by the Contract Documents; establish a date for termination or partial termination of the assessment of liquidated damages; or constitute a waiver of claims.
- B. <u>Damage</u>; <u>Duty to repair and warranties</u>: Notwithstanding anything in the preceding paragraph, Owner shall be responsible for loss of or damage to the Work resulting from Prior Occupancy. Contractor's one year duty to repair any system warranties shall begin on building systems activated and used by Owner as agreed in writing by Owner and Contractor.

# 6.09 FINAL COMPLETION, ACCEPTANCE, AND PAYMENT

A. <u>Final Completion defined:</u> Final Completion shall be achieved when the Work is fully and finally complete in accordance with the Contract Documents. The date Final Completion is achieved shall be established by Owner in writing, but in no case shall constitute Final Acceptance which is a subsequent, separate, and distinct action.

- B. <u>Final Acceptance defined:</u> Final Acceptance shall be achieved when the Contractor has completed the requirements of the Contract Documents. The date Final Acceptance is achieved shall be established by Owner in writing. Prior to Final Acceptance, Contractor shall, in addition to all other requirements in the Contract Documents, submit to Owner a written notice of any outstanding disputes or claims between Contractor and any of its Subcontractors, including the amounts and other details thereof. Neither Final Acceptance, nor final payment, shall release Contractor or its sureties from any obligations of these Contract Documents or the payment and performance bonds, or constitute a waiver of any claims by Owner arising from Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. <u>Final payment waives Claim rights:</u> Acceptance of final payment by Contractor, or any Subcontractor, shall constitute a waiver and release to Owner of all claims by Contractor, or any such Subcontractor, for an increase in the Contract Sum or the Contract Time, and for every act or omission of Owner relating to or arising out of the Work, except for those Claims made in accordance with the procedures, including the time limits, set forth in Part 8.

#### PART 7 - CHANGES

# 7.01 CHANGE IN THE WORK

- A. Changes in Work, Contract Sum, and Contract Time by Change Order: Owner may, at any time and without notice to Contractor's surety, order additions, deletions, revisions, or other changes in the Work. These changes in the Work shall be incorporated into the Contract Documents through the execution of Change Orders. If any change in the Work ordered by Owner causes an increase or decrease in the Contract Sum or the Contract Time, an equitable adjustment shall be made as provided in Section 7.02 or 7.03, respectively, and such adjustment(s) shall be incorporated into a Change Order.
- B. Owner may request COP from Contractor: If Owner desires to order a change in the Work, it may request a written Change Order Proposal (COP) from Contractor. Contractor shall submit a Change Order Proposal within 14 Days of the request from Owner, or within such other period as mutually agreed. Contractor's Change Order Proposal shall be full compensation for implementing the proposed change in the Work, including any adjustment in the Contract Sum or Contract Time, and including compensation for all delays in connection with such change in the Work and for any expense or inconvenience, disruption of schedule, or loss of efficiency or productivity occasioned by the change in the Work.
- C. <u>COP negotiations:</u> Upon receipt of the Change Order Proposal, or a request for equitable adjustment in the Contract Sum or Contract Time, or both, as provided in Sections 7.02 and 7.03, Owner may accept or reject the proposal, request further documentation, or negotiate acceptable terms with Contractor. Pending agreement on the terms of the Change Order, Owner may direct Contractor to proceed immediately with the Change Order Work. Contractor shall not proceed with any change in the Work until it has obtained Owner's approval. All Work done pursuant to any Owner-directed change in the Work shall be executed in accordance with the Contract Documents.
- D. Change Order as full payment and final settlement: If Owner and Contractor reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, such agreement shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of all claims for time and for direct, indirect, and consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity, related to any Work either covered or affected by the Change Order, or related to the events giving rise to the request for equitable adjustment.
- E. <u>Failure to agree upon terms of Change Order; Final offer and Claims:</u> If Owner and Contractor are unable to reach agreement on the terms of any change in the Work, including any adjustment in the Contract Sum or Contract Time, Contractor may at any time in writing, request a final offer from

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Owner. Owner shall provide Contractor with its written response within 30 Days of Contractor's request. Owner may also provide Contractor with a final offer at any time. If Contractor rejects Owner's final offer, or the parties are otherwise unable to reach agreement, Contractor's only remedy shall be to file a Claim as provided in Part 8.

F. <u>Field Authorizations:</u> The Owner may direct the Contractor to proceed with a change in the work through a written Field Authorization (also referred to as a Field Order) when the time required to price and execute a Change Order would impact the Project.

The Field Authorization shall describe and include the following:

- 1. The scope of work
- 2. An agreed upon maximum not-to-exceed amount
- 3. Any estimated change to the Contract Time
- 4. The method of final cost determination in accordance with the requirements of Part 7 of the General Conditions
- 5. The supporting cost data to be submitted in accordance with the requirements of Part 7 of the General Conditions

Upon satisfactory submittal by the Contractor and approval by the Owner of supporting cost data, a Change Order will be executed. The Owner will not make payment to the Contractor for Field Authorization work until that work has been incorporated into an executed Change Order.

# 7.02 CHANGE IN THE CONTRACT SUM

#### A. General Application

- 1. <u>Contract Sum changes only by Change Order:</u> The Contract Sum shall only be changed by a Change Order. Contractor shall include any request for a change in the Contract Sum in its Change Order Proposal.
- 2. Owner fault or negligence as basis for change in Contract Sum: If the cost of Contractor's performance is changed due to the fault or negligence of Owner, or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Sum in accordance with the following procedure. No change in the Contract Sum shall be allowed to the extent: Contractor's changed cost of performance is due to the fault or negligence of Contractor, or anyone for whose acts Contractor is responsible; the change is concurrently caused by Contractor and Owner; or the change is caused by an act of Force Majeure as defined in Section 3.05.
  - (a) Notice and record keeping for equitable adjustment: A request for an equitable adjustment in the Contract Sum shall be based on written notice delivered to Owner within 7 Days of the occurrence of the event giving rise to the request. For purposes of this part, "occurrence" means when Contractor knew, or in its diligent prosecution of the Work should have known, of the event giving rise to the request. If Contractor believes it is entitled to an adjustment in the Contract Sum, Contractor shall immediately notify Owner and begin to keep and maintain complete, accurate, and specific daily records. Contractor shall give Owner access to any such records and, if requested shall promptly furnish copies of such records to Owner.
  - (b) <u>Content of notice for equitable adjustment; Failure to comply:</u> Contractor shall not be entitled to any adjustment in the Contract Sum for any occurrence of events or costs that

occurred more than 7 Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the Contract Sum; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Sum requested. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.

- (c) Contractor to provide supplemental information: Within 30 Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data. Contractor shall supplement the written notice provided in accordance with subparagraph a. above with additional supporting data. Such additional data shall include, at a minimum: the amount of compensation requested, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis that confirms not only that Contractor suffered the damages claimed, but that the damages claimed were actually a result of the act, event, or condition complained of and that the Contract Documents provide entitlement to an equitable adjustment to Contractor for such act, event, or condition; and documentation sufficiently detailed to permit an informed analysis of the request by Owner. When the request for compensation relates to a delay, or other change in Contract Time, Contractor shall demonstrate the impact on the critical path, in accordance with Section 7.03C. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
- (d) <u>Contractor to proceed with Work as directed:</u> Pending final resolution of any request made in accordance with this paragraph, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.
- (e) <u>Contractor to combine requests for same event together:</u> Any requests by Contractor for an equitable adjustment in the Contract Sum and in the Contract Time that arise out of the same event(s) shall be submitted together.
- 3. Methods for calculating Change Order amount: The value of any Work covered by a Change Order, or of any request for an equitable adjustment in the Contract Sum, shall be determined by one of the following methods:
  - (a) Fixed Price: On the basis of a fixed price as determined in paragraph 7.02B.
  - (b) <u>Unit Prices:</u> By application of unit prices to the quantities of the items involved as determined in paragraph 7.02C.
  - (c) <u>Time and Materials:</u> On the basis of time and material as determined in paragraph 7.02D.
- 4. <u>Fixed price method is default; Owner may direct otherwise:</u> When Owner has requested Contractor to submit a Change Order Proposal, Owner may direct Contractor as to which method in subparagraph 3 above to use when submitting its proposal. Otherwise, Contractor shall determine the value of the Work, or of a request for an equitable adjustment, on the basis of the fixed price method.

# B. Change Order Pricing - Fixed Price

<u>Procedures:</u> When the fixed price method is used to determine the value of any Work covered by a Change Order, or of a request for an equitable adjustment in the Contract Sum, the following procedures shall apply:

- Breakdown and itemization of details on COP: Contractor's Change Order Proposal, or request for adjustment in the Contract Sum, shall be accompanied by a complete itemization of the costs, including labor, material, subcontractor costs, and overhead and profit. The costs shall be itemized in the manner set forth below, and shall be submitted on breakdown sheets in a form approved by Owner.
- 2. <u>Use of industry standards in calculating costs:</u> All costs shall be calculated based upon appropriate industry standard methods of calculating labor, material quantities, and equipment costs.
- 3. <u>Costs contingent on Owner's actions:</u> If any of Contractor's pricing assumptions are contingent upon anticipated actions of Owner, Contractor shall clearly state them in the proposal or request for an equitable adjustment.
- 4. <u>Markups on additive and deductive Work:</u> The cost of any additive or deductive changes in the Work shall be calculated as set forth below, except that overhead and profit shall not be included on deductive changes in the Work. Where a change in the Work involves additive and deductive work by the same Contractor or Subcontractor, small tools, overhead, profit, bond and insurance markups will apply to the net difference.
- 5. <u>Breakdown not required if change less than \$1,000</u>: If the total cost of the change in the Work or request for equitable adjustment does not exceed \$1,000, Contractor shall not be required to submit a breakdown if the description of the change in the Work or request for equitable adjustment is sufficiently definitive for Owner to determine fair value.
- 6. <u>Breakdown required if change between \$1,000 and \$2,500</u>: If the total cost of the change in the Work or request for equitable adjustment is between \$1,000 and \$2,500, Contractor may submit a breakdown in the following level of detail if the description of the change in the Work or if the request for equitable adjustment is sufficiently definitive to permit the Owner to determine fair value:
  - a. lump sum labor;
  - b. lump sum material;
  - c. lump sum equipment usage;
  - d. overhead and profit as set forth below; and
  - e. insurance and bond costs as set forth below.
- 7. <u>Components of increased cost:</u> Any request for adjustment of Contract Sum based upon the fixed price method shall include only the following items:
  - a. <u>Craft labor costs:</u> These are the labor costs determined by multiplying the estimated or actual additional number of craft hours needed to perform the change in the Work by the hourly labor costs. Craft hours should cover direct labor, as well as indirect labor due to trade inefficiencies. The hourly costs shall be based on the following:
    - (1) <u>Basic wages and benefits:</u> Hourly rates and benefits as stated on the L&I approved "statement of intent to pay prevailing wages" or a higher amount if approved by the Owner. Direct supervision shall be a reasonable percentage not to exceed 15% of the cost of direct labor. No supervision markup shall be allowed for a working supervisor's hours.
    - (2) <u>Worker's insurance:</u> Direct contributions to the state of Washington for industrial insurance; medical aid; and supplemental pension, by the class and rates established by the L&I.

- (3) <u>Federal insurance:</u> Direct contributions required by the Federal Insurance Compensation Act; Federal Unemployment Tax Act; and the State Unemployment Compensation Act.
- (4) <u>Travel allowance:</u> Travel allowance and/or subsistence, if applicable, not exceeding those allowances established by regional labor union agreements, which are itemized and identified separately.
- (5) <u>Safety:</u> Cost incurred due to the Washington Industrial Safety and Health Act, which shall be a reasonable percentage not to exceed 2% of the sum of the amounts calculated in (1), (2), and (3) above.
- b. <u>Material costs:</u> This is an itemization of the quantity and cost of materials needed to perform the change in the Work. Material costs shall be developed first from actual known costs, second from supplier quotations or if these are not available, from standard industry pricing guides. Material costs shall consider all available discounts. Freight costs, express charges, or special delivery charges, shall be itemized.
- c. <u>Equipment costs:</u> This is an itemization of the type of equipment and the estimated or actual length of time the construction equipment appropriate for the Work is or will be used on the change in the Work. Costs will be allowed for construction equipment only if used solely for the changed Work, or for additional rental costs actually incurred by the Contractor. Equipment charges shall be computed on the basis of actual invoice costs or if owned, from the current edition of one of the following sources:
  - The National Electrical Contractors Association for equipment used on electrical work.
  - (2) The Mechanical Contractors Association of America for equipment used on mechanical work.
  - (3) The EquipmentWatch Fleet Manager Estimator Package (digital). The maximum rate for standby equipment shall not exceed that shown in the Associated General Contractors Washington State Department of Transportation (AGC WSDOT) Equipment Rental Agreement, current edition on the Contract execution date.
    - The EquipmentWatch Rental Rate Blue Book shall be used as a basis for establishing rental rates of equipment not listed in the above sources. The maximum rate for standby equipment shall not exceed that shown in the AGC WSDOT Equipment Rental Agreement, current edition on the Contract execution date.
- d. <u>Allowance for small tools, expendables & consumable supplies:</u> Small tools consist of tools which cost \$250 or less and are normally furnished by the performing contractor. The maximum rate for small tools shall not exceed the following:
  - (1) 3% for Contractor: For Contractor, 3% of direct labor costs.
  - (2) 5% for Subcontractors: For Subcontractors, 5% of direct labor costs.

Expendables and consumables supplies directly associated with the change in Work must be itemized.

e. <u>Subcontractor costs:</u> This is defined as payments Contractor makes to Subcontractors for changed Work performed by Subcontractors of any tier. The Subcontractors' cost of Work shall be calculated and itemized in the same manner as prescribed herein for Contractor.

- f. Allowance for overhead: This is defined as costs of any kind attributable to direct and indirect delay, acceleration, or impact, added to the total cost to Owner of any change in the Contract Sum. If the Contractor is compensated under Section 7.03D, the amount of such compensation shall be reduced by the amount Contractor is otherwise entitled to under this subsection (f). This allowance shall compensate Contractor for all noncraft labor, temporary construction facilities, field engineering, schedule updating, as-built drawings, home office cost, B&O taxes, office engineering, estimating costs, additional overhead because of extended time, and any other cost incidental to the change in the Work. It shall be strictly limited in all cases to a reasonable amount, mutually acceptable, or if none can be agreed upon to an amount not to exceed the rates below:
  - (1). <u>Projects less than \$3 million:</u> For projects where the Contract Award Amount is under \$3 million, the following shall apply:
    - (a) Contractor markup on Contractor Work: For Contractor, for any Work actually performed by Contractor's own forces, 16% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
    - (b) <u>Subcontractor markup for Subcontractor Work:</u> For each Subcontractor (<u>including</u> lower tier subcontractors), for any Work actually performed by its own forces, 16% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
    - (c) Contractor markup for Subcontractor Work: For Contractor, for any work performed by its Subcontractor(s) 6% of the first \$50,000 of the amount due each Subcontractor, and 4% of the remaining amount if any.
    - (d) Subcontractor markup for lower tier Subcontractor Work: For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 4% of the first \$50,000 of the amount due the sub-Subcontractor, and 2% of the remaining amount if any.
    - (e) <u>Basis of cost applicable for markup:</u> The cost to which overhead is to be applied shall be developed in accordance with Section 7.02B 7a. e.
  - (2). <u>Projects more than \$3 million:</u> For projects where the Contract Award Amount is equal to or exceeds \$3 million, the following shall apply:
    - (a) Contractor markup on Contractor Work: For Contractor, for any Work actually performed by Contractor's own forces, 12% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
    - (b) <u>Subcontractor markup for Subcontractor Work:</u> For each Subcontractor (including lower tier subcontractors), for any Work actually performed by its own forces, 12% of the first \$50,000 of the cost, and 4% of the remaining cost, if any.
    - (c) Contractor markup for Subcontractor Work: For Contractor, for any Work performed by its Subcontractor(s), 4% of the first \$50,000 of the amount due each Subcontractor, and 2% of the remaining amount if any.
    - (d) <u>Subcontractor markup for lower tier Subcontractor Work:</u> For each Subcontractor, for any Work performed by its Subcontractor(s) of any lower tier, 4% of the first \$50,000 of the amount due the sub-Subcontractor, and 2% of the remaining amount if any.

- (e) <u>Basis of cost applicable for markup:</u> The cost to which overhead is to be applied shall be developed in accordance with Section 7.02B 7a. e.
- g. <u>Allowance for profit</u>: Allowance for profit is an amount to be added to the cost of any change in contract sum, but not to the cost of change in Contract Time for which contractor has been compensated pursuant to the conditions set forth in Section 7.03. It shall be limited to a reasonable amount, mutually acceptable, or if none can be agreed upon, to an amount not to exceed the rates below:
  - (1) <u>Contractor / Subcontractor markup for self-performed Work:</u> For Contractor or Subcontractor of any tier for work performed by their forces, 6% of the cost developed in accordance with Section 7.02B 7a. e.
  - (2) <u>Contractor / Subcontractor markup for Work performed at lower tier:</u> For Contractor or Subcontractor of any tier for work performed by a subcontractor of a lower tier, 4% of the subcontract cost developed in accordance with Section 7.02B 7a. h.
- h. <u>Insurance and bond premiums:</u> Cost of change in insurance or bond premium: This is defined as:
  - (1) <u>Contractor's liability insurance:</u> The cost of any changes in Contractor's liability insurance arising directly from execution of the Change Order; and
  - (2) <u>Payment and Performance Bond:</u> The cost of the additional premium for Contractor's bond arising directly from the changed Work.

The cost of any change in insurance or bond premium shall be added after overhead and allowance for profit are calculated in accordance with subparagraph f. and g above.

#### C. Change Order Pricing – Unit Prices

- 1. <u>Content of Owner authorization:</u> Whenever Owner authorizes Contractor to perform Work on a unit-price basis, Owner's authorization shall clearly state:
  - a. Scope: Scope of work to be performed;
  - b. <u>Reimbursement basis:</u> Type of reimbursement including pre-agreed rates for material quantities; and
  - c. Reimbursement limit: Cost limit of reimbursement.
- 2. <u>Contractor responsibilities:</u> Contractor shall:
  - a. Cooperate with Owner and assist in monitoring the Work being performed. As requested by Owner, Contractor shall identify workers assigned to the Change Order Work and areas in which they are working;
  - b. Leave access as appropriate for quantity measurement; and
  - c. Not exceed any cost limit(s) without Owner's prior written approval.
- 3. <u>Cost breakdown consistent with Fixed Price requirements:</u> Contractor shall submit costs in accordance with paragraph 7.02B and satisfy the following requirements:

- a. <u>Unit prices must include overhead, profit, bond and insurance premiums:</u> Unit prices shall include reimbursement for all direct and indirect costs of the Work, including overhead, profit, bond, and insurance costs; and
- b. <u>Owner verification of quantities:</u> Quantities must be supported by field measurement statements signed by Owner.

#### D. Change Order Pricing – Time-and-Material Prices

- 1. <u>Content of Owner authorization:</u> Whenever Owner authorizes Contractor to perform Work on a time-and-material basis, Owner's authorization shall clearly state:
  - a. Scope: Scope of Work to be performed;
  - b. <u>Reimbursement basis:</u> Type of reimbursement including pre-agreed rates, if any, for material quantities or labor; and
  - c. Reimbursement limit: Cost limit of reimbursement.
- 2. <u>Contractor responsibilities:</u> Contractor shall:
  - a. <u>Identify workers assigned:</u> Cooperate with Owner and assist in monitoring the Work being performed. As requested by Owner, identify workers assigned to the Change Order Work and areas in which they are working;
  - b. <u>Provide daily timesheets:</u> Identify on daily time sheets all labor performed in accordance with this authorization. Submit copies of daily time sheets within 2 working days for Owner's review.
  - c. <u>Allow Owner to measure quantities:</u> Leave access as appropriate for quantity measurement:
  - d. <u>Perform Work efficiently:</u> Perform all Work in accordance with this section as efficiently as possible; and
  - e. <u>Not exceed Owner's cost limit:</u> Not exceed any cost limit(s) without Owner's prior written approval.
- 3. <u>Cost breakdown consistent with Fixed Price requirements:</u> Contractor shall submit costs in accordance with paragraph 7.02B and additional verification supported by:
  - a. Timesheets: Labor detailed on daily time sheets; and
  - b. <u>Invoices:</u> Invoices for material.

#### 7.03 CHANGE IN THE CONTRACT TIME

- A. <u>COP requests for Contract Time:</u> The Contract Time shall only be changed by a Change Order. Contractor shall include any request for a change in the Contract Time in its Change Order Proposal.
- B. <u>Time extension permitted if not Contractor's fault:</u> If the time of Contractor's performance is changed due to an act of Force Majeure, or due to the fault or negligence of Owner or anyone for whose acts Owner is responsible, Contractor shall be entitled to make a request for an equitable adjustment in the Contract Time in accordance with the following procedure. No adjustment in the Contract Time shall be allowed to the extent Contractor's changed time of

performance is due to the fault or negligence of Contractor, or anyone for whose acts Contractor is responsible.

- Notice and record keeping for Contract Time request: A request for an equitable adjustment
  in the Contract Time shall be based on written notice delivered within 7 Days of the
  occurrence of the event giving rise to the request. If Contractor believes it is entitled to
  adjustment of Contract Time, Contractor shall immediately notify Owner and begin to keep
  and maintain complete, accurate, and specific daily records. Contractor shall give Owner
  access to any such record and if requested, shall promptly furnish copies of such record to
  Owner.
- 2. Timing and content of Contractor's Notice: Contractor shall not be entitled to an adjustment in the Contract Time for any events that occurred more than 7 Days before Contractor's written notice to Owner. The written notice shall set forth, at a minimum, a description of: the event giving rise to the request for an equitable adjustment in the Contract Time; the nature of the impacts to Contractor and its Subcontractors of any tier, if any; and to the extent possible the amount of the adjustment in Contract Time requested. Failure to properly give such written notice shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
- 3. Contractor to provide supplemental information: Within 30 Days of the occurrence of the event giving rise to the request, unless Owner agrees in writing to allow an additional period of time to ascertain more accurate data, Contractor shall supplement the written notice provided in accordance with subparagraph 7.03B.2 with additional supporting data. Such additional data shall include, at a minimum: the amount of delay claimed, itemized in accordance with the procedure set forth herein; specific facts, circumstances, and analysis that confirms not only that Contractor suffered the delay claimed, but that the delay claimed was actually a result of the act, event, or condition complained of, and that the Contract Documents provide entitlement to an equitable adjustment in Contract Time for such act, event, or condition; and supporting documentation sufficiently detailed to permit an informed analysis of the request by Owner. Failure to provide such additional information and documentation within the time allowed or within the format required shall, to the extent Owner's interests are prejudiced, constitute a waiver of Contractor's right to an equitable adjustment.
- 4. <u>Contractor to proceed with Work as directed:</u> Pending final resolution of any request in accordance with this paragraph, unless otherwise agreed in writing, Contractor shall proceed diligently with performance of the Work.
- C. Contractor to demonstrate impact on critical path of schedule: Any change in the Contract Time covered by a Change Order, or based on a request for an equitable adjustment in the Contract Time, shall be limited to the change in the critical path of Contractor's schedule attributable to the change of Work or event(s) giving rise to the request for equitable adjustment. Any Change Order Proposal or request for an adjustment in the Contract Time shall demonstrate the impact on the critical path of the schedule. Contractor shall be responsible for showing clearly on the Progress Schedule that the change or event: had a specific impact on the critical path, and except in case of concurrent delay, was the sole cause of such impact; and could not have been avoided by resequencing of the Work or other reasonable alternatives.
- D. <u>Cost of change in Contract Time:</u> Contractor may request compensation for the cost of a change in Contract Time in accordance with this paragraph, 7.03D, subject to the following conditions:
  - 1. <u>Must be solely fault of Owner or A/E:</u> The change in Contract Time shall solely be caused by the fault or negligence of Owner or A/E;
  - 2. Procedures: Contractor shall follow the procedure set forth in paragraph 7.03B;

- 3. <u>Demonstrate impact on critical path:</u> Contractor shall establish the extent of the change in Contract Time in accordance with paragraph 7.03C; and
- 4. <u>Limitations on daily costs</u>: The daily cost of any change in Contract Time shall be limited to the items below, less the amount of any change in the Contract Sum the Contractor may otherwise be entitled to pursuant to Section 7.02B 7f for any change in the Work that contributed to this change in Contract Time:
  - a. <u>Non-productive supervision or labor:</u> cost of nonproductive field supervision or labor extended because of delay;
  - b. <u>Weekly meetings and indirect activities:</u> cost of weekly meetings or similar indirect activities extended because of the delay;
  - c. <u>Temporary facilities or equipment rental:</u> cost of temporary facilities or equipment <u>rental</u> extended because of the delay;
  - d. Insurance premiums: cost of insurance extended because of the delay;
  - e. <u>Overhead:</u> general and administrative overhead in an amount to be agreed upon, but not to exceed 3% of the Contract Award Amount divided by the originally specified Contract Time for each Day of the delay.

# PART 8 - CLAIMS AND DISPUTE RESOLUTION

#### 8.01 CLAIMS PROCEDURE

- A. <u>Claim is Contractor's remedy:</u> If the parties fail to reach agreement on the terms of any Change Order for Owner-directed Work as provided in Section 7.01, or on the resolution of any request for an equitable adjustment in the Contract Sum as provided in Section 7.02 or the Contract Time as provided in Section 7.03, Contractor's only remedy shall be to file a Claim with Owner as provided in this section.
- B. <u>Claim filing deadline for Contractor:</u> Contractor shall file its Claim within 120 Days from Owner's final offer made in accordance with paragraph 7.01E, or by the date of Final Acceptance, whichever occurs first.
- C. <u>Claim must cover all costs and be documented:</u> The Claim shall be deemed to cover all changes in cost and time (including direct, indirect, impact, and consequential) to which Contractor may be entitled. It shall be fully substantiated and documented. At a minimum, the Claim shall contain the following information:
  - 1. <u>Factual statement of Claim:</u> A detailed factual statement of the Claim for additional compensation and time, if any, providing all necessary dates, locations, and items of Work affected by the Claim;
  - 2. Dates: The date on which facts arose which gave rise to the Claim;
  - 3. Owner and A/E employee's knowledgeable about Claim: The name of each employee of Owner or A/E knowledgeable about the Claim;
  - 4. <u>Support from Contract Documents:</u> The specific provisions of the Contract Documents which support the Claim;

- 5. <u>Identification of other supporting information:</u> The identification of any documents and the substance of any oral communications that support the Claim;
- 6. <u>Copies of supporting documentation:</u> Copies of any identified documents, other than the Contract Documents, that support the Claim;
- 7. <u>Details on Claim for Contract Time:</u> If an adjustment in the Contract Time is sought: the specific days and dates for which it is sought; the specific reasons Contractor believes an extension in the Contract Time should be granted; and Contractor's analysis of its Progress Schedule to demonstrate the reason for the extension in Contract Time:
- 8. <u>Details on Claim for adjustment of Contract Sum:</u> If an adjustment in the Contract Sum is sought, the exact amount sought and a breakdown of that amount into the categories set forth in, and in the detail as required by Section 7.02; and
- 9. <u>Statement certifying Claim:</u> A statement certifying, under penalty of perjury, that the Claim is made in good faith, that the supporting cost and pricing data are true and accurate to the best of Contractor's knowledge and belief, that the Claim is fully supported by the accompanying data, and that the amount requested accurately reflects the adjustment in the Contract Sum or Contract Time for which Contractor believes Owner is liable.
- D. Owner's response to Claim filed: After Contractor has submitted a fully documented Claim that complies with all applicable provisions of Parts 7 and 8, Owner shall respond, in writing, to Contractor as follows:
  - 1. Response time for Claim less than \$50,000: If the Claim amount is less than \$50,000, with a decision within 60 Days from the date the Claim is received; or
  - 2. Response time for Claim of \$50,000 or more: If the Claim amount is \$50,000 or more, with a decision within 60 Days from the date the Claim is received, or with notice to Contractor of the date by which it will render its decision. Owner will then respond with a written decision in such additional time.
- E. Owner's review of Claim and finality of decision: To assist in the review of Contractor's Claim, Owner may visit the Project site, or request additional information, in order to fully evaluate the issues raised by the Claim. Contractor shall proceed with performance of the Work pending final resolution of any Claim. Owner's written decision as set forth above shall be final and conclusive as to all matters set forth in the Claim, unless Contractor follows the procedure set forth in Section 8.02.
- F. <u>Waiver of Contractor rights for failure to comply with this Section:</u> Any Claim of the Contractor against the Owner for damages, additional compensation, or additional time, shall be conclusively deemed to have been waived by the Contractor unless made in accordance with the requirements of this Section.

# 8.02 ARBITRATION

- A. <u>Timing of Contractor's demand for arbitration:</u> If Contractor disagrees with Owner's decision rendered in accordance with paragraph 8.01D, Contractor shall provide Owner with a written demand for arbitration. No demand for arbitration of any such Claim shall be made later than 30 Days after the date of Owner's decision on such Claim; failure to demand arbitration within said 30 Day period shall result in Owner's decision being final and binding upon Contractor and its Subcontractors.
- B. <u>Filing of Notice for arbitration:</u> Notice of the demand for arbitration shall be filed with the American Arbitration Association (AAA), with a copy provided to Owner. The parties shall negotiate or

mediate under the Voluntary Construction Mediation Rules of the AAA, or mutually acceptable service, before seeking arbitration in accordance with the Construction Industry Arbitration Rules of AAA as follows:

- 1. <u>Claims less than \$30,000:</u> Disputes involving \$30,000 or less shall be conducted in accordance with the Northwest Region Expedited Commercial Arbitration Rules; or
- 2. <u>Claims greater than \$30,000</u>: Disputes over \$30,000 shall be conducted in accordance with the Construction Industry Arbitration Rules of the AAA, unless the parties agree to use the expedited rules.
- C. <u>Arbitration is forum for resolving Claims:</u> All Claims arising out of the Work shall be resolved by arbitration. The judgment upon the arbitration award may be entered, or review of the award may occur, in the superior court having jurisdiction thereof. No independent legal action relating to or arising from the Work shall be maintained.
- D. Owner may combine Claims into same arbitration: Claims between Owner and Contractor, Contractor and its Subcontractors, Contractor and A/E, and Owner and A/E shall, upon demand by Owner, be submitted in the same arbitration or mediation.
- E. <u>Settlement outside of arbitration to be documented in Change Order:</u> If the parties resolve the Claim prior to arbitration judgment, the terms of the resolution shall be incorporated in a Change Order. The Change Order shall constitute full payment and final settlement of the Claim, including all claims for time and for direct, indirect, or consequential costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity.

# 8.03 CLAIMS AUDITS

- A. Owner may audit Claims: All Claims filed against Owner shall be subject to audit at any time following the filing of the Claim. Failure of Contractor, or Subcontractors of any tier, to maintain and retain sufficient records to allow Owner to verify all or a portion of the Claim or to permit Owner access to the books and records of Contractor, or Subcontractors of any tier, shall constitute a waiver of the Claim and shall bar any recovery.
- B. <u>Contractor to make documents available:</u> In support of Owner audit of any Claim, Contractor shall, upon request, promptly make available to Owner the following documents:
  - 1. Daily time sheets and supervisor's daily reports;
  - 2. Collective bargaining agreements;
  - 3. Insurance, welfare, and benefits records;
  - 4. Payroll registers;
  - 5. Earnings records;
  - 6. Payroll tax forms;
  - 7. Material invoices, requisitions, and delivery confirmations;
  - 8. Material cost distribution worksheet;
  - 9. Equipment records (list of company equipment, rates, etc.);
  - 10. Vendors', rental agencies', Subcontractors', and agents' invoices;

- 11. Contracts between Contractor and each of its Subcontractors, and all lower-tier Subcontractor contracts and supplier contracts;
- 12. Subcontractors' and agents' payment certificates;
- 13. Cancelled checks (payroll and vendors);
- 14. Job cost report, including monthly totals;
- 15. Job payroll ledger;
- 16. Planned resource loading schedules and summaries;
- 17. General ledger;
- 18. Cash disbursements journal;
- 19. Financial statements for all years reflecting the operations on the Work. In addition, the Owner may require, if it deems it appropriate, additional financial statements for 3 years preceding execution of the Work;
- 20. Depreciation records on all company equipment whether these records are maintained by the company involved, its accountant, or others;
- 21. If a source other than depreciation records is used to develop costs for Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all such other source documents;
- 22. All nonprivileged documents which relate to each and every Claim together with all documents which support the amount of any adjustment in Contract Sum or Contract Time sought by each Claim;
- 23. Work sheets or software used to prepare the Claim establishing the cost components for items of the Claim including but not limited to labor, benefits and insurance, materials, equipment, Subcontractors, all documents which establish the time periods, individuals involved, the hours for the individuals, and the rates for the individuals; and
- 24. Work sheets, software, and all other documents used by Contractor to prepare its bid.
- C. Contractor to provide facilities for audit and shall cooperate: The audit may be performed by employees of Owner or a representative of Owner. Contractor, and its Subcontractors, shall provide adequate facilities acceptable to Owner, for the audit during normal business hours. Contractor, and all Subcontractors, shall make a good faith effort to cooperate with Owner's auditors.

#### PART 9 - TERMINATION OF THE WORK

#### 9.01 TERMINATION BY OWNER FOR CAUSE

A. <u>7 Day Notice to Terminate for Cause:</u> Owner may, upon 7 Days written notice to Contractor and to its surety, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for cause upon the occurrence of any one or more of the following events:

- 1. <u>Contractor fails to prosecute Work:</u> Contractor fails to prosecute the Work or any portion thereof with sufficient diligence to ensure Substantial Completion of the Work within the Contract Time;
- 2. <u>Contractor bankrupt:</u> Contractor is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency;
- 3. <u>Contractor fails to correct Work:</u> Contractor fails in a material way to replace or correct Work not in conformance with the Contract Documents;
- 4. <u>Contractor fails to supply workers or materials:</u> Contractor repeatedly fails to supply skilled workers or proper materials or equipment;
- 5. <u>Contractor failure to pay Subcontractors or labor:</u> Contractor repeatedly fails to make prompt payment due to Subcontractors or for labor;
- 6. <u>Contractor violates laws:</u> Contractor materially disregards or fails to comply with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction; or
- 7. <u>Contractor in material breach of Contract:</u> Contractor is otherwise in material breach of any provision of the Contract Documents.
- B. Owner's actions upon termination: Upon termination, Owner may at its option:
  - 1. <u>Take possession of Project site:</u> Take possession of the Project site and take possession of or use all materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor to maintain the orderly progress of, and to finish, the Work;
  - 2. <u>Accept assignment of Subcontracts:</u> Accept assignment of subcontracts pursuant to Section 5.20; and
  - 3. Finish the Work: Finish the Work by whatever other reasonable method it deems expedient.
- C. <u>Surety's role:</u> Owner's rights and duties upon termination are subject to the prior rights and duties of the surety, if any, obligated under any bond provided in accordance with the Contract Documents.
- D. <u>Contractor's required actions:</u> When Owner terminates the Work in accordance with this section, Contractor shall take the actions set forth in paragraph 9.02B, and shall not be entitled to receive further payment until the Work is accepted.
- E. Contractor to pay for unfinished Work: If the unpaid balance of the Contract Sum exceeds the cost of finishing the Work, including compensation for A/E's services and expenses made necessary thereby and any other extra costs or damages incurred by Owner in completing the Work, or as a result of Contractor's actions, such excess shall be paid to Contractor. If such costs exceed the unpaid balance, Contractor shall pay the difference to Owner. These obligations for payment shall survive termination.
- F. <u>Contractor and Surety still responsible for Work performed:</u> Termination of the Work in accordance with this section shall not relieve Contractor or its surety of any responsibilities for Work performed.
- G. <u>Conversion of "Termination for Cause" to "Termination for Convenience":</u> If Owner terminates Contractor for cause and it is later determined that none of the circumstances set forth in paragraph 9.01A exist, then such termination shall be deemed a termination for convenience pursuant to Section 9.02.

## 9.02 TERMINATION BY OWNER FOR CONVENIENCE

- A. Owner Notice of Termination for Convenience: Owner may, upon written notice, terminate (without prejudice to any right or remedy of Owner) the Work, or any part of it, for the convenience of Owner.
- B. <u>Contractor response to termination Notice:</u> Unless Owner directs otherwise, after receipt of a written notice of termination for either cause or convenience, Contractor shall promptly:
  - 1. Cease Work: Stop performing Work on the date and as specified in the notice of termination;
  - 2. <u>No further orders or Subcontracts:</u> Place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of such portion of the Work as is not terminated:
  - 3. <u>Cancel orders and Subcontracts:</u> Cancel all orders and subcontracts, upon terms acceptable to Owner, to the extent that they relate to the performance of Work terminated;
  - 4. <u>Assign orders and Subcontracts to Owner:</u> Assign to Owner all of the right, title, and interest of Contractor in all orders and subcontracts;
  - 5. <u>Take action to protect the Work:</u> Take such action as may be necessary or as directed by Owner to preserve and protect the Work, Project site, and any other property related to this Project in the possession of Contractor in which Owner has an interest; and
  - 6. <u>Continue performance not terminated:</u> Continue performance only to the extent not terminated
- C. <u>Terms of adjustment in Contract Sum if Contract terminated:</u> If Owner terminates the Work or any portion thereof for convenience, Contractor shall be entitled to make a request for an equitable adjustment for its reasonable direct costs incurred prior to the effective date of the termination, plus reasonable allowance for overhead and profit on Work performed prior to termination, plus the reasonable administrative costs of the termination, but shall not be entitled to any other costs or damages, whatsoever, provided however, the total sum payable upon termination shall not exceed the Contract Sum reduced by prior payments. Contractor shall be required to make its request in accordance with the provisions of Part 7.
- D. Owner to determine whether to adjust Contract Time: If Owner terminates the Work or any portion thereof for convenience, the Contract Time shall be adjusted as determined by Owner.

## PART 10 - MISCELLANEOUS PROVISIONS

### 10.01 GOVERNING LAW

<u>Applicable law and venue:</u> The Contract Documents and the rights of the parties herein shall be governed by the laws of the state of Washington. Venue shall be in the county in which Owner's principal place of business is located, unless otherwise specified.

### 10.02 SUCCESSORS AND ASSIGNS

<u>Bound to successors</u>; <u>Assignment of Contract</u>: Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party shall assign the Work without written consent of the other, except that Contractor may assign the Work for security

purposes, to a bank or lending institution authorized to do business in the state of Washington. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations set forth in the Contract Documents.

## 10.03 MEANING OF WORDS

Meaning of words used in Specifications: Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the code of any governmental authority, whether such reference be specific or by implication, shall be to the latest standard specification, manual, or code in effect on the date for submission of bids, except as may be otherwise specifically stated. Wherever in these Drawings and Specifications an article, device, or piece of equipment is referred to in the singular manner, such reference shall apply to as many such articles as are shown on the drawings, or required to complete the installation.

## 10.04 RIGHTS AND REMEDIES

No waiver of rights: No action or failure to act by Owner or A/E shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall action or failure to act constitute approval or an acquiescence in a breach therein, except as may be specifically agreed in writing.

## 10.05 CONTRACTOR REGISTRATION

<u>Contractor must be registered or licensed:</u> Pursuant to RCW 39.06, Contractor shall be registered or licensed as required by the laws of the State of Washington, including but not limited to RCW 18.27.

# 10.06 TIME COMPUTATIONS

<u>Computing time:</u> When computing any period of time, the day of the event from which the period of time begins shall not be counted. The last day is counted unless it falls on a weekend or legal holiday, in which event the period runs until the end of the next day that is not a weekend or holiday. When the period of time allowed is less than 7 days, intermediate Saturdays, Sundays, and legal holidays are excluded from the computation.

### 10.07 RECORDS RETENTION

<u>Six year records retention period:</u> The wage, payroll, and cost records of Contractor, and its Subcontractors, and all records subject to audit in accordance with Section 8.03, shall be retained for a period of not less than 6 years after the date of Final Acceptance.

### 10.08 THIRD-PARTY AGREEMENTS

<u>No third party relationships created:</u> The Contract Documents shall not be construed to create a contractual relationship of any kind between: A/E and Contractor; Owner and any Subcontractor; or any persons other than Owner and Contractor.

## **10.09 ANTITRUST ASSIGNMENT**

Contractor assigns overcharge amounts to Owner: Owner and Contractor recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by the purchaser. Therefore, Contractor hereby assigns to Owner any and all claims for such overcharges as to goods, materials, and equipment purchased in connection with the Work performed in accordance with the Contract Documents, except as to overcharges which result from antitrust violations commencing after the Contract Sum is established and which are not passed on to Owner

under a Change Order. Contractor shall put a similar clause in its Subcontracts, and require a similar clause in its sub-Subcontracts, such that all claims for such overcharges on the Work are passed to Owner by Contractor.

## 10.10 HEADINGS AND CAPTIONS

<u>Headings for convenience only:</u> All headings and captions used in these General Conditions are only for convenience of reference, and shall not be used in any way in connection with the meaning, effect, interpretation, construction, or enforcement of the General Conditions, and do not define the limit or describe the scope or intent of any provision of these General Conditions.

### 10.11 DIVERSE BUSINESS PARTICIAPTION

The state of Washington encourages participation in all of its contracts by Diverse Businesses as found in RCW Chapters 39, 43, and WAC 326. The voluntary Diverse Business goal of 26%, which is an aggregate of: 10% Minority Business Enterprises (MBE), 6% Women Business Enterprises (WBE), 5% Veteran-owned Business, and 5% Washington Small Businesses self-identified in the Washington Electronic Business Solution (WEBS). Contractors are encouraged to meet or exceed the project goals in the advertisement by any level of participation, regardless of category.

DES reserves the right to adjust the voluntary participation goals.

Businesses are encouraged to register in WEBS, as well as registering as a state certified M/WBE/Veteran Business.

For reporting, Contractor is required to register and create an account in the DES Public Works Diversity Tracking & Management System powered by B2GNow.

Every month for the duration of your contract, and while your contract is active in the DES Public Works Diversity Tracking & Management System, submit and accurately maintain the following information:

- 1. Payments received by the prime contractor from the Agency
- 2. Payments paid to each first tier subcontractor
- 3. Payments paid to each first tier supplier

You must also ensure the following information is reported in the DES Public Works Diversity Tracking & Management System by your first tier subcontractors and suppliers for the duration of your contract:

- 1. Confirmation of payments from the prime contractor to the first tier subcontractor
- 2. Confirmation of payments from the prime contractor to first tier suppliers

## 10.12 MINIMUM LEVELS OF APPRENTICESHIP PARTICIPATION

In accordance with RCW 39.04.320, the State of Washington requires 15% apprenticeship participation for projects estimated to cost one million dollars or more. Contractors who meet or exceed minimum participation requirement are eligible for monetary incentive. Contractors failing to meet minimum apprenticeship participation requirement are subject to monetary penalty.

- A. Apprentice participation, under this contract, may be counted towards the required percentage (%) only if the apprentices are from an apprenticeship program registered and approved by the Washington State Apprenticeship and Training Council (RCW 49.04 and WAC 296-05).
- B. Bidders may contact the L&I to obtain more information about apprenticeship programs.

- C. No changes to the required percentage (%) of apprentice participation shall be allowed without written approval of the Owner. In any request for the change, the Contractor shall clearly demonstrate a good faith effort to comply with the requirements for apprentice participation.
- D. Any substantive violation of the mandatory requirements of this part of the contract may be a material breach of the contract by the Contractor. The Owner may withhold payment pursuant to Part 6.05, stop the work for cause pursuant to Part 3.04, and terminate the contract for cause pursuant to Part 9.01.

## 10.13 SPECIAL CONDITIONS

The Owner may have Federal Funding or other special requirements for this project. If applicable, the Contractor will be required to comply with the "DIVISION 00 SPECIAL CONDITIONS" section in the specifications that will be based on the specific requirements of the funding source.

### **SECTION 01 11 00**

# **SUMMARY OF WORK**

### **PART 1 - GENERAL**

## 1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Modifications to the General Conditions and Divisions 00 and 01 Specification Sections, apply to work of this section.

### 1.02 SECTION INCLUDES

- A. Summary of Work, including:
  - 1. Project Description
  - 2. Contract Method
  - Permit Conditions
  - 4. Objection to Application of Products
  - 5. Existing Information
  - 6. Completion Time
  - 7. Contractor's Use of Building and Site
  - 8. Construction Documents

### 1.03 PROJECT DESCRIPTION

- A. The work of the project is defined by the Contract Documents and generally consists of the following:
  - 1. Tacoma Public Library Main Branch Renovation INTERIOR RENOVATION OF EXISTING MAIN BUILDING (1953) TO CONSOLIDATE LIBRARY SERVICES TO LEVEL 1 AND PROVIDE NEW TENANT SPACES ON LEVEL 2.

SCOPE INCLUDES NEW TOILET ROOMS, OFFICES, MEETING ROOMS, AND BREAK AREAS; NEW LED LIGHTING AND CONTROLS, NEW ELECTRICAL AND DATA LOCATIONS; MODIFICATIONS TO EXISTING HVAC WITH ONE NEW ROOF TOP UNIT; AND MODIFICATIONS TO BUILDING EXTERIOR AT SELECT LOCATIONS AS DESCRIBED PER PLANS. MODIFICATIONS TO EXISTING CEILING FINISHES AND NEW CARPET AND PAINT THROUGHOUT.

LIMITED SCOPE OF INTERIOR RENOVATIONS TO CARNEGIE BUILDING LEVEL 1 AND LEVEL 2 INCLUDING FINISH UPGRADES AND BATHROOM RENOVATIONS.

- B. Provide materials, labor, equipment, temporary facilities and construction expertise as required to complete the Project as shown in the Contract Documents.
- C. Contractor represents that he has carefully examined prior to bidding, Contract Documents and site conditions, and understands the character, quality and quantity of work called for and conditions affecting the Contract Work.

## 1.04 CONTRACT METHOD

- A. Construct the Work under a guaranteed single fixed-price Contract.
- B. The General Contractor is responsible for coordinating, understanding and directing the work of trades involved in the project.
- C. General Contractor is responsible for coordinating and scheduling work of each subcontractor to expedite progress of the Project. Cooperate and coordinate with any other separate Contractors under Contract with the Owner.

## 1.05 PERMIT CONDITIONS

- A. Conform to permit conditions and requirements imposed by authority(s) having jurisdiction.
- B. The Owner has obtained building permits from the City of Tacoma for the following scopes: Architectural, Structural, Mechanical, and Plumbing. Electrical permit will be obtained by electrical engineer of record through Tacoma Power prior to start of construction.

- C. General Contractor is responsible to acquire and pay for all other permits and fees required by all other agencies having jurisdiction. These will include: design and permitting of modifications to fire alarm system, deferred submittals as described in the contract documents, and may include dumpster or right of way permits needed during construction.
- D. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction. Contractor is responsible for coordinating and paying for the cost of any special permit requirements for staging and delivery of materials within the right-of-way.

## 1.06 OBJECTIONS TO APPLICATION OF PRODUCTS

A. Subcontractors and suppliers submitting a bid for this Project shall thoroughly familiarize themselves with specified products and installation procedures and submit any questions or substitutions (in writing) by deadline specified in the advertisement for bid. Submittal of Bid constitutes acceptance of products and procedures specified.

## 1.07 EXISTING INFORMATION

A. Subcontractors and suppliers are encouraged to familiarize themselves with existing site conditions prior to bidding. Submit any questions or substitutions (in writing). Submittal of Bid constitutes acceptance of products and procedures specified.

### 1.08 COMPLETION TIME

- A. Time is of the essence, the Owner needs this project completed within the times listed. Provide the necessary management, equipment and manpower, including any overtime, double-shifting or special work schedules, required to achieve completion of the Project within the times listed in the following Completion Schedule.
- B. Substantial Completion for this project will be considered to have been achieved when all of the Work shown on the drawings has been satisfactorily completed in accordance the Contract Documents and an Occupancy Permit (or Temporary Occupancy Permit) has been issued by the City. Minor punch list items may be completed after Substantial Completion date within the time frame listed in the Completion Schedule. The Contractor shall provide written notice, three (3) days prior to anticipated substantial completion date.

# C. <u>Anticipated Construction Completion Schedule:</u>

- 1. Substantially complete all the work within 150 Calendar Days (estimated 5 months) after the Notice to Proceed.
- 2. Anticipated Notice to Proceed: Mid October 2023
- 3. <u>Anticipated Substantial Completion Date</u>: Late February 2023

Tacoma Public Library – Main Branch Renovation SECTION 01 11 00 SUMMARY OF WORK

D. Early completion of the Work is allowed provided that the Owner shall not be obligated for any costs associated with delays to the Contractor's accelerated schedule which are within the stipulated contract completion schedule above.

## 1.09 CONTRACTOR'S USE OF BUILDING AND SITE

- A. The Contractor has direct responsibility for and control of the Contractor occupied construction areas for the duration of the Project, subject to this Section.
- B. Contractor's Use of Site: Limit use of the site for work, storage and access only as required to achieve work of this contract. Contractor shall maintain a clean and secure site.
  - 1. No parking exists on-site. Owner will <u>not</u> obtain parking stalls for the Contractor's use to park equipment and store materials.
  - 2. Owner will <u>not</u> obtain parking stalls for the Contractor's or subcontractor's vehicles.
- C. Contractor's Materials / Equipment: Limit storage of materials and equipment to within Contractor occupied construction areas on levels 1 and 2 of the main building.
- D. Construction Facilities and Temporary Controls: Refer to Section 01 50 00.
- E. Emergency Vehicle Access: Maintain access roadway and fire lanes on site for use by emergency vehicles. Coordinate requirements with local authority having jurisdiction.
- F. Access Routes to Construction Areas: Contractor is to access the site from the main library doors off South Tacoma Ave, the existing entry at the northwest corner of the 2<sup>nd</sup> floor, and any/all new entries from Court F that are completed as part of this project. Access to the Carnegie building is to be through the Main Building only. Contractor shall maintain site access routes in a clean and safe manner free of construction materials, debris and dirt. Maintain access to existing walkways, sideways, parking spots, entrances, and other adjacent occupied or used facilities. Do not close or obstruct walkways, sidewalks, parking spots, entrances, or other occupied or used facilities without written approval of authorities having jurisdiction.
- G. Public Safety: Contractor is responsible for performing a safety analysis for the construction work on the project site and shall:
  - 1. Implement and enforce conclusions from safety analysis for duration of project.
  - 2. Maintain site and building in a manner that prevents any unsafe or potentially unsafe condition.

- H. Construction Areas: Monitor to prevent unauthorized persons from entering during construction work. After work hours remove ladders and tools.
  - 1. Contractor shall assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.
- Owner Occupancy During Construction: Owner will occupy the basement level and third floor of the main building as well of both floors of the Carnegie building during entire construction period. Owner will vacate floors 1 and 2 of the main building prior to start of construction until the contractor obtains TCO. Owner will vacate portions of occupied areas of the building as needed for Contractor to complete work.
  - Contractor to provide temporary barriers to separate areas of work for security and safety and prevent odors and dust from entering occupied spaces. Note an IAQ plan for construction must be submitted prior to the start of work.
  - 2. Coordinate with Owner during construction operations to minimize conflicts and facilitate Owner usage.
  - 3. Perform the Work so as not to interfere with Owner's day-to-day operations.
  - 4. Maintain existing exits from owner occupied spaces at all times.
  - 5. The existing loading dock at Alley F will continue to be used by library staff through the duration of the project and is not to be used for contractor deliveries or staging during business hours. Contractor may propose use of loading dock for large deliveries during non-business hours at the discretion of the owner.
- J. Noise: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruptions with the Owner. Contractor work hours and noise levels shall comply with Tacoma Municipal Code, Chapter 8.122 Noise Enforcement.
  - Construction and demolition activity which exceeds the noise limits of Tacoma Municipal Code Section 8.122.060(a) is <u>not</u> allowed between 9pm and 7am on weekdays.
  - 2. Construction and demolition activity which exceeds the noise limits of Tacoma Municipal Code Section 8.122.060(a) is <u>not</u> allowed between 9pm and 9am on weekends and federal holidays.
- K. Contractor shall provide a site-specific safety plan.

### 1.10 CONSTRUCTION DOCUMENTS

A. Contractor is responsible for posting any addendums in the Contract Drawings and Project Manual.

- B. The General Contractor is responsible for costs to reproduce the Construction Documents.
- C. The General Contractor is required to keep an up-to-date set of Contract Drawings, Project Manual, and submittal log on-site at all times. This should incorporate all addenda and RFI responses provided by the architect over the course of construction.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

### PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Delegated design components and systems.
- B. Deferred submittal procedures

# 1.2 RELATED REQUIREMENTS

A. Drawing coversheet; list of Deferred Submittals.

### 1.3 DEFINITIONS

- A. Applicant: Contractor applying for submittal approval by Architect, approved permit for Deferred Submittals, and coordinating Contractor Engineered Components with Project and with each other. Includes coordination of required submittals with Architect and the Authority Having Jurisdiction.
- B. Architect: Architect registered in the State in which the Project is located and engaged by Owner to provide contract documents including drawings, computations and specifications required for building permit approval by Authority Having Jurisdiction for principal project systems. Includes Architect's staff, consultants and consultant's staffs.
- C. Contractor: Firm engaged by Owner to construct Project. Includes employees, subcontractors, suppliers and their employees.
- D. Contractor Design Engineer: Professional Engineer with 5 years documented experience in design of this work and licensed in the location of the Project and engaged by Contractor, subcontractor or supplier to provide drawings, computations and specifications required by Building Official for designated Contractor Engineered specialty system, in accordance with criteria set forth in Contract Documents.
- E. Contractor Engineered Components are defined as complete systems provided for intended use.
- F. Seal: Certification that drawings, computations and specifications were designed and prepared under direct supervision of Architect or Engineer whose name appears thereon.
- G. Review Stamp: Certification that Architect has reviewed drawings, computations and specifications bearing seal of Contractor Design Engineer, verifying conformance with information given and design concept set forth in Drawings and Specifications.
- H. Approval Stamp: Certification that Building Official has reviewed submittal and finds it acceptable with respect to applicable code compliance.

### 1.4 SUBMITTALS

A. Show complete criteria, design assumptions, details, calculations, instructions for fabrications, assembly, installation and interface with other trades.

- B. Contractor Design Engineer's stamp with calculations for that portion of work.
  - 1. Submittals without required calculations or Contractor Design Engineer's stamp and which have not been reviewed by Contractor will not be reviewed by Architect.

### 1.5 DELEGATED DESIGN COMPONENTS AND SYSTEMS

- A. Components of Work and designated Delegated Design.
  - Contractor is responsible to coordinate and assume complete responsibility for design, calculations, submittals, permits if required, fabrication, delivery and installation of Delegated Design Components and Systems.
  - 2. If these Delegated Design systems are designated as a Deferred Submittal Contractor is responsible for submittal of documents to Authority Having Jurisdiction for review. Schedule Work so review will not adversely affect Project's construction schedule.
  - Architect's review of Delegated Design submittals is for general conformance with design intent as required by Authority Having Jurisdiction. Architect not responsible for coordination of Contractor Engineered Components with Contract Documents. Review does not lessen nor shift burden of responsibility from Contractor or assigned subcontractor/supplier to Owner or Architect.
  - 4. Owner not responsible to pay for delays, additional products, hours of work or overtime, restocking or rework required due to failure to coordinate the Work with other trades or to provide Delegated Design and Deferred Submittal Components and their approval as required to meet project schedule.
  - 5. Delegated Design Components and Systems: As scheduled below.

## 1.6 DEFERRED SUBMITTAL PROCEDURES

- A. Components listed below are designated as a Deferred Submittal within the Authority Having Jurisdiction building permit approval process.
  - 1. See drawing coversheet for list of deferred submittals.
- B. Contractor shall serve as Applicant and submit for review and approval per Authority Having Jurisdiction requirements for all Deferred Submittals.
- C. Components shall be coordinated with adjacent systems.
- D. Authority Having Jurisdiction Submittals:
  - 1. Contractor Engineered Summary Sheet listing Contractor's Delegated Design engineer including registered engineer's name, address and telephone number.
  - Three sets of design drawings and specifications clearly and legibly showing members, dimensions, connections, materials and indicating how component is attached to main structure.

- a. Prepare these documents stamped by Engineer licensed in the State in which the Project is located.
- b. Submit for Architect's signature indicating General Design Conformance.
- 3. Submit one set of calculations including criteria, design assumptions, substantiating computations and additional data sufficient to show correctness of drawings and compliance with structural revisions as indicated Structural Specialty Code.
  - a. Prepare calculations stamped by Engineer who prepared calculations.
  - b. Submit for Architect's signature indicating acceptance of design concepts, loading criteria and compatibility of designs.
- E. Prior to start of work Deferred Submittals must be examined and approved by Authority Having Jurisdiction and returned to Owner.
- F. Documents not completed prior to issuance of building permit, must be completed and submitted for approval prior to fabrication.

# PART 2 PRODUCTS - NOT USED

## **PART 3 EXECUTION**

- 3.1 SCHEDULE OF DELEGATED DESIGN COMPONENTS AND SYSTEMS
  - A. Exterior Storefront
  - B. Fire Alarm System modifications and tie in to existing system
  - C. Mechanical HVAC equipment product data, connections seismic calculations, and anchorages.

## **SECTION 01 12 00**

### **PERMITS AND FEES**

### **PART 1 - GENERAL**

### 1.01 PERMITS PAID FOR BY OWNER

A. The Owner has obtained building permits from the City of Tacoma for the following scopes: Architectural, Structural, Mechanical, and Plumbing. Electrical permit will be obtained by electrical engineer of record through Tacoma Power prior to start of construction.

### 1.02 PERMITS PAID FOR BY CONTRACTOR

A. Contractor is responsible to acquire and pay for all other permits and fees required by all other agencies having jurisdiction. These will include: design and permitting of modifications to fire alarm system, deferred submittals as described in the contract documents, and may include dumpster or right of way permits needed during construction.

### 1.03 PERMIT RECORDS

A. Maintain notebook on site with copies of all permits and inspection reports. Include same in Maintenance and Operation Manuals furnished at conclusion of project.

### 1.04 PERMANENT EXISTING UTILITY SERVICES

A. It is not expected that permanent utility service will need to be disconnected or reconnected to complete the scope of work described in the contract documents. If the Contractor's means and methods propose disconnection of building utility services, the contractor is responsible for coordination with all utility providers, the payment of all fees, and providing temporary service to the lower level and third floors of the building that will continue to be occupied during construction.

## 1.05 UTILITY SERVICE CONNECTION FEES PAID FOR BY CONTRACTOR (Temporary)

A. The contractor is responsible to pay for all utility service connection fees required by utility vendors that are required for temporary use during the course of construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

### **SECTION 01 25 00**

### SUBSTITUTION PROCEDURES

### **PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

- A. Division 00 Bid Period Forms Substitution Request Form
- B. Section 01 31 00 Project Management and Coordination.

### 1.2 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

## PART 2 - PRODUCTS (Not Used)

## **PART 3 - EXECUTION**

### 3.1 GENERAL REQUIREMENTS

- A. Furnish and install products in accordance with options and conditions for substitutions stated in this Section.
  - 1. Where specified only by performance or reference standards, select a product meeting standards by any Manufacturer.
  - 2. Where specified by naming several products or Manufacturers, select any product and Manufacturer named.
  - 3. Where specified by naming one or more products, but indicating "or equal" or similar wording after specified listing, select specified product or submit Request for Product Substitution on attached form. Attached data, including a point by point comparison to the specified product, must be provided for consideration.
  - 4. Where specified by naming only one product and Manufacturer, there is no option, and no substitution will be allowed.

# B. SUBSTITUTIONS (PRIOR TO BID DATE)

- 1. Prior to Bid Date, substitution requests shall be submitted utilizing the form provided under "Bid Period Forms" to the Senior Buyer. Substitution requests must be received no later than the date specified on the "Substitution Request Form" to be included in an addendum:
  - a. Submit electronic copy of request for substitution for consideration. Limit each request to one proposed substitution.
  - b. Requests received after the due date will not be reviewed or considered regardless of cause. No request for approval will be considered unless submitted in accordance with this Section.

c. Bidders will be notified by Addendum of materials and products approved for use in addition to those specified. No other form of approval, including verbal or implied, is acceptable as indicator of accepted Substitution Reguests.

# C. SUBSTITUTIONS (AFTER AWARD OF CONTRACT)

- 1. After award of the Contract, the Owner may, at their option, consider certain other substitutions submitted in accordance with requirements of this Section. Indicate one or more of the following reasons for request:
  - a. Substitution is required for compliance with final code interpretation requirements, or insurance regulation.
  - b. Specified product is unavailable through no fault of Contractor.
  - c. Subsequent information discloses specified product unable to perform properly or fit designated space.
  - d. Manufacturer or fabricator refuses to certify or guarantee performance of specified product, as required.
  - e. Substitution saves substantial cost, time. (Submit accurate cost and/or time data for proposed substitution in lieu of product specified.)
- D. In making request for Substitution, Manufacturer/Contractor represents:
  - 1. It has personally investigated proposed product and, in his opinion, it is equal or superior in all respects to that specified.
    - a. Substantiate whenever requested by Architect.
  - 2. It will coordinate installation of accepted substitution into the Work and guarantees to complete it in all respects.
  - 3. It has identified any and all changes, if any, required to other portions of the Work as a result of the proposed product.
  - 4. It will provide the same or an improved guarantee for the proposed substitution as for the specified product.
  - 5. It waives all claims for additional costs related to the proposed substitution that consequently become apparent.
  - 6. It agrees to pay all of the Owner's additional costs related to the proposed substitution that consequently become apparent, such as redesign expenses, utility and service relocations, etc.
  - 7. Cost data is complete and includes all related costs under its Contract, but excludes:
    - a. Cost under separate Contractors.
    - b. Design Consultants' redesign, unless designated.
  - 8. Substitutions will not be considered if:

- a. They are indicated or implied on Shop Drawings or other submittals without proper submittal on attached Form.
- b. Acceptance will require substantial revisions of Contract Documents.
- 9. Contractor shall pay Architect and his Consultants for time required to review substitutions, if requested.
- 10. Architect is sole judge of suitability of substitution and decision is final.

# 3.2 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

# CSI Form 1.5C

# SUBSTITUTION REQUEST

(During the Bid Period)

Project:	Substitution Request Number:
	From:
To:	Date:
	A/E Project Number:
Re:	Contract For:
Specification Title:	
Section: Page:	Article/Paragraph:
Proposed Substitution:	
Manufacturer: Address: Address:	Phone: Model No.:
	ations, drawings, photographs, and performance and test data adequate for evaluation arly identified.
Attached data also includes a description of change installation.	s to the Contract Documents that the proposed substitution will require for its proper
substitution.	ng design, including A/E design, detailing, and construction costs caused by the
Submitted by:	
Signed by:	
Firm:	
Address:	
Telephone:	
A/E's REVIEW AND ACTION	
	dance with Specification Section 01 25 00 Substitution Procedures. s in accordance with Specification Section 01 25 00 Substitution Procedures. iffed materials.
Signed by:	Date:
Supporting Data Attached: Drawings	Product Data

### **SECTION 01 26 00**

### **CONTRACT MODIFICATION PROCEDURES**

### **PART 1 - GENERAL**

### 1.1 GENERAL

- A. Changes to and/or clarifications of the Work may be initiated by a Request for Information, Architect's Supplemental Instruction, Construction Change Directive, or a Change Order.
- B. A monetary change to the Contract Sum is only implemented by a Change Order.

## 1.2 DOCUMENTATION OF COSTS

- A. All actual or proposed costs, whether initiated by a Change Order Proposal or Construction Change Directive, shall be summarized on forms acceptable to the Owner, with all necessary substantiating documentation attached thereto. Contractor and Subcontractors of all tiers shall submit Change in the Work Summary Calculation Sheets, Forms A and B, respectively.
- B. Estimates of Not-to-Exceed costs may only be used for the purpose of expediting the Work.
- C. The Owner reserves the right to request notarized time sheets, invoices and other documentation as necessary to protect the public interest.
- D. The Contractor's quotations shall be valid for 60 days.

### 1.3 CHANGES TO CONTRACT TIME

- A. The Contractor shall make every effort to comply with the Contract Dates of Substantial and Final Completion.
- B. The Contractor may not make claim for costs or losses associated with the use of float time, if any, between anticipated completion dates and the Contract Dates of Substantial and Final Completion.
- C. Only impacts on critical path activities which can be documented as delaying the Contract Date of Substantial Completion shall be considered for changes in the Contract Time. Contractor shall be responsible for showing clearly on the Progress Schedule that the change or event: had a specific impact on the critical path, and except in case of concurrent delay, was the sole cause of such impact; and could not have been avoided by resequencing of the Work or other reasonable alternatives.

# 1.4 REQUEST FOR INFORMATION (RFI)

- A. Prepared by Contractor and distributed to Owner and Architect.
- B. Form to be created by the Contractor and approved, prior to use, by the Owner and the Architect.
  - 1. Form To include the following:
    - a. Contractor's company name
    - b. Project Name
    - c. "Request for Information"
    - d. Sequential numbering
    - e. Date issued
    - f. Due date as defined by contract
    - g. Location within project
    - h. Document/drawing reference
    - i. Potential Cost Impact
    - j. Potential Schedule Impact
    - k. Dedicated space for Question and Response
- C. Where applicable, Contractor to provide a preferred solution for consideration.
- D. A single response will be provided by Architect that includes input from all design team members and/or owner.
- E. Contractor must either:
  - 1. Proceed upon receipt of response if no cost impact, or,
  - 2. Submit a statement of cost impact within 7 days of receipt of response.
    - a. If cost impact is justified, Owner shall issue a CCD and/or COP.
    - b. If cost impact is not justified, Owner will issue a Notice to Proceed, directing the Contractor to proceed with the Work in question, with no change to the Contract Sum.
- F. RFIs and responses to RFIs shall be numbered consecutively. RFIs reissued for additional clarification or information shall be given decimal extensions (e.g. 12.1).
- G. Responses shall be recorded weekly by contractor on record drawings and specifications.

# 1.5 ARCHITECT'S SUPPLEMENTAL INSTRUCTION (ASI)

- A. Prepared by Architect.
- B. Form provided by Architect.
- C. Form will be clearly marked with one of the following options:

- 1. The work described herein is a clarification of the Contract Documents. Proceeding with the work indicates your acknowledgement that there will be no change in the Contract Sum or Contract Time.
- You are hereby directed to proceed as outlined herein. Submit an itemized proposal for change (Increase or Decrease) in the Contract Sum & Contract Time, prepared in accordance with the General & Supplementary General Conditions of the Contract, within (7) days. A formal Change Order will be issued after approval of the proposal by the Owner & the Architect.
- 3. You are NOT authorized to proceed with this work. Submit an itemized proposal for changes (Increase or Decrease) in the Contract Sum and Contract Time, prepared in accordance with the General and Supplementary General Conditions of the Contract, within (7) days.
- 4. You are hereby directed to proceed with the work herein, to be performed on a T/M basis; General Contractor's overhead and profit shall be per the OWNER/CONTRACTOR agreement. Submit a proposal for changes in Contract Time, if any, within (7) days.
- D. Acceptance by Owner required prior to issuance to Contractor.
- E. Transmitted to Contractor for signature.
- F. Contractor must either:
  - 1. Proceed upon receipt.
  - 2. Submit a statement of cost impact within 7 days of receipt.
    - a. If cost impact is justified, Owner shall issue a CCD and/or COP.
    - b. If cost impact is not justified, Owner will issue a Notice to Proceed, directing the Contractor to proceed with the work in question, with no change to the Contract sum.
- G. Architect's Supplemental Instructions shall be numbered consecutively. Reissued ASIs shall be given decimal extensions (e.g. 17.1).
- H. Changes shall be recorded weekly by contractor on record drawings and specifications.

## 1.6 CONSTRUCTION CHANGE DIRECTIVE (CCD)

- A. Issued by Owner in response to:
  - 1. An unresolved Architect's Supplemental Instruction.
  - 2. The absence of agreement on Change Order Proposal costs submitted by Contractor.
  - 3. The need to expedite the work and avoid delays.

- B. Form provided by Architect.
- C. Signed by Owner.
- D. Contractor must proceed immediately with the work identified in the CCD.
- E. Method of adjustment of the Contact Sum shall be determined per General Conditions.

# 1.7 CHANGE ORDER PROPOSAL (COP)

- A. Issued by Owner and distributed to Contractor and Architect.
- B. May be initiated by Contractor by submitting a written notice to Owner indicating justification and proposed cost impact.
- C. Contractor must provide cost data and substantiating documentation within 14 days of receipt of COP.
- D. All costs must be summarized on the forms provided by the Owner, utilizing the fees indicated.
- E. Direct costs of labor and fringe benefits shall be limited to the amounts shown in Statements of Intent to pay Prevailing Wages. Additional labor burden costs shall be limited to actual costs substantiated in writing by the Contractor and approved by the Owner and Architect.
  - 1. All indirect costs, including but not limited to such items as insurance, taxes, (except Sales Tax), general conditions, small tool allowance, plant and equipment costs, and the like, shall be included in the fees as provided for on the forms, which shall not exceed the percentages specified in the General Conditions.
- F. Prime Contractor Change Order Proposal provided to the Owner, <u>must</u> be submitted together with all necessary substantiating documentation.
- G. Each subcontractor or sub-subcontractor of any tier <u>must</u> prepare and submit, through the Contractor, all of its costs together with all necessary substantiating documentation.
- H. Architect makes recommendation.
- I. Owner accepts or rejects:
  - 1. Owner prepares Change Order, or,
  - 2. Owner requests additional cost data, and/or issues CCD.
  - 3. Owner may issue Notice to Proceed to expedite Work.
- J. Accepted and signed COP is binding on both Owner and Contractor. It is the Notice to Proceed and authorization to do the work as soon as practical.

- K. COPs shall be numbered consecutively. Reissued COPs shall be given decimal extensions.
- L. Changes shall be recorded by contractor on record drawings and specifications.

# 1.8 CHANGE ORDER (CO)

- A. Prepared by Owner.
- B. May include several COPs or CCDs.
- C. Shall be signed by Contractor as soon as practicable.
- D. Change Orders shall be numbered consecutively.
- E. Changes shall be marked on record drawings and specifications.
- F. Costs May be included in Applications for Payment only following approval of the Change Order by the Board of Directors.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

### **SECTION 01 29 00**

## **APPLICATION FOR PAYMENT**

### **PART 1 GENERAL**

### 1.01 RELATED DOCUMENTS

- A. Division 0 (Bidding & Contract Requirements) Section E. City Programs: LEAP Requirements
- B. Section 01 26 00 Contract Modification Procedures
- C. Section 01 77 00 Closeout Procedures: Project record documents.

### 1.02 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Procedures for preparation and submittal of application for final payment.

### 1.03 SCHEDULE OF VALUES

- A. Forms: Use AIA G703 or other form agreed to by the Architect & Owner for the Schedule of Values.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values electronically within 15 days after the Notice to Proceed.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization, bonds and insurance, and Contractor's General Conditions.
  - 1. Provide additional breakdown of line items if requested by the Architect or the Owner's Representative.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

# 1.04 PRIOR TO APPLICATION FOR PROGRESS PAYMENT

- A. Submit Contractor's Construction Schedule for information and Submittal Schedule.
- B. Submit a list of all Subcontractors and Suppliers.
- C. City of Tacoma LEAP Program Documentation Forms.

# 1.05 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit monthly.
- B. Forms: Use modified AIA G702 or other form provided by or agreed to by the Architect & Owner for Applications for Payment.
  - 1. Application for Payment must identify sales tax as a separate item.

- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
  - 1. Item Number.
  - 2. Description of work.
  - 3. Scheduled Values.
  - 4. Previous Applications.
  - 5. Work in Place and Stored Materials under this Application.
  - 6. Authorized Change Orders.
  - 7. Total Completed and Stored to Date of Application.
  - 8. Percentage of Completion.
  - 9. Balance to Finish.
  - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
  - Stored Materials: Requests for payment on materials stored shall be for materials properly stored on the site. Materials stored off-site may be included subject to the following conditions:
    - a. A paid invoice from Supplier is provided.
    - b. Materials are stored in a secure facility and photographs of materials are provided.
    - c. Contractor and its bonding company accepts total responsibility for the stored materials.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- I. Submit one electronic copy of each Application for Payment.
- J. Include the following with the application:
  - 1. Transmittal letter as specified for submittals in Section 01 31 00.
  - 2. Partial release of liens from major subcontractors and vendors.
  - 3. Affidavits attesting to off-site stored products.
- K. When Architect requires substantiating information, submit data justifying dollar amounts in question.
- L. Submit City of Tacoma LEAP Program Documentation Forms.

# 1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

- B. Application for Final Payment will not be considered until the following have been accomplished:
  - 1. All closeout procedures specified in Section 01 77 00.
  - 2. Satisfactory completion of the following:
    - Ensure that unsettled claims will be settled. Receipt by the Owner of General Release of Liens.
    - b. Receipt by the Owner of proof of all project tax payments to the State of Washington Department of Revenue and Department of Labor and Industries for the entire length of the project.
    - c. Receipt by the Owner of release by the Washington State Employment Security Department.
    - d. Receipt by the Owner of all approved Affidavit of Wages Paid.
    - e. Punch list items complete and accepted.
    - f. Contract closeout document submittals received and accepted.
    - g. Original documentation of all required permits signed off by Authorities Having Jurisdiction.
    - h. Submittal of Operating and Maintenance Data.
    - i. LEAP Program Documentation Forms.
- C. Retainage payment will be made separately. Once all completion and release forms have been received, the retainage payment may be released and a Final Acceptance Letter issued by the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

### **SECTION 01 31 00**

### PROJECT MANAGEMENT AND COORDINATION

### **PART 1 - GENERAL**

### 1.01 SECTION INCLUDES

- A. Administrative and Procedural Requirements for:
  - 1. Project Management
  - 2. Coordination
  - 3. File Sharing and Distribution
  - 4. Variations, revisions and clarifications
  - 5. Request For Information
  - 6. Preconstruction conference
  - 7. Progress meetings

### 1.02 PROJECT MANAGEMENT

- A. General: Provide direct, effective, experienced, cooperative, team-oriented, hands-on management of the Work including the daily construction operations on the project site and that part of the Work that the Contractor chooses to delegate to Subcontractors / Suppliers.
  - 1. Project management personnel shall be employees of the Contractor and shall not be subcontracted, or delegated to others.
  - 2. Failure to provide the specified project management personnel is a breach of Contract and subject to Owner's termination of Contract for cause.
  - 3. Site Management Personnel: This Project requires a minimum of one (1) project management personnel on the Project site as follows:
    - a. Superintendent on site full time.
    - b. The management personnel listed herein are minimums and shall not be construed as limiting the Contractor from employing additional or other types of management personnel.
- B. SUPERINTENDENT: Employ a Project Superintendent to oversee, direct, and manage the construction of the Work and including, but not limited to, the following minimum characteristics and responsibilities:

- A good communicator, organized, effective and capable of managing multiple tasks, difficult personalities and tight deadlines without losing selfcontrol or management effectiveness.
- 2. Trained, knowledgeable and experienced in jobsite safety and shall be responsible for managing safety issues on site in conformance with Federal, State and Local regulations.
- 3. Superintendent shall become thoroughly familiar with the requirements of the Contract Documents before work is started.
- 4. Responsible for executing the Work in conformance with the Construction Schedule specified in Section 01 3215 so that Project is completed on time.
- 5. Oversee and direct the work of Subcontractors and suppliers and confirm they are conforming to the requirements of the Contract Documents.
- 6. Jointly with the Project Engineer, coordinate the Work of this project as specified under "Coordination" in this section.
- 7. Responsible for determining the means and methods used to execute the Work.
- 8. Responsible for managing and controlling the quality of the Work (including work by Subcontractors) in conformance with the Contract Documents and good construction practice.
- 9. Responsible for coordinating with the local Building Department and Building Inspector(s) inspections and requirements.
- 10. Responsible for coordinating the final inspections required by Authorities having jurisdiction required for issuance of the Certificate of Occupancy.
- 11. Responsible for inspecting the work and preparing the Contractor's Punch List as specified in Section 01 7700.

## 1.04 COORDINATION

- A. General: Coordinate the Work and construction operations required in different sections of the Specifications:
  - 1. Ensure efficient and orderly installation of each part of the Work.
  - 2. Coordinate different work and trades that depends on each other for proper installation, connection, and operation.
  - 3. No additional compensation will be approved for extra work incurred through the lack of cooperation and coordination.

- B. Coordination Planning and Administration: Plan out the Work in advance and anticipate the interrelationships between each subcontractor and their relationship to the overall Project.
  - 1. Provide the leadership, direction and decisions necessary to prevent subcontractor and supplier problems and disputes from affecting the project schedule or the quality of the work.
  - 2. Coordinate scheduling, submittals, and Work of the various sections of Specifications to assure proper, efficient and orderly sequence of preparation and installation of interdependent construction elements, with provisions for accommodating items installed later.
  - 3. Hold coordination meetings with each trade to determine Work requiring coordination with other trades / sections.
  - 4. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordination Drawings: Before materials are fabricated or Work begun, prepare coordination drawings including plans, elevations, sections and other details as required to clearly define relationships between Work sharing the same space / area, or installed within or passing through Work by other trades so as to avoid any conflicts.
  - 1. Calculate, backcheck and lay out the horizontal dimensions in conformance with the design concept indicated on the Drawings.
  - 2. Consult with Owner whenever available space or conditions do not permit any element of the Work to be accomplished in conformance with the design concept indicated on the Drawing.
  - 3. When requested by Owner, provide copy of coordination drawings; submit with any Request for Information involving coordination issues.
  - 4. Distribute coordination drawings to affected Subcontractors / suppliers.
- D. Subcontractor Coordination: Provide direct supervision and coordination of each Subcontractor and each part of the Work; require each Subcontractor to coordinate their portion of the Work and provide their requirements for coordination of their Work with other related Work.
  - 1. Schedule such work so as to prevent delays in dependent work and so that related work will progress together.
  - 2. Fully inform each trade or Subcontractor of the relation of its work to other work, and require each to make necessary provisions for the requirements of such other work.

- 3. Do not delegate Subcontractor coordination responsibility to any subcontractor.
- E. Sequence of Work Coordination: Coordinate the Work of trades and other sections to ensure that elements of the work are installed in their proper sequence, without the need for unplanned modifications to work already installed.
- F. Completion and Closeout Coordination: Coordinate the efficient completion and closeout of the Work by each Subcontractor.
  - 1. Coordinate completion and cleanup of Work of separate trades in preparation for Completion.
  - 2. After substantial completion, coordinate access to site for correction punch list items; minimize disruption to the building occupants if applicable.

# G. Existing Conditions Coordination:

1. Lay out and mark existing utilities requiring protection or which remain operational or active during construction, to prevent any accidental damage or disruption of building services during this Project.

## H. Coordination With Owner:

- 1. Cooperate with the Owner to resolve any scheduling or construction coordination concerns or problems that arise during the course of this Project and coordinate the work accordingly to minimize the disruption to the Owner and to the construction schedule.
- 2. Schedule shutdowns of existing equipment, utilities and building systems with the Owner, refer to Section 01 5000 for requirements.
- 3. Coordinate with the Owner for the scheduling of any construction activities that could potentially disturb or threaten the life safety of any building occupants involving the building structure, chemical fumes and smells, noise, change of exiting or access, blocking of any site path or road, or that could potentially result in disruption or damage to any existing utility or building system. Work that involves any of these potential disturbances, poses a threat to life safety, or involves any element of risk to building occupants shall be subject to the Owner's direction to accomplish this work at a time when the building is not occupied.
- 4. Coordinate with and follow Owner's security procedures and requirements to maintain building and area / room security throughout the Project.
- 5. Coordinate deliveries in advance with the Owner. Schedule delivery times so that Owner's use of the site is not hindered. Egress from occupied spaces of the building are not to be impacted at any time.

### I. Coordination With Architect:

- 1. Communication with the Architect, including all RFIs, calls, and emails, are to come from the General Contractor. Subcontractors are not to request information from the architect without the General Contractor present.
- 2. General contractor is to review all submittals, RFIs, and other questions posed by subcontractors for completeness and clarity prior to sending to architect.

### 1.05 FILE SHARING AND DISTRIBUTION

- A. The contractor is responsible for setting up and maintaining a cloud-based construction project management and document sharing portal through the duration of the project. This portal or site must have the capabilities to post RFIs and submittals, notify team members of the posting, and allow team members to upload RFI responses and reviewed submittals. Each upload must be time and date stamped and be accessible to all team members through the shared portal.
  - 1. Acceptable systems include Procore, Newforma, and Primavera Submittal Exchange. Alternate systems and softwares will be reviewed by architect and owner for appropriateness.

# 1.06 VARIATIONS, REVISIONS AND CLARIFICATIONS

A. Variations, revisions and clarifications to the work not involving an adjustment to the Contract Sum or Contract Time will be confirmed in writing. These written confirmations may be included in the project minutes, memos to the Contractor and Owner, e-mail correspondence, or in answers to written Requests for Information (RFI).

# 1.07 PRECONSTRUCTION CONFERENCE

- A. Owner will schedule a preconstruction conference at start of construction.
- B. Attendance Required: Contractor, Owner and Architect / Engineer.
- C. Agenda:
  - 1. Designation of personnel representing the parties in Contract and the Architect.
  - 2. Discussion of list of Subcontractors, list of Products, schedule of values, and progress schedule.
  - 3. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures.
  - 4. Scheduling.

- 5. Coordination with Owner.
- 6. Procedures for maintaining record documents.
- 7. Requirements for start-up of equipment.
- 8. Inspection and acceptance of equipment put into service during construction period.
- 9. Contractor Safety.

### 1.08 PROGRESS MEETINGS

- A. Progress meetings will be held on a regularly scheduled basis not exceeding once per week.
  - 1. Contractor will administer the meeting, record decisions and actions from the meeting and send copies of meeting notes to Owner and Architect within two business days.
  - 2. The Contractor will be responsible to distribute copies to his field representative and to Subcontractors.
- B. Location of Meeting: Progress meetings will be held at the job site. The contractor shall make physical arrangements for the meeting space as well as a camera and microphone that captures all on-site participants allowing for virtual call-ins.
- C. Attendance: Contractor's management team, Owner, Architect and professional Consultants; subcontractors; suppliers and others as appropriate to agenda may attend. If the contractor would like any specific consultants from the design team or representatives of library operations to attend, a request must be made 3 business days in advance of the meeting.
  - 1. All representatives attending meetings shall be authorized to act on behalf of the entity each represents.

# D. Agenda:

- 1. Approval of minutes of previous meetings.
- 2. Review of Work progress since previous meeting and work planned.
- 3. Review project schedule (4-week and Master Project Schedule).
- 4. Review submittal schedules; expedite as required.
- 5. Review of Request for Information (RFI).
- 6. Review deliveries.
- 7. Review proposed changes.

- 8. Review technical and administrative questions / concerns from Contractor, Owner, Architect, Consultants.
- 9. Review As-Built Drawings.
- 10. Field Observations.

### E. Four-Week Schedule:

- 1. Prior to each meeting, prepare a four (4) week schedule showing work completed during the previous week, work that is in progress for the current week and work planned for the following two weeks. This four week schedule, which is revised weekly by the Contractor, will be presented by the Contractor at the progress meeting and a copy will be given to the Owner at that time.
- 2. In the event that a progress meeting is not scheduled for the current week, prepare the 4 week schedule and forward it to the Owner in the same week.

### 1.08 PRE-INSTALLATION CONFERENCES

- A. Where required in a specification Section, schedule and administer a preinstallation conference prior to commencing work of the Section.
- B. Unless otherwise required, notify the Architect a minimum of 7 calendar days prior to each scheduled meeting.
- C. Require the attendance of entities directly affecting, or affected by, the work of the Section.
- D. Review conditions of installation, preparation and installation procedures, and coordination with related work.

**PART 2 - PRODUCTS Not Used** 

**PART 3 - EXECUTION Not Used** 

#### PART 1 - GENERAL 1.1 SUMMARY

- A. Section Includes:
  - 1. Contractor participation in pre-construction conferences.
  - 2. Contractor administration of progress meetings and pre-installation conferences.
- B. This Section applies to all Technical Specification Sections, and supplements the General and Supplemental Conditions.

### 1.2 GENERAL MEETING REQUIREMENTS

- A. Make physical arrangements for meetings; notify participants, prepare agenda with copies for each attendee.
- B. Take meeting minutes, and distribute copies within 2 days to the Owner, Architect, and all attendees. Distribute copies to other parties as appropriate.
- C. All representatives attending meetings shall be authorized to act on behalf of the entity each represents.
- D. Architect will attend meetings to ascertain the work is expedited consistent with Contract Documents and construction schedules.

### 1.3 PRECONSTRUCTION CONFERENCES

- A. Owner will administer pre-construction conference for execution of Owner-Contractor Agreement and exchange of preliminary submittals.
- B. Architect will administer site mobilization conference at Project site for clarification of Owner and Contractor responsibilities in use of site and for review of administrative procedures.

### 1.4 PROGRESS MEETINGS

- A. Schedule and administer progress meetings throughout the Work at maximum bi-monthly intervals.
- B. Attendance: Job superintendent, major subcontractors and suppliers, Owner, Architect, and others as appropriate to the meeting agenda.
- C. Suggested Agenda:
  - 1. Review of Work progress.
  - 2. Status of progress schedule and adjustments.
  - 3. Delivery schedules.
  - 4. Submittals.
  - 5. Maintenance of quality standards.
  - 6. Pending changes and substitutions
  - 7. Other items affecting progress of Work.

### 1.5 PRE-INSTALLATION CONFERENCES

- A. Where required in a specification Section, schedule and administer a pre-installation conference prior to commencing work of the Section.
- B. Unless otherwise required, notify the Architect a minimum of 7 calendar days prior to each scheduled meeting.
- C. Require the attendance of entities directly affecting, or affected by, the work of the Section.
- D. Review conditions of installation, preparation and installation procedures, and coordination with related work.

### **SECTION 01 32 15**

## **CONSTRUCTION SCHEDULE**

## **PART 1 - GENERAL**

### 1.01 SECTION INCLUDES

A. Administrative and procedural requirements for the contractor's construction schedule.

### 1.02 GENERAL

- A. The intent of the construction schedule is to assist the Contractor in planning and execution of the Work in a timely manner and assist the Contractor, Architect and Owner in monitoring the construction progress for the purpose of coordination, communication, evaluation of Applications and Certificates for Payment, and evaluation of time extension requests.
- B. The Owner's review of the schedule will be to ensure that it conforms to the requirements of the specifications. The sequence and scheduling of the work is the Contractor's responsibility. Contract completion date(s) is as specified in the Contract Documents. The Owner's review of the schedule does not change, revise, or amend that date(s).
- C. This section supplements the General Conditions and the Modifications to the General Conditions with additional schedule requirements, where conflicts exist, the most restrictive requirement shall govern.
- D. Any plan by the Contractor to complete the Work or any part of the Work earlier than any contract required milestone or specific completion date shall not be construed as creating any responsibility or liability for the Owner or Architect should their actions, or lack thereof, prevent the Contractor from achieving the planned early completion. The Owner and Architect shall not be liable to the Contractor for any costs or other damages if the Contractor is unable to achieve early completion of the Work before a milestone or completion date.
- E. Float Time: Float time is the amount of time between the earliest start date and the latest start date, or between the earliest finish date and the latest finish date of a chain of activities on the CPM Schedule. Float time belongs to the project and is not for the exclusive use or benefit of either the Contractor or the Owner; float time may be used by either the Contractor or Owner for offsetting delays. Use of float suppression techniques such as preferential sequencing, special lead / lag logic restraints, zero total or free float constraints, extended activity times or imposed dates shall be cause for rejection of the Construction Schedule or any revisions or updates.

Tacoma Public Library – Main Branch Renovation SECTION 01 32 15 CONSTRUCTION SCHEDULE

F. Schedule shall anticipate and include sufficient float time for weather dependent work tasks to allow for any delays due to normal inclement weather (defined as any inclement weather within the ten year average of accumulated record mean values from climatological data compiled by the National Oceanic and Atmospheric Administration (NOAA), for the locale of the project, over the full duration of the Contract Time).

### 1.03 FORMAT

- A. Listings: Reading from left to right, in ascending order for each activity. Identify each activity with the applicable specification section number.
- B. Diagram Sheet Size: 11 x 17 inches.
- C. Scale and Spacing: Weekly increments to be a minimum of 5/8-inch long. Lettering to be a minimum of 1/16-inch high. Schedule to be legible and allow for notations and revisions.

#### 1.04 SCHEDULES

- A. Provide a time scaled diagram with a separate activity bar for each work activity. Diagram to illustrate order and interdependence of activities and sequence of work, how start of a given activity depends on completion of preceding activities and how completion of the activity may restrain start of subsequent activities. Indicate early and late start, early and late finish, manpower loading and description of each activity. Indicate critical path.
- B. Provide as many activities as necessary to clearly show how the project will be constructed within the time allowed. As a minimum, every item on the schedule of values must be shown on the progress schedule. Provide sub-net schedules where necessary to enhance clarity.
- C. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities.
- D. Show accumulated percentage of completion of each item of work at time of each Application for Progress Payment.
- E. As a sub-net show submittal dates including specified Architects' review time for shop drawings, product data and samples. Indicate decision date for selection of finishes.
- F. Show product delivery dates, including those furnished and / or installed by Owner.
- G. Show dates when application for separate permits (i.e., fire alarm, fire sprinkler, etc.) will be made and when permit will be received.
- H. Show dates when application for warranties / guarantees will be made and when warranties will be delivered. Final payment will not be made until all warranties / guarantees have been received and found to be acceptable.

### 1.05 UPDATING SCHEDULES

- A. Update the construction schedules monthly to reflect actual work activity dates accomplished and any revised work activity dates.
- B. Maintain Construction Schedules to record actual start and finish dates of activities as they are completed.
- C. Indicate progress of each activity at the time of the revision date. Update diagrams to graphically depict current status of Work.
- D. Indicate revision date on revised schedule.
- E. Show changes occurring since previous Schedule submission such as:
  - 1. Any major changes in scope;
  - 2. Activities modified since previous submission;
  - 3. Revised projections for progress and completion, as applicable;
  - 4. Any other identifiable changes.
- F. Provide narrative report as needed to define:
  - 1. Problem areas; anticipated delays; and impact on schedule.
  - Corrective action to be taken by the Contractor to get the project back on schedule. This report will define how and when the Contractor will accomplish this.

#### 1.06 SUBMITTALS

- A. Prepare and submit proposed construction schedule to Owner and Architect as soon as possible after Notice to Proceed and prior to first Application for Payment.
  - 1. Submit schedule in both paper and digital computer formats acceptable to the Owner.
- B. Submit updated schedule with each Application for Payment or more frequent if required.
- C. Applications for Payment will not be processed until schedule is in conformance with requirements of the specifications.

### 1.07 DISTRIBUTION

A. Distribute copies of construction schedule to project site file, subcontractors, suppliers, Owner, Architect, and other concerned parties.

Tacoma Public Library – Main Branch Renovation SECTION 01 32 15 CONSTRUCTION SCHEDULE

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

#### **SECTION 01 33 00**

#### **SUBMITTALS**

#### **PART 1 - GENERAL**

#### 1.01 SECTION INCLUDES

A. Administrative and Procedural Requirements for Project Submittals

### 1.02 SUBMITTAL PROCEDURES

- A. Schedule submittals to expedite the Project. Transmit submittals in accordance with Construction Schedule and in such sequence to avoid delay in the Work. Coordinate submission of related items with schedule.
- B. Electronic Submittals Format: Shop Drawings, Product Data, Certificates, Warranties and any similar submittals, other than physical samples, shall be provided as digital submittals in PDF format suitable for sending via electronic mail or downloaded from internet file transfer website.
  - 1. PDF security permissions shall be formatted to allow printing, reviewing and editing functions by Architect and Owner using any PDF compatible computer program.
  - 2. When electronic submittals are required to be accompanied by a physical sample, the submittal will not be returned until both the electronic submittal and physical sample are reviewed.

#### C. Contractor Shall:

- Prepare / obtain submittals for each item required in the specifications in accordance with the Contractor's submission schedule and as required to prevent delays in the ordering, fabrication, delivery and installation of the Work.
  - a. Submittals are to be complete and inclusive of all information required by the contract documents, including product data, LEED information, shop drawings, and samples. Partial submittals will be returned without review as "revise and resubmit" unless previously agreed upon by owner and architect.
  - b. Where required, physical samples must be received by architect for review and can be sent to the architect's office in Seattle via mail/delivery, courier, or delivered by the contractor. A photo of approved physical samples will be returned to the contractor to expedite approval process; one approved physical sample for each approved submittal will be brought delivered to the jobsite the next time the architect is on site.

- c. Sequence the frequency rate of submittals sent to the Architect to avoid submitting more submittals within the same week than can receive a thorough, timely review, generally 4 to 5 submittals per week. Include a review priority for Architect if multiple and / or large submittals are transmitted to Architect in the same week and plan for longer review times by Architect.
- 2. Contractor is to review each submittal for compliance to the Contract Documents, note any deviations and approve in writing prior to submission to Architect; each submittal shall bear the Contractor's review and approval stamp, with the review date and name of reviewer.
- 3. Reproduce and distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions. Pay costs for reproduction, distribution and materials.
- 4. Coordinate submittals into logical groupings to facilitate inter-relation of the several items:
  - a. Finishes which involve Architect selection of colors, textures, or patterns.
  - b. Associated items which require correlation for efficient function or for installation.
- 5. Identify, in writing, variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed Work.
- 6. Accompany submittals with transmittal letter containing:
  - a. Date.
  - b. Project title and number.
  - c. Contractor's name and address.
  - d. Number of copies of Shop Drawings, Product Data and Samples submitted.
  - e. Identification of submittal as it relates to:
    - 1) Subcontractor / Supplier / Manufacturer:

Name.

Address.

Telephone number.

### Representative's name.

- 2) Detail number and location in Construction Documents.
- 3) Specification reference number and paragraph.
- 4) Applicable Standards.
- 5) Finishes.
- 6) Identification of deviations from Contract Documents.
- f. Clear space for architect's review stamp, measuring 6" high by 3.5" wide, minimum

## D. Additional Information Required:

- 1. Relation to adjacent structure or materials.
- 2. Fabrication methods, assembly, special installation requirements, accessories, fasteners, and other pertinent information.
- 3. Field dimensions, clearly identified.
- 4. Coordination with other trades. Stamped and signed by affected trades.

# E. Distribution:

- 1. Submittals are to be distributed and returned to Owner and Architect via the contractor's cloud-based construction project management and document sharing portal as described in section 01 31 00.
- Architect will return reviewed submittals to Contractor and Owner via the contractor's cloud-based construction project management and document sharing portal.
- 3. Contractor is responsible for distributing the Architect reviewed submittal to Subcontractors / Suppliers.

# 1.03 SUBCONTRACTOR AND SUPPLIER LIST

A. Prior to submission of First Application for Payment, submit complete list of subcontractors and suppliers to be used for the Work. Provide specification section identification number, addresses and telephone numbers for each listed subcontractor and supplier providing materials.

# 1.04 SHOP DRAWINGS

A. Present in clear and thorough manner. Title each drawing with Project name and

- number; identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.
- B. Identify field dimensions; show relation to adjacent or critical features or Work or products.
- C. Do not submit freehand drawings.
- D. Shop Drawings Requiring Code Agency Approval: Submit on format and media required by Approval Agency. Include information required by Project Documents and Approval Agency.

#### 1.05 PRODUCT DATA

- A. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.
- B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.

#### 1.06 SAMPLES

- A. Submit three samples of the specified color and texture for each product unless specified otherwise in individual specification sections; samples will be retained by Architect.
- B. Where a specific color has not been specified, submit full range of manufacturer's standard and special finishes except when more restrictive requirements are specified, indicating colors, textures, and patterns, for Architect selection.
- C. Label each sample with identification required for transmittal letter.
- D. Field samples are to be maintained at the site of the Work and are to be removed after substantial completion unless directed otherwise.

## 1.07 CONTRACTOR REVIEW

A. Coordinate submittals with requirements of the Work and Contract Documents.

B. Apply Contractor's approval stamp with signature. The submittal signed by the Contractor certifies that the Contractor has reviewed the submittal for accuracy, completeness and compliance with the Contract Documents. It also certifies that the Contractor has verified products required, field dimensions, adjacent construction work, and coordination of information, in accordance with the requirements of the Work and Contract Documents. Submittals without Contractor's stamp and signature are rejected. Notify Architect in writing at time of submittal, of any deviations from requirements of Contract Documents.

#### 1.08 RESUBMITTALS

- A. Revise and resubmit submittals as required, identify changes made since previous submittal.
- B. Shop Drawings, Product Data and Calculations:
  - 1. Revise initial drawings, data or calculations and resubmit as specified for the initial submittal.
  - 2. Indicate any changes which have been made including those requested by the Architect.
- C. Samples: Submit new samples as required.
- D. Architect reserves the right to charge the Contractor for reviewing non-responsive resubmittals.

#### 1.09 ARCHITECT REVIEW

- A. Architect or their consultant(s) will review shop drawings, product data, calculations and samples and return submittals to Contractor as soon as possible, generally within 10 working days, except Contractor shall plan for large submittals such as mechanical and electrical product binders or numerous submittals sent to Architect at the same timing taking a longer period of time.
- B. Architect's review is qualified by the following language included on the review stamp: "This review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made on the shop drawing during this review do not relieve the contractor from compliance with the requirements of the plans and specifications. No exception to a specific item does not imply no exception to an assembly of which the item is a component. Contrator is responsible for dimensions to be confirmed and correlated at the jobsite; information that pertains solely to the fabrication process or to the means, methods, techniques, sequences, and procedures of construction; coordination of the Work with that of all other trades and for performing all work in a safe and satisfactory manner."

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		Any action shown is subject to Contract Document's requirements. Architect will mark the review submittal in one of the following boxes on review stamp:
		☐ Not Required for Review
		☐ No Exceptions Taken
		☐ Make Corrections Noted
		Revise & Resubmit
C.		ct / Engineer review of individual or separate items does not constitute of assembly in which it functions.
ART 2 - PR	ODUCTS	(Not Used)

PA

PART 3 - EXECUTION (Not Used)

#### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A . This Section includes general requirements and procedures for the contractor and subcontractor(s) for Project to obtain LEED® Certification based on USGBC's "LEED v4 for Interior Design and Construction."
- B . See Divisions 1 through 33 for LEED® requirements specific to the Work of each of those Sections.

### 1.2 DEFINITIONS

- A . LEED®: Leadership in Energy & Environmental Design.
- B . USGBC: United States Green Building Council
- C . GBCI: Green Building Certification Institute
- D . LEED Project Administrator: Designated by Owner to provide oversight of LEED related work.
- E . Environmental Product Declarations (EPD): Life cycle assessment reports, third party verified, that reference various ISO Standards.
  - Industry-Wide (Generic) EPD: Provide products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. EPD must conform to ISO 14025, 14044, and EN 15804 or ISO 21930, and have at least a cradle-to-gate scope.
  - Product-Specific Type III EPD: A product with a third-party certification, including external verification, in which the manufacturer is explicitly recognized by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930, and have at least a cradle-to-gate scope.
- F . Health Product Declarations (HPD): A standard format for reporting product content and associated health information for building products and materials.
- G . General Emissions Evaluation: Product is tested and compliant with California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v1.1-2010 or v1.2-2017, for the emissions testing and requirements of products and materials.

#### 1.3 SUBMITTALS

- A . LEED® Action Plans: Provide preliminary submittals within 30 days of date established for the Notice to Proceed indicating how the following requirements will be met. Coordinate with Section 01 33 00 Submittal Procedures.
  - 1. Credit MR Prerequisite/Credit: Waste management plan complying with Section 01 74 19– Construction Waste Management and Disposal.
  - Credit EQ Construction Indoor Air Quality Plan complying with Section 01 57 21 Indoor Air Quality Controls.
- B . LEED® Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED® action plans. Coordinate with Section 01 29 00 Price and Payment Procedures.

- C . LEED® Documentation Submittals. Conform to following as required for LEED documentation of Contractor-responsible LEED Credits.
  - 1. General: Provide schedule of values by CSI division. Labor and equipment is to be listed separately from material cost.
  - 2. WE Prerequisite/Credit: Provide product data for tank style toilets, urinals, private lavatory faucets and showerheads indicating products are WaterSense labeled. Provide product data for flow fixtures (shower heads, lavatory faucets, and kitchen faucets) indicating flow rate in gallons per minute (gpm). Provide product data for flush fixtures (water closets and urinals) indicating gallons per flush (gpf). Provide Energy Star product data for ice machines, residential clothes washers and residential dishwashers. See Division 22 Plumbing.
  - 3. EA Prerequisite: Minimum Energy Performance: Provide product data for HVAC indicating equipment efficiency. Provide product data for Electrical fixtures indicating lighting wattage, daylight controls and occupancy sensors. See Division 23 Mechanical and Division 26 Electrical.
  - 4. MR Prerequisite/Credit: Construction and Demolition Waste Management: Provide reporting demonstrating diversion of a minimum of 75% and 4 waste streams of construction and demolition waste from the landfill. Comply with Section 01 7419 Construction Waste Management.
  - 5. MR Credit: BPDO Environmental Product Declarations Option 1: Provide documentation for products that have an Environmental Product Declaration (EPD).
  - 6. MR Credit: BPDO Material Ingredients Option 1: provide documentation demonstrating material ingredient reporting for products that have any of the following documents or certificates:
    - a. Health Product Declaration (HPD v1.0, v2.0 and v2.1)
    - b. Cradle to Cradle Certification (v2 Basic and higher or v3 Bronze and higher)
    - c. Declare Label
    - d. Cradle to Cradle Material Health Certificate
    - e. ANSI/BIFMA e3 Furniture Sustainability Standard
    - f. UL Product Lens Certification
  - 7. IEQ Credit: Construction Indoor Air Quality Management Plan during construction. See Section 01 57 21–Construction IAQ Management.
    - a. Provide product data for temporary filtration media and for filtration media used during occupancy. Include six photographs with date and timestamp at two different occasions during construction along with a brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures.
  - 8. IEQ Credit: Low Emitting Materials: Volume tracking by cost or surface area and emissions testing documents showing compliance with requirements for low-emitting materials, for the following materials:

- i. Flooring
- ii. Ceilings
- iii. Insulation
- iv. Paints/Coatings

#### **PART 2 - PRODUCTS**

#### 2.1 SUSTAINABLE BUILDING PERFORMANCE CRITERIA

- A . Integrate sustainable building materials and methods into Work as required to meet or exceed USGBC LEED for Interior Design and Construction v4 Certification.
  - 1. Satisfy prerequisites and credits applicable to Work of this Contract.
  - 2. Submit documentation that demonstrates this performance.
  - 3. Participate as necessary to complete LEED certification application.
  - 4. Conform to documentation requirements for LEED certification.
- B . Refer to Contract Documents for incorporated sustainable/environmental requirements provisions.
- C . Substitutions: Conform to provisions of Section 01 60 00 Product Requirements.

### 2.2 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

- A . MR Credit: BPDO Environmental Product Declarations (EPD): Option 1. Provide at least 10 permanently installed products (sourced from at least 3 different manufacturers) which meet one of the disclosure criteria:
  - 1. Product-Specific Declaration: Valued as one whole product.
  - 2. Industry-Wide (Generic) EPD: Valued as one whole product.
  - 3. Product-Specific Type III EPD: Valued as one and one half (1/2) product.
- B . MR Credit: BPDO Material Ingredients: Option 1. Provide at least 10 products permanently installed products (sourced from at least 3 different manufacturers) that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:
  - 1. Health Product Declaration (HPD v2.0, v2.1 and v2.2).
  - 2. Cradle to Cradle Certification (v3 Bronze and higher).
  - 3. Declare Label.
  - 4. Cradle to Cradle Material Health Certificate.
  - 5. ANSI/BIFMA e3 Furniture Sustainability Standard.
  - UL Product Lens Certification.

#### 2.3 LOW EMITTING MATERIALS

A . EQ Credit: Low-Emitting Materials, General Emissions Requirements: Products must demonstrate they have been tested and determined compliant in accordance with California

Department of Public Health (CDHP), Standard Method v1.2-2017 (Standard Method v1.12010 will also be acceptable), using the applicable exposure scenario. Manufacturer's documentation demonstrating compliance must state the range of total VOCs (tVOC) after 14 days measured as specified in the CDPH Standard Method v1.1 as follows:

- 0.5mg/m3 or less,
- 2. Between 0.5 and 5.0 mg/m3 or,
- 3. 0.50 mg/m3 or more.
- B . EQ Credit: Low-Emitting Materials, Flooring: At least 90% of flooring by cost or surface area shall comply with the requirements of the California Department of Public Health Standard Method v1.2-2017 (Standard Method v1.1-2010 and v1.1-2016 also acceptable). Acceptable certifications and labels include but are not limited to:
  - 1. UL Greenquard Gold.
  - 2. SCS Indoor Advantage Gold.
  - FloorScore.
  - 4. Green Label Plus.
  - 5. Intertek Clean Air Gold.
  - 6. Materials Analytical Services (MAS) Certified Green.
- C . EQ Credit Low-Emitting Materials, Ceilings: At least 90% of ceilings by cost or by surface area shall comply with the requirements of the California Department of Public Health Standard Method v1.2-2017 (v1.1-2010 would also be acceptable). This includes all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights. Overhead structural elements are excluded. Acceptable certifications and labels include but are not limited to:
  - UL Greenguard Gold.
  - 2. SCS Indoor Advantage Gold.
  - 3. Intertek ETL Environmental VOC+.
  - 4. Materials Analytical Services (MAS) Certified Green.
- D . EQ Credit: Low-Emitting Materials, Insulation: 75% of all insulation by cost or surface area shall comply with the requirements of the California Department of Public Health Standard Method v1.2-2017 (Standard Method v1.1-2010 and v1.1-2016 also acceptable). This includes all thermal and acoustic boards, batts, rolls, blankets, sound attenuation fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation. Insulation for HVAC ducts and plumbing piping is excluded Acceptable certifications and labels include but are not limited to:
  - UL Greenguard Gold.
  - 2. SCS Indoor Advantage Gold.
  - 3. Intertek Clean Air Gold.
  - 4. Materials Analytical Services (MAS) Certified Green.
- E . EQ Credit: Low-Emitting Materials, Paints and Coatings: For field applications that are inside the weatherproofing system, use paints and coatings that have no added methylene chloride or perchloroethylene and comply with the limits for VOC content when calculated according to the South Coast Air Quality Management District (SCAQMD) Rule #1113, effective February 5, 2016:

Table 1 Low-Emitting Materials: Paints	and Coatings VOC Limits.
Product Type:	Allowable VOC Content (g/L):
Bond Breakers	350
Building Envelope Coating	100
Clear Wood Finishes - Varnish	275
Varnish	275
Sanding Sealers	275
Lacquer	275
Concrete-Curing Compounds	100
Concrete Surface Retarder	50
Driveway Sealer	50
Dry-Fog Coatings	50
Faux Finishing Coatings - Clear Topcoat	100
Faux Finishing Coatings - Decorative Coatings	350
Faux Finishing Coatings - Glazes	350
Faux Finishing Coatings - Japan	350
Faux Finishing Coatings - Trowel Applied Coatings	50
Fire-Proofing Coatings	150
Flats	50
Floor Coatings	50
Form Release Compound	100
Graphic Arts (Sign) Coatings	200
Industrial Maintenance (IM) Coatings	100
High Temperature IM Coatings	420
Non-Sacrificial Anti-Graffiti Coatings	100
Zinc-Rich IM Primers	100
Magnesite Cement Coatings	450
Mastic Coatings	100
Metallic Pigmented Coatings	150
Multi-Color Coatings	250
Nonflat Coatings	50
Pre-Treatment Wash Primers	420
Primers, Sealers, and Undercoaters	100
Reactive Penetrating Sealers	350
Recycled Coatings	250
Roof Coatings	50
Roof Coatings Aluminum	100
Roof Primers, Bituminous	350

Rust Preventative Coatings	100
Sacrificial Anti-Graffiti Coatings	50
Stone Consolidant	450
Table 1 Low-Emitting Materials: Paints ar	nd Coatings VOC Limits.
Product Type:	Allowable VOC Content (g/L):
Shellac Clear	730
Shellac Pigmented	550
Specialty Primers	100
Stains, Interior	250
Swimming Pool Coatings	
Repair	340
Other	340
Tile and Stone Sealers	100
Traffic Coatings	100
Tub and Tile Refinishing Coatings	420
Waterproofing Sealers	100
Waterproofing Concrete/Masonry Sealers	100
Wood Coatings	275
Wood Conditioners	100
Wood Preservatives	350

- F . EQ Credit: Low-Emitting Materials, Paints and Coatings: For field applications that are inside the weatherproofing system, 75% of paints and coatings by volume or surface area shall comply with the requirements of the California Department of Public Health Standard Method v1.2-2017 (v1.1-2010 would also be acceptable). Acceptable certifications and labels include but are not limited to:
  - 1. UL Greenguard Gold.
  - 2. SCS Indoor Advantage Gold.
  - 3. Berkeley Analytical ClearChem.
  - 4. Intertek ETL Environmental VOC+.
  - 5. Materials Analytical Services (MAS) Certified Green.

# **PART 3 - EXECUTION**

- 3.1 LEED COMPLIANCE GENERAL
  - A . Coordinate with team to meet LEED Prerequisites and Credits as identified in Figure 1, at end of this Section, as required for achieve LEED Certification.
  - B . Prior to beginning Work of this Contract, verify construction conditions as acceptable to achieve LEED Credit and Prerequisite requirements.
    - 1. Do not proceed with Work until unsatisfactory conditions are corrected in a manner acceptable to Owner's LEED Project Administrator, Owner, and Architect.

- C . Correct non-conforming work failing to meet LEED requirements at Contractor's expense.
  - 1. Submit documentation as necessary to show conformance of corrected work.
  - 2. Owner's LEED Project Administrator and GBCI will be sole judge in determining conformance to LEED Credit requirements.
- D . Completion of Construction:
  - 1. Comply with acoustic measurement per credit EQ9 (Acoustic Performance), as required to achieve LEED Certification.
- 3.2 IAQ MANAGEMENT DURING CONSTRUCTION
  - A . IEQ Credit. Conform to Section 01 74 21 Construction Waste Management and Disposal.
- 3.3 CONSTRUCTION WASTE MANAGEMENT
  - A . MR Prerequisite/MR Credit: Comply with Section 01 74 21, Construction Waste Management and Disposal.
- 3.4 PROHIBITION OF SMOKING
  - A . EQ Prerequisite: Environmental Tobacco Smoke (ETS) Control Prohibit smoking within the building during and after construction. See Section 01 30 00 Administrative Requirements and Coordination and Section 01 74 21 Construction Waste Management and Disposal.
    - 1. Provide proof of permanent no smoking signage installed within 10 feet of all building entrances indicating no smoking policy.



#### LEED v4 for ID+C: Commercial Interiors - Project Checklist

Project Name
Project Manager
Date

8/18/2023

Tacoma Public Library - Main Branch
George Oakley
8/18/2023



Max \* = v4.1 Substitution Silver = 50 points Pts 53 57 Total 110 Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110 Credit Phase Status Lead 2 IP1 Integrative Process D NA 2 14 Location and Transportation Possible Points: 18 LT 1 **LEED ND Location** D NA 18 Attempting 8 LT 4 Surrounding Density and Diverse Uses\* D ArchE 8 Requirement (v 4.1) Locate where surrounding density in 0.25 mi radius is 7 du/acre, 0.5 FAR or 22,000 sf/buildable acre (3 p); 12 DU/acre, 0.8 FAR or 35,000 sf/buildable acre (6 p) AND/OR main entrance is 0.5 mi walk to diverse uses - 4 to 7 (1 p) 8+ (2 p) OR walkable location based on third-party walkability assessment (1 - 8 p). Notes Walk Score = 95 - Walker's Paradise (90 to 100) = 8 points (Documented) **Next Steps** Upload 24-Apr-2023 ArchE 1 LT 5 ArchE 6 Access to Quality Transportation\* D Attempting 7 Requirement (v4.1) Path 1. Access to Public Transit Service - Meet minimum weekday and weekend trips on bus, streetcar within 0.25 mi. OR rapid bus, rail, or commuter ferry within 0.5 mi. Must have paired routes but only one direction counts. See tables. Five different bus stops within 0.25 mi and Link LR station within 0.5. Weekday trips = Notes 259, weekend trips = 188 (6 points) (Documented) Next Steps Upload 31-May-2023 ArchE 1 LT 6 Bicycle Facilities D NA 1 2 LT 7 2 Reduced Parking Footprint\* D NA Water Efficiency 4 Possible Points: 12 Υ WEp 1 Indoor Water Use Reduction D PreRea BW Rea. Requirement Reduce water consumption by 20% from the UPC/IBC baseline. All newly installed fixtures eligible for labeling (tank style WC, urinal, and showerheads) must be Water Sense labeled. Appliances must be Energy Star, prerinse spray valves must be 1.3 qpm or Water closets 1.28 gpf, RR faucets 0.35 gpm, Kitchen faucets 1.5 gpm - This will meet min. Notes requirements at 22.88%. Energy Star appliances. Pre-rinse spray <= 1.3 gpm. Confirm FTE employee and average daily 7-Aug-2023 BW **Next Steps** visitor counts. 4 8 WE 1 **Indoor Water Use Reduction** D 12 Requirement Achieve further water use reductions with high efficiency fixtures and fittings, and alternative water sources - 2 p for every 5% savings after mandatory 20% required. Water closets dual flush 1.28 / 1.1 gpf, RR faucets 0.35 gpm, Kitchen faucets 1.5 gpm - This Notes will result in 28.29% reduction = 2 p. Energy Star appliances. Pre-rinse spray <= 1.3 gpm. Provide FTE employee and average daily 5-May-2023 BW **Next Steps** visitor counts. 26 Energy and Atmosphere 12 Possible Points: 38 Υ EAp 1 Fundamental Commissioning and Verification PreReq Req. Requirement Owner to hire Commissioning Authority (CxA) prior to the end of DD. CxA shall have 2 buildings previous experience, report to Owner and shall not be involved in the design and construction of the project though they can be an employee of project team firms or

Notes

**Next Steps** 

**TPL** 

10-May-2023

Owner. If project is less than 20,000SF, CxA can be part of project team.

Owner to solicit proposals and hire CxA prior to end of Design Development.

Solicit CxA proposals. ArchE can provide

recommendations.

Υ	EAp 2	Minimum Energy Performance	D	PreReg	Hultz BHU	Reg.
	Requirement	Option 1: Demonstrate 3% reduction over ASHRAE		· · · · · · · · · · · · · · · · · · ·		,I.
		2: Prescriptive Compliance by meeting ASHRAE rec				
		density 5% over ASHRAE. Provide 50% of eligible n				
		tenant scope as Energy Star.	cw ap	Silarices iristanca	as part or	
		Whole building energy simulation model (Option 1) is	profo	rrod but Proscript	ivo	1
	Notes	Compliance (Option 2) may be better if most of exist				
	Notes		ilig nv	AC (30-40 years	olu) is to	
	Next Steps	remain.  Provide mechanical design drawings.		10-May-2023	Hultz BHU	1
Y	EAp 3		D	PreReq	Hultz BHU	Dog
	Requirement	Fundamental Refrigerant Management		riekeq	Huitz BHO	Req.
	Requirement	Do not use CFC's in HVAC&R equipment.  With existing HVAC&R equipment a complete CFC p	basa s	ut conversion is	roquirod	1
	Notes		mase-c	out conversion is	equired	
		before project completion.				4
	Nove Chama	Inventory all existing HVAC&R equipment in		10 May 2022	LIGHT DILL	
	Next Steps	the project and determine whether any items		10-May-2023	Hultz BHU	
4	4 54	use CFC refrigerants.	С	A + + + ·	TDI	-
4	1 EA1	Enhanced Commissioning	<u> </u>	Attempting	TPL	5
	Requirement	Option 1: Use a 3rd party Cx who in addition to Fund			-	
		submittals; develop a systems manual; verify training				
		occupancy review at 8-10 months, develop an ongo	_			
		Monitoring-Based approach that combines achieving	ng Opt	ion 1 with an M&V	approach	
		(5p).				-
	Notes	Owner has solicited proposals and will hire CxA prio	r to en			_
	Next Steps	Enhanced Cx only will be pursued		8-Aug-2023	TPL	
8	17 EA 2	Optimize Energy Performance	D	Attempting	Hultz BHU	25
	Requirement	Option 1 (1 - 25 pts): Use an Energy model to show 4		-		
		90.1 2010 baseline. Option 2 (1-16 pts): Prescriptive				
		6 pts); HVAC systems (2 pts); interior lighting power		s); interior lighting	controls (1-2	
		pts); ENERGY STAR equipment and appliances (1-2				
		Whole building energy simulation model (Option 1) is				
	Notes	Compliance (Option 2) may be better if most of exist	ing HV	AC (30-40 years	old) is to	
		remain.				]
	Next Steps	Provide mechanical design drawings.		10-May-2023	Hultz BHU	
	2 EA 3	Advanced Energy Metering	D	Attempting	ArchE	2
	Requirement	Option 1 (1 pt): Tenant-level energy meters to provide	le total	tenant energy co	nsumption	
		(electricity, natural gas, chilled water, steam, fuel oi				
		data sharing at one-month intervals. Option 2 (2 pts	s): Adv	anced energy me	tering for all	
		energy sources in tenant space and any individual	energy	end uses that re	oresent 10%	
		or more of total annual consumption.				
	Notes	Identify energy types and metering plans for all space	es.			]
	Novt Ctons	Review project MEP scope with Architect and		12 May 2022	۸ ۲۰۰۵ ⊏	
	Next Steps	MEP consultant.		12-May-2023	ArchE	
	3 EA 4	Renewable Energy Production*	D	Attempting	TPL	3
	Requirement	(v4.1) Use on-site renewable energy systems or pro-	cure re	newable energy	from offsite	
		sources for all or a portion of the building's annual				
		for implementing one or more strategies by tier. Tie				
		generation; Tier 2: New off-site renewable energy;				
		pts).	-		3) (1.3	
		v4.1 Married to Green Power. The default contract le	nath fo	or renewable ene	av	1
	Notes	procurement is 10 years. Contract lengths less than 1				
	Next Steps	Revisit if points are needed.	. J y cui	10-May-2023	TPL	-
	richt Steps	Meviole if points are necaea.	1	10 111dy 2023		_

					٠
1 EA 6	Enhanced Refrigerant Management	D	Attempting	Hultz BHU	] 1
Requirement	Option 1 (1 p) - No refrigerants or low impact refriger				
	Option 2 (1 p) - Refrigerant impact calculations that			ting base	
	building and tenant HVAC&R equipment that serve				,
Notes	May comply depending on refrigerant type and refrigerant	gerant	charge.	T	_
	Inventory all existing HVAC&R equipment in				
Next Steps	the project. Provide refrigerant type and		21-Apr-2023	Hultz BHU	
	charge.				
2 EA 7	Green Power and Carbon Offsets*	С	Attempting	TPL	2
Requirement	(v4.1) See Renewable Energy above.				
Natas	v4.1 Married to Renewable Energy. Always possible	as a pu	ırchase as an offs	et. No direct	
Notes	benefit.				
Next Steps	Revisit if points are needed.		10-May-2023	TPL	1
	<u> </u>				_
8 5 Materi	als and Resources			Possible Points	: 13
Y MRp 1	Storage and Collection of Recyclables	D	PreReg	TPL	Req.
Requirement	Provide easily accessible area for collection and st	orage o	•	1	,
•	paper, cardboard, glass, plastics and metals. Provid				
	following - <b>batteries</b> , mercury-containing lamps or				
Notes	Straightforward. Discuss strategy.				1
Next Steps	Identify and provide storage location.		10-May-2023	TPL	4
Y MRp 2		С	PreReg	GC	Req.
Requirement	Implement construction waste and demolition diver				iteq.
Requirement	(5) materials and whether waste will be source sep				
	diversion rate.	uruteu	or commingied di	na expected	
Notes		ntion			1
Notes	Will need to source separate or pursue waste preven	ntion.	10 May 2022	66	4
Next Steps	Provide C&DWM plan.	_	10-May-2023	GC	٠.
1 MR 1	Tenant Space - Long-Term Commitment	D	Attempting	TPL	] 1
Requirement	Tenant commits to remain not less than 10 years.	•			7
Notes	Owner occupied building can comply with letter of c	ommiti	ment. Verity sub-t	enant spaces.	
	In	1	00 4 0000	<b>TD</b> .	4
Next Steps	Provide letter.	_	26-Apr-2023	TPL	
3 1 MR 2	Interiors Life-Cycle Impact Reduction*	D	Attempting	ArchE	4
Requirement	(v4.1) Option 3 (1 - 3 points) Path 1: Conduct a life cy				
	(1 pt). For TIs and renovations, conduct a life-cycle of				
	scope of work, including structure and enclosure (if				
	partition assemblies including acoustic insulation, r		_	-	
	furnishings. LCA data sets must be compliant with I				
	requirements of Path 1 and conduct a life cycle as				
	design compared against a baseline interiors pro				
	requirements of Path 2 and incorporate building re-				
	project's scope of work. Demonstrate reductions co	ompare	ed with the interior	rs project	
	baseline of at least 20% for global warming potenti	ial and	demonstrate at le	east 10%	
	reduction in two additional listed impact categories	(3 pts)			
Notes	Pursue Option 3, LCA, Path 2 and possibly Path 3				
Next Steps	Conduct LCA and document results.		31-May-2023	ArchE	1
1 1 MR 3	BPDO - Environmental Product Declarations*	С	Attempting	BW	2
Requirement	(v4.1) Option 1: Use at least 10 different permaner	ntly inst	alled products so	urced from at	
	least 3 different manufacturers that have Environment	ental P	roduct Declaratio	ns (1 p)	
	AND/OR Option 2: Achieve 10% by cost or use 10 p				
	product specific LCA and have a publicly available				
	impacts or have a third party verified EPD that show				
	potential.		<i>J. J. J. J. J. J. J. J.</i>	3	
Notes	Option 1 is achievable typically.				1
Next Steps	Vet basis of design products.		10-May-2023	BW	1
richt Steps	var basis of acsign products.	1	10 111dy 2023	244	J

	2 MR 4	BPDO - Sourcing of Raw Materials*	С	NA		2
	Requirement	-			ırers that	
	·	meet at least one of the responsible sourcing and				
		15%, by cost, of the total value of permanently inst				
		point). Option 2: Use products sourced from at lea				
		meet at least one of the responsible sourcing and				
		30%, by cost, of the total value of permanently ins				
		(2 points).		31	, ,	
	Notes					1
	Next Steps					1
1	1 MR 5	BPDO - Material Ingredients*	С	Attempting	BW	2
	Requirement					_
	- 1	manufacturers that publish the chemical inventory	•			
		disclosure or third party certification - health produ			_	
		certification, or other approved program. (1 p) ANE				
		installed materials from 3 mfrs. that document ma			-	
		10% by cost or use 10 compliant products that use				
		least 100 ppm, advanced inventory assessment or		-	-	
		, , , , , , , , , , , , , , , , , , ,		<i>J</i>	,	
	Notes	Option 1 is achievable typically.				1
	Next Steps			10-May-2023	BW	
2	MR 5	C&D Waste Management	С	Attempting	GC	2
	Requirement	-			1	
	•	p) OR Generate 2.5 lbs. of waste per sf of floor are				
		both options.		o. (= p) =xomp.a.)	μο	
	Notes		ntion			1
	Next Steps		21161011.	10-May-2023	GC	
		. To that Gas Tim plans	_	10 may 2020		
8	9 Indoo	Environmental Quality				
Υ	EQp 1			-	Possible Points	: 17
_	LOOP	Minimum Indoor Air Quality Performance	D		Possible Points Hultz BHU	_
	Requirement	Minimum Indoor Air Quality Performance  Meet ventilation requirements of ASHRAE 62.1-20		PreReq	Hultz BHU	_
				PreReq	Hultz BHU	_
		Meet ventilation requirements of ASHRAE 62.1-20 stations.	10, inclu	PreReq ding air flow moni	Hultz BHU itoring	_
	Requirement	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e	10, inclu	PreReq ding air flow moni	Hultz BHU itoring t of TI.	_
Υ	Requirement	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.	10, inclu	PreReq ding air flow moni	Hultz BHU itoring	Re
Υ	Requirement Notes Next Steps	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control	quipmen	PreReq ding air flow moni nt installed as par 24-Apr-2023 PreReq	t of TI. Hultz BHU Hultz BHU TPL	Re
Υ	Requirement  Notes  Next Steps  EQp 2	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of opening	quipmen	PreReq ding air flow moni nt installed as par 24-Apr-2023 PreReq	t of TI. Hultz BHU Hultz BHU TPL	Re
Υ	Requirement  Notes  Next Steps  EQp 2  Requirement	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of opening within 10' of all building entrances.	quipmen D	PreReq ding air flow moni nt installed as par 24-Apr-2023 PreReq n site. Signage to	t of TI. Hultz BHU TPL be posted	Re
Υ	Requirement  Notes  Next Steps  EQp 2  Requirement	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of openin within 10' of all building entrances.  Written policy required. Signage must be permaner	quipment D pgs, or on	PreReq ding air flow moni nt installed as par 24-Apr-2023 PreReq n site. Signage to ontain specified le	t of TI. Hultz BHU TPL be posted enguage.	Re
Y	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of opening within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.	quipmen D ggs, or ou	PreReq ding air flow moni  nt installed as par 24-Apr-2023 PreReq n site. Signage to ontain specified la 10-May-2023	t of TI. Hultz BHU TPL be posted enguage. TPL	Re-
Y 1	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps  1 EQ 1	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of openin within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.  Enhanced Indoor Air Quality Strategies	quipment Degs, or on	PreReq ding air flow moni nt installed as par 24-Apr-2023 PreReq n site. Signage to ontain specified la 10-May-2023 Attempting	t of TI. Hultz BHU TPL be posted enguage. TPL Hultz / BW	Red
Y 1	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of openin within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.  Enhanced Indoor Air Quality Strategies  Option 1: Implement entryway systems (10' inside in	quipmed D ggs, or on thank and co	PreReq ding air flow moni  nt installed as par 24-Apr-2023 PreReq n site. Signage to  ontain specified la 10-May-2023 Attempting ion of travel), MER	t of TI. Hultz BHU TPL be posted enguage. TPL Hultz / BW V 13 filtration	Re-
Y 1	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps  1 EQ 1	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of openin within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.  Enhanced Indoor Air Quality Strategies  Option 1: Implement entryway systems (10' inside is and separately exhaust chemical spaces. (1 p) OR	quipmen D pgs, or on the and continue of the c	PreReq ding air flow moni  nt installed as par 24-Apr-2023 PreReq n site. Signage to  ontain specified le 10-May-2023 Attempting fon of travel), MER 2: Exterior contain	t of TI. Hultz BHU TPL be posted  anguage. TPL Hultz / BW V 13 filtration mination	Re-
Y 1	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps  1 EQ 1	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of openin within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.  Enhanced Indoor Air Quality Strategies  Option 1: Implement entryway systems (10' inside is and separately exhaust chemical spaces. (1 p) OR prevention (evaluate ambient air quality at intakes)	quipmen  D  gs, or on  at and co  pn directi  Option	PreReq ding air flow moni  nt installed as par 24-Apr-2023 PreReq n site. Signage to  ontain specified la 10-May-2023 Attempting ion of travel), MER 2: Exterior contain ased ventilation,	t of TI. Hultz BHU TPL be posted  anguage. TPL Hultz / BW V 13 filtration mination	Re Re
Y 1	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps  1 EQ 1	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of openin within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.  Enhanced Indoor Air Quality Strategies  Option 1: Implement entryway systems (10' inside is and separately exhaust chemical spaces. (1 p) OR	quipmen  D  gs, or on  at and co  pn directi  Option	PreReq ding air flow moni  nt installed as par 24-Apr-2023 PreReq n site. Signage to  ontain specified la 10-May-2023 Attempting ion of travel), MER 2: Exterior contain ased ventilation,	t of TI. Hultz BHU TPL be posted  anguage. TPL Hultz / BW V 13 filtration mination	Re
Y 1	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps  1 EQ 1	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of opening within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.  Enhanced Indoor Air Quality Strategies  Option 1: Implement entryway systems (10' inside in and separately exhaust chemical spaces. (1 p) OR prevention (evaluate ambient air quality at intakes additional contaminant control or monitoring if approximate in the state of	quipment D gs, or on the and continue of the c	PreReq ding air flow moni  nt installed as par 24-Apr-2023 PreReq n site. Signage to  ontain specified la 10-May-2023 Attempting ion of travel), MER 2: Exterior contain ased ventilation, . (1 p)	t of TI. Hultz BHU TPL be posted anguage. TPL Hultz / BW V 13 filtration mination monitor CO2,	Re Re
Y 1	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps  1 EQ 1  Requirement	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of opening within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.  Enhanced Indoor Air Quality Strategies  Option 1: Implement entryway systems (10' inside in and separately exhaust chemical spaces. (1 p) OR prevention (evaluate ambient air quality at intakes additional contaminant control or monitoring if app	quipment D D and direction Option 2, incresolicable.	PreReq ding air flow moni  nt installed as par 24-Apr-2023 PreReq n site. Signage to  ontain specified la 10-May-2023 Attempting ion of travel), MER 2: Exterior contain ased ventilation, . (1 p)  be feasible. Monit	t of TI. Hultz BHU TPL be posted anguage. TPL Hultz / BW V 13 filtration mination monitor CO2,	Re Re
Y 1	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps  1 EQ 1	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of opening within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.  Enhanced Indoor Air Quality Strategies  Option 1: Implement entryway systems (10' inside is and separately exhaust chemical spaces. (1 p) OR prevention (evaluate ambient air quality at intakes additional contaminant control or monitoring if applications.  Option 2 increased ventilation and/or CO2 sensors ALL densely occupied spaces (Defined as 25 occupied spaces)	quipment D D and direction Option 2, incresolicable.	PreReq ding air flow moni  nt installed as par 24-Apr-2023 PreReq n site. Signage to  ontain specified la 10-May-2023 Attempting ion of travel), MER 2: Exterior contain ased ventilation, . (1 p)  be feasible. Monit	t of TI. Hultz BHU TPL be posted anguage. TPL Hultz / BW V 13 filtration mination monitor CO2,	Red
Y 1	Requirement  Notes  Next Steps  EQp 2  Requirement  Notes  Next Steps  1 EQ 1  Requirement	Meet ventilation requirements of ASHRAE 62.1-20 stations.  Outside air flow monitoring only required on new e Provide mechanical drawings.  Environmental Tobacco Smoke Control  No Smoking in building or within 25 feet of opening within 10' of all building entrances.  Written policy required. Signage must be permaner Identify signage locations.  Enhanced Indoor Air Quality Strategies  Option 1: Implement entryway systems (10' inside in and separately exhaust chemical spaces. (1 p) OR prevention (evaluate ambient air quality at intakes additional contaminant control or monitoring if applications.)  Option 2 increased ventilation and/or CO2 sensors ALL densely occupied spaces (Defined as 25 occupied spaces)	quipment D D and direction Option 2, incresolicable.	PreReq ding air flow moni  nt installed as par 24-Apr-2023 PreReq n site. Signage to  ontain specified la 10-May-2023 Attempting ion of travel), MER 2: Exterior contain ased ventilation, . (1 p)  be feasible. Monit	t of TI. Hultz BHU TPL be posted anguage. TPL Hultz / BW V 13 filtration mination monitor CO2,	Red

_	EQ 2	Low-Emitting Materials*	С	Attempting	BW
	Requirement	(v4.1) Achieve threshold of compliance for the follow	ving pr	oducts: Interior pai	nts &
		coatings at 75% emissions/100% VOC content per S			
		sealants at 75% emissions/100% VOC content per S			
		emissions; Composite Wood at 75% ULEF or no add			
		emissions; Ceilings at 90% of emissions; Insulation		•	
		by cost. 2 categories = 1 p, 3 categories = 2 p, 4 ca			
		exemplary.	.cgcc	σ σ <sub>β</sub> , σ σατοgo	20 <b>0</b> p
			n r o di i o	to points/sosting	a flooring
	Notes	4 categories are feasible with some attention to the	produc	is - paints/coating	s, nooring,
		insulation, ceilings are typical.			
_	Next Steps	Specifications		10-May-23	BW
	EQ 3	Construction IAQ Management Plan	С	Attempting	GC
	Requirement	Implement IAQ Management Plan, including keepir	ng HVA	C equipment and v	/ent
		openings sealed, protecting absorptive materials f	rom mo	oisture, and implem	nenting
		practices that protect air quality.			
	Notes	Standard practice. ArchE can provide a sample plan	if need	led.	
	Next Steps	Provide management plan.		25-Apr-2023	GC
T	2 EQ 4	Indoor Air Quality Assessment*	С	Attempting	BW
	Requirement	(v4.1) Option 1: Full flush out before occupancy of 14			
	Requirement				
		80 degree temp and 60% max humidity OR Partial			
		proceeding during occupancy at lower rate (1 p) OR	-		_
		particulate matter and inorganic gases to meet targ	get limi	ts. (1 p) AND/OR Pa	ıth 2: Air
		testing of VOCs (1 p).			
	Notes	Particulate and VOC testing.			
	Next Steps	Confirm Owner's interest in pursuing.		10-May-2023	BW
	1 EQ 5	Thermal Comfort	D	Attempting	BW
	Requirement	Design HVAC and envelope to meet ASHRAE 55-2	010 (or		
	- 1	CEN15251:2007) AND provide individual thermal co			
		spaces and ALL shared multi-occupant spaces. Col			
			ווויטוט ני	o dudress dir terrip	, radiant
		temp, air speed or humidity.			
	Notes	Likely to be undesirable given public setting and exist	sting z	oning.	
	Next Steps	Discuss desire to pursue with Owner.		26-Apr-2023	BW
	110/11000			Attempting	
	1 EQ 6		D	Attempting	Cross
		Interior Lighting	<u> </u>		
	1 EQ 6	Interior Lighting Option 1: For 90% of individual occupant spaces an	d all m	ulti-occupant spac	es, provide
	1 EQ 6	Interior Lighting Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND,	d all m OR <b>O</b>	ulti-occupant spac ption 2: Implemen	es, provide et 4 of 8
	1 EQ 6	Interior Lighting Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND/lighting strategies - a) No uplighting that can hit o	d all m /OR <b>O</b> ccupal	ulti-occupant space ption 2: Implement nts; b) CRI of 80+;	es, provide at 4 of 8 <b>c) Rated life</b>
	1 EQ 6	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND/lighting strategies - a) No uplighting that can hit of 24,000 hrs. or L70 for LED for 75% of connected.	d all m /OR <b>O</b> ccupai d load;	ulti-occupant spac ption 2: Implemen nts; b) CRI of 80+; d) Limit direct on	es, provide at 4 of 8 c) Rated life ly overhead
	1 EQ 6	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND/lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet give	d all m /OR <b>O</b> ccupai d load; /en thre	ulti-occupant spac ption 2: Implemen nts; b) CRI of 80+; d) Limit direct onlessholds for surface	es, provide at 4 of 8 c) Rated life ly overhead reflectance
	1 EQ 6	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND/lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance thres	d all m /OR O ccupai d load; /en thre	ulti-occupant spac ption 2: Implements; b) CRI of 80+; d) Limit direct onlesholds for surface for furniture; g) Mee	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall
	1 EQ 6	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet giv for 90% of occ. floor area; f) Meet reflectance thres surface illuminance reqs for 75% of occ. floor area,	d all m /OR O ccupai d load; /en thre sholds t	ulti-occupant space ption 2: Implements; b) CRI of 80+; ad) Limit direct onleasholds for surface for furniture; g) Meenth with e) and f); or h)	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall
	1 EQ 6	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND/lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance thres	d all m /OR O ccupai d load; /en thre sholds t	ulti-occupant space ption 2: Implements; b) CRI of 80+; ad) Limit direct onleasholds for surface for furniture; g) Meenth with e) and f); or h)	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall
	1 EQ 6	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet giv for 90% of occ. floor area; f) Meet reflectance thres surface illuminance reqs for 75% of occ. floor area,	d all m /OR O ccupai d load; /en thre sholds t	ulti-occupant space ption 2: Implements; b) CRI of 80+; ad) Limit direct onleasholds for surface for furniture; g) Meenth with e) and f); or h)	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall
	1 EQ 6	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance three surface illuminance reqs for 75% of occ. floor area, illuminance reqs for 75% of occ. floor area, along w	d all m /OR O ccupai d load; /en thre sholds t along v	ulti-occupant space ption 2: Implements; b) CRI of 80+; et d) Limit direct one esholds for surface for furniture; g) Mee with e) and f); or h) nd f). (1 p)	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall Meet ceiling
	1 EQ 6	Interior Lighting  Option 1: For 90% of individual occupant spaces and controls with at least 3 levels of lighting. (1 p) AND/ lighting strategies - a) No uplighting that can hit of 24,000 hrs. or L70 for LED for 75% of connected lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance three surface illuminance reqs for 75% of occ. floor area, illuminance reqs for 75% of occ. floor area, along with all new lighting planned one option or the other.	d all m /OR O ccupai d load, ven thre sholds t along v ith e) a	ulti-occupant space ption 2: Implements; b) CRI of 80+; cd) Limit direct onleasholds for surface for furniture; g) Mee with e) and f); or h) nd f). (1 p) s feasible. Option	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall Meet ceiling
	1 EQ 6 Requirement	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance three surface illuminance reqs for 75% of occ. floor area, illuminance reqs for 75% of occ. floor area, along w	d all m /OR O ccupai d load, ven thre sholds t along v ith e) a	ulti-occupant space ption 2: Implements; b) CRI of 80+; cd) Limit direct onleasholds for surface for furniture; g) Mee with e) and f); or h) nd f). (1 p) s feasible. Option	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall Meet ceiling
	1 EQ 6 Requirement	Interior Lighting  Option 1: For 90% of individual occupant spaces and controls with at least 3 levels of lighting. (1 p) AND/ lighting strategies - a) No uplighting that can hit of 24,000 hrs. or L70 for LED for 75% of connected lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance three surface illuminance reqs for 75% of occ. floor area, illuminance reqs for 75% of occ. floor area, along with all new lighting planned one option or the other.	d all m /OR O ccupai d load, ven thre sholds t along v ith e) a	ulti-occupant space ption 2: Implements; b) CRI of 80+; cd) Limit direct onleasholds for surface for furniture; g) Mee with e) and f); or h) nd f). (1 p) s feasible. Option	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall Meet ceiling
	1 EQ 6 Requirement	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance three surface illuminance reqs for 75% of occ. floor area, illuminance reqs for 75% of occ. floor area, along w  With all new lighting planned one option or the othe feasible with dimming switches but may require task	d all m /OR O ccupai d load, ven thre sholds t along v ith e) a	ulti-occupant space ption 2: Implements; b) CRI of 80+; cd) Limit direct onleasholds for surface for furniture; g) Mee with e) and f); or h) nd f). (1 p) s feasible. Option	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall Meet ceiling
	Requirement  Notes  Next Steps	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet giv for 90% of occ. floor area; f) Meet reflectance thres surface illuminance reqs for 75% of occ. floor area, illuminance reqs for 75% of occ. floor area, along w  With all new lighting planned one option or the othe feasible with dimming switches but may require task	d all m /OR O ccupai d load, yen thre sholds t along v ith e) a	ulti-occupant space ption 2: Implements; b) CRI of 80+; at d) Limit direct onlessholds for surface for furniture; g) Mee with e) and f); or h) and f). (1 p) s feasible. Option for workstation st	es, provide at 4 of 8 c) Rated life by overhead reflectance et wall Meet ceiling  1 is typically yle spaces.  Cross
	Notes  Next Steps  3 EQ 7	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet giv for 90% of occ. floor area; f) Meet reflectance thres surface illuminance reqs for 75% of occ. floor area, illuminance reqs for 75% of occ. floor area, along w  With all new lighting planned one option or the othe feasible with dimming switches but may require task  Provide lighting plan and light fixture schedule.  Daylight*	d all m /OR O ccupai d load, yen thre sholds t along v ith e) a r seem	ulti-occupant space ption 2: Implements; b) CRI of 80+; at at Limit direct onless for surface for furniture; g) Mee with e) and f); or h) and f). (1 p) s feasible. Option for workstation st  12-May-2023  Attempting	es, provide at 4 of 8 c) Rated life by overhead reflectance et wall Meet ceiling I is typically yle spaces.  Cross  ArchE
	Requirement  Notes  Next Steps	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance three surface illuminance reas for 75% of occ. floor area, illuminance reas for 75% of occ. floor area, along w  With all new lighting planned one option or the other feasible with dimming switches but may require task  Provide lighting plan and light fixture schedule.  Daylight*  (v4.1) Provide glare control AND Option 1: Use simulations.	d all m //OR O ccupan d load, ven thre sholds t along v ith e) a r seem t lamps	ulti-occupant space ption 2: Implements; b) CRI of 80+; et d) Limit direct onless for surface for furniture; g) Mee with e) and f); or h) and f). (1 p) s feasible. Option for workstation st  12-May-2023  Attempting or demonstrate ave	es, provide at 4 of 8 c) Rated life by overhead reflectance et wall Meet ceiling I is typically yle spaces.  Cross  ArchE rage
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	Notes  Next Steps  3 EQ 7	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit o of 24,000 hrs. or L70 for LED for 75% of connecte lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance threes surface illuminance reas for 75% of occ. floor area, illuminance reas for 75% of occ. floor area, along w  With all new lighting planned one option or the other feasible with dimming switches but may require task  Provide lighting plan and light fixture schedule.  Daylight*  (v4.1) Provide glare control AND Option 1: Use simulation 40%/55%/75% spatial daylight autonomy (1-3 p). OR illuminance between 300 and 3000 lux for 55%/75	d all m /OR O //OR	ulti-occupant space ption 2: Implements; b) CRI of 80+; et a) Limit direct onless for surface for furniture; g) Mee with e) and f); or h) and f). (1 p) s feasible. Option for workstation st  12-May-2023  Attempting or demonstrate average a 2: Simulation to a regularly occupied	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall Meet ceiling  1 is typically yle spaces.  Cross  ArchE rage lemonstrate I area (1-3 p);
	Notes  Next Steps  3 EQ 7	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit of 24,000 hrs. or L70 for LED for 75% of connected lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance three surface illuminance reas for 75% of occ. floor area, illuminance reas for 75% of occ. floor area, along with all new lighting planned one option or the other feasible with dimming switches but may require task Provide lighting plan and light fixture schedule.  Daylight*  (v4.1) Provide glare control AND Option 1: Use simulation 40%/55%/75% spatial daylight autonomy (1-3 p). OR illuminance between 300 and 3000 lux for 55%/75 Or Option 3: Measurement to demonstrate illuminance.	d all m /OR O //OR	ulti-occupant space ption 2: Implements; b) CRI of 80+; et a) Limit direct onless for surface for furniture; g) Mee with e) and f); or h) and f). (1 p) s feasible. Option for workstation st  12-May-2023  Attempting or demonstrate average a 2: Simulation to a regularly occupied	es, provide at 4 of 8 c) Rated life ly overhead reflectance et wall Meet ceiling  1 is typically yle spaces.  Cross  ArchE rage lemonstrate I area (1-3 p);
	Notes  Next Steps  3 EQ 7  Requirement	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit of 24,000 hrs. or L70 for LED for 75% of connected lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance threes surface illuminance reas for 75% of occ. floor area, illuminance reas for 75% of occ. floor area, along with all new lighting planned one option or the other feasible with dimming switches but may require task Provide lighting plan and light fixture schedule.  Daylight*  (v4.1) Provide glare control AND Option 1: Use simulation 40%/55%/75% spatial daylight autonomy (1-3 p). OR illuminance between 300 and 3000 lux for 55%/75 Or Option 3: Measurement to demonstrate illuminates 55%/75%/90% regularly occupied area.(1-3 p)	d all m /OR O /OR	ulti-occupant space ption 2: Implements; b) CRI of 80+; et d) Limit direct onless for furniture; g) Mee with e) and f); or h) and f). (1 p) s feasible. Option for workstation st  12-May-2023  Attempting a demonstrate ave a 2: Simulation to a regularly occupied tween 300 and 30	es, provide at 4 of 8 c) Rated life by overhead reflectance et wall Meet ceiling I is typically yle spaces.  Cross  ArchE rage lemonstrate I area (1-3 p); 00 lux for
	Notes  Next Steps  3 EQ 7  Requirement	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit or of 24,000 hrs. or L70 for LED for 75% of connected lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance threes surface illuminance reast for 75% of occ. floor area, illuminance reast for 75% of occ. floor area, along with all new lighting planned one option or the other feasible with dimming switches but may require task provide lighting plan and light fixture schedule.  Daylight*  (v4.1) Provide glare control AND Option 1: Use simulation 40%/55%/75% spatial daylight autonomy (1-3 p). OR illuminance between 300 and 3000 lux for 55%/75 Or Option 3: Measurement to demonstrate illuminates 55%/75%/90% regularly occupied area.(1-3 p)  Can be difficult to achieve. DL Simulation required with the option of the same control with the control of the	d all m /OR O /OR	ulti-occupant space ption 2: Implements; b) CRI of 80+; et d) Limit direct onlessholds for surface for furniture; g) Mee with e) and f); or h) and f). (1 p) s feasible. Option for workstation st  12-May-2023  Attempting a demonstrate ave a 2: Simulation to a regularly occupied tween 300 and 30  guarantee of succe	es, provide at 4 of 8 c) Rated life by overhead reflectance et wall Meet ceiling  I is typically yle spaces.  Cross ArchE rage lemonstrate I area (1-3 p); 00 lux for
	Notes  Next Steps  3 EQ 7  Requirement	Interior Lighting  Option 1: For 90% of individual occupant spaces an controls with at least 3 levels of lighting. (1 p) AND, lighting strategies - a) No uplighting that can hit of 24,000 hrs. or L70 for LED for 75% of connected lighting to 25% or less of lighting load; e) Meet give for 90% of occ. floor area; f) Meet reflectance threes surface illuminance reas for 75% of occ. floor area, illuminance reas for 75% of occ. floor area, along with all new lighting planned one option or the other feasible with dimming switches but may require task Provide lighting plan and light fixture schedule.  Daylight*  (v4.1) Provide glare control AND Option 1: Use simulation 40%/55%/75% spatial daylight autonomy (1-3 p). OR illuminance between 300 and 3000 lux for 55%/75 Or Option 3: Measurement to demonstrate illuminates 55%/75%/90% regularly occupied area.(1-3 p)	d all m /OR O /OR	ulti-occupant space ption 2: Implements; b) CRI of 80+; et d) Limit direct onless for furniture; g) Mee with e) and f); or h) and f). (1 p) s feasible. Option for workstation st  12-May-2023  Attempting a demonstrate ave a 2: Simulation to a regularly occupied tween 300 and 30	es, provide at 4 of 8 c) Rated life by overhead reflectance et wall Meet ceiling  T is typically yle spaces.  Cross  ArchE rage lemonstrate d area (1-3 p); 00 lux for

	1 EQ 8	Quality Views	D	Attempting	ArchE
	Requirement	Direct line of site to outdoors for 75% of regularly of			
		quality factors - multiple lines of sight 90% apart; flo			
		unobstructed views within 3 times head height; view			
		study.			
	Notes	Review floor plan for feasibility.			
	Next Steps	Assess floor plans, windows and sections.		26-Apr-2023	ArchE
2	EQ 9	Acoustic Performance*	D	Attempting	BW
	Requirement	(v4.1) For all occupied spaces, meet two of the follo	wing cr	riteria: HVAC back	ground
		noise; sound transmission; or reverberation time. A	coustic	engineer likely ne	eded.
	Notes	With an acoustic engineer / consultant this credit is a	attainal	ole.	
	Next Steps	Verify Owner's desire to pursue.		26-Apr-2023	BW
6	Innova				ossible Points:
1	In 1.1	Purchasing - Lamps	D	Attempting	Cross
	Requirement	Reduce the amount of mercury brought onto the bu	ıilding s	site. Provide LED l	amps.
	Notes	100% LEDs will comply.			
	Next Steps	Generate light fixture schedule.	_	26-Apr-2023	Cross
	In 1.2	All-Gender Restrooms (Pilot)	D	Attempting	BW
1					II IITI-STAII
1   _	Requirement	Two single-stall, all-gender restrooms shall be prov			
1   _	Requirement	gendered restrooms. The single-stall facilities shall	meet A	ADA or equivalent	local code,
1	Requirement	· ·	meet A	ADA or equivalent	local code,
1	Requirement	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restro	meet A oom lay	ADA or equivalent wout and accessibi	local code, ility.
1	Requirement	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restro	meet A oom lay	ADA or equivalent wout and accessibi	local code, ility.
1	Notes	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restro  Must meet LEED Indoor Water Use Reduction Prerection Prerection Presents and Pr	meet A oom lay	ADA or equivalent vout and accessibi	local code, ility. provide free
	Notes Next Steps	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restro  Must meet LEED Indoor Water Use Reduction Prerecements hygiene materials.  Verify restroom plans	meet A oom lay quisite	ADA or equivalent vout and accessibitequirements and	local code, ility. provide free
1	Notes Next Steps In 1.3	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restroments makes the stringent of the str	meet A pom lay quisite D	ADA or equivalent vout and accessibitequirements and 10-May-2023 Attempting	local code, ility. provide free BW TPL
	Notes Next Steps	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restrooms.  Must meet LEED Indoor Water Use Reduction Prered menstrual hygiene materials.  Verify restroom plans  Comprehensive Composting (Pilot)  Requires hauling agreement or mandate; signage of	meet A pom lay quisite D	ADA or equivalent vout and accessibitequirements and 10-May-2023 Attempting	local code, ility. provide free BW TPL
	Notes Next Steps In 1.3	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restrooms. The single-stall facilities shall whichever is more stringent, requirements for restroom plans.    Verify restroom plans	meet A pom lay quisite  D pon cont	ADA or equivalent vout and accessibite requirements and 10-May-2023 Attempting tainers; signage for	provide free  BW TPL r appropriate
	Notes Next Steps In 1.3	materials; and evaluation process.  Jensel Requires the single-stall facilities shall whichever is more stringent, requirements for restrong the stringent of t	quisite  D  D  cont	ADA or equivalent and accessibile requirements and accessibile requirements and allowed the second accessibility and accessibility accessibility and accessibility and accessibility accessibility accessibility accessibility and accessibility a	provide free  BW TPL r appropriate
	Notes  Next Steps  In 1.3  Requirement  Notes	must meet LEED Indoor Water Use Reduction Prerections restrouted by Provide Signage of materials; and evaluation process.  Locate organic waste receptacles wherever there are Provide signage that clearly illustrates what is acceptacles.	quisite  D  D  cont	ADA or equivalent and accessibile requirements and 10-May-2023 Attempting ainers; signage for the signage and landfill rempost.	provide free  BW TPL r appropriate
1	Notes Next Steps In 1.3 Requirement Notes Next Steps	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restrooms. The single-stall facilities shall whichever is more stringent, requirements for restroom restroin menstrual hygiene materials.  Verify restroom plans  Comprehensive Composting (Pilot)  Requires hauling agreement or mandate; signage of materials; and evaluation process.  Locate organic waste receptacles wherever there are Provide signage that clearly illustrates what is acceptance and collection service with City of Tacoma.	meet Apport lay	ADA or equivalent vout and accessibile requirements and 10-May-2023 Attempting ainers; signage for eling and landfill rempost.	provide free  BW TPL r appropriate eceptacles. TPL
	Notes Next Steps In 1.3 Requirement  Notes Next Steps In 1.4	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restrooms. The single-stall facilities shall whichever is more stringent, requirements for restroom plans.  Must meet LEED Indoor Water Use Reduction Prerection menstrual hygiene materials.  Verify restroom plans  Comprehensive Composting (Pilot)  Requires hauling agreement or mandate; signage of materials; and evaluation process.  Locate organic waste receptacles wherever there are Provide signage that clearly illustrates what is acceptance acceptance with City of Tacoma.  High Priority Site	meet Apport lay	ADA or equivalent yout and accessibile requirements and 10-May-2023 Attempting ainers; signage for empost. 10-May-2023 Attempting additional and signature and landfill response.	provide free  BW TPL r appropriate eceptacles.  TPL ArchE
1	Notes Next Steps In 1.3 Requirement Notes Next Steps	gendered restrooms. The single-stall facilities shall whichever is more stringent, requirements for restrooms. The single-stall facilities shall whichever is more stringent, requirements for restroom restroom plans.  Werify restroom plans  Comprehensive Composting (Pilot)  Requires hauling agreement or mandate; signage of materials; and evaluation process.  Locate organic waste receptacles wherever there are Provide signage that clearly illustrates what is acceptary agreement or mandate; signage of the provide signage that clearly illustrates what is acceptary are provided in the process.  High Priority Site  Historic district infill or Priority designation or Brown	meet Apport lay	ADA or equivalent yout and accessibile requirements and 10-May-2023 Attempting ainers; signage for empost. 10-May-2023 Attempting additional and signature and landfill response.	provide free  BW TPL r appropriate eceptacles.  TPL ArchE
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# ALTERATION PROJECT PROCEDURES, CUTTING, AND PATCHING

#### **SECTION 01 35 16**

## **ALTERATION PROJECT PROCEDURES, CUTTING AND PATCHING**

### PART 1 - GENERAL

### 1.01 SECTION INCLUDES

- Alteration Project Procedures.
- B. Cutting and Patching.

# 1.02 REGULATORY REQUIREMENTS

- A. Obtain required permits from authorities.
- B. Do not close or obstruct egress from any building exit.
- C. Do not disable or disrupt existing building utilities or fire and life safety systems without 3 days prior written notice to the Owner; proceed only after receiving the Owner's confirmation of approval.
- D. Conform to procedures and requirements of authorities having jurisdiction when hazardous or contaminated materials are discovered. Notify the Owner and Architect immediately.

### 1.03 QUALIFICATIONS

A. Contractor's on-site management personnel shall be competent to survey the condition of the structures and building systems to determine both their condition and the possibility of unplanned structural collapse or failure. Management Personnel shall be capable of taking prompt corrective action when necessary to protect the safety of persons and the integrity of the building structure or systems.

## B. DEFINITIONS:

- SKILLED CRAFTSMAN is someone who has journeyman level abilities in a specific trade or craft and is currently working at that trade or craft on a regular basis, is capable of competently performing all aspects of the specific trade or craft and, if work has special warranties involved, has received special training to qualify their work for warranty.
- QUALIFIED INSTALLER is someone who has journeyman level abilities for installing a particular product or system and is currently doing this installation work on a regular basis, is capable of competently performing all aspects of the installation and, if work has special warranties involved, has received special training to qualify their work for warranty.

## ALTERATION PROJECT PROCEDURES, CUTTING, AND PATCHING

- C. Demolition, moving, removing, cutting and drilling is required to be performed by trades qualified to perform the work in a manner to cause the least damage and disruption to existing structure and finishes. Use skilled craftsmen or qualified installers wherever waterproof integrity, structural integrity, sight-exposed finishes or materials or systems that are under warranty are involved.
- D. Patching, repair and restoration work shall be accomplished by skilled craftsmen and qualified installers in those specific trades that normally perform the type of work required (e.g. finish carpentry work by a finish carpenter, plaster work by a plasterer, etc.).

### 1.04 QUALITY ASSURANCE

- A. Assign the specific demolition, cutting and patching work required for the work of this contract to the appropriate skilled craftsman or qualified installer.
- B. Lay out, coordinate, and direct the demolition and cutting accomplished by the various trades to:
  - 1. Minimize patching work required for restoration.
  - 2. Accommodate the existing conditions.
  - 3. Prevent damage to existing building structure, finishes or equipment / systems.
  - 4. Prevent removal or cutting of existing elements intended to remain.

#### 1.05 PROTECTION

- A. Protect and prevent damage to existing finishes, equipment / systems and adjacent work scheduled to remain.
- B. Protection shall include, but not be limited to, wood timbers or framing, plywood panels, plastic sheeting, canvas drop cloths, carpet scraps etc. or anything required to protect item(s) or areas from damage.
- C. Protection shall be in place prior to specific demolition, cutting or patching work is started.

#### 1.06 EXISTING CONDITIONS

A. UNFORESEN CONDITIONS: Should unforeseen conditions be encountered that affect the design or function of the project or the structural or functional integrity of the structure or any building system, notify the Architect and Owner immediately in writing.

# PART 2 - PRODUCTS

#### 2.01 PRODUCTS / MATERIALS FOR PATCHING AND EXTENDING WORK

- A. New Products / Materials: As specified in Product sections; match existing products / materials and work for patching and extending work.
- B. Type and Quality of Existing Products / Materials: Determine by inspecting and testing Products where necessary, referring to existing Work as a standard.
- C. As applicable, salvage sufficient quantities of cut or removed material to replace damaged work of existing construction, when materials are not obtainable on the current market. Do not incorporate salvaged or used materials in new construction except with permission of Architect and Owner or as described in contract documents. Protect stored salvage items in dry, secure place.

#### PART 3 - EXECUTION

#### 3.01 COORDINATION

A. Review, coordinate and accommodate work of other trades that interface with, affect or are affected by the work of this section so as to facilitate the execution of the overall Work of this project in a coordinated and efficient manner.

#### 3.02 ALTERATION PROJECT PROCEDURES

# A. PREPARATION

- 1. Replace and restore at completion.
- 2. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- 3. Remove debris and abandoned items from area and from concealed spaces.
- 4. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.
- 5. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Insulate duct work and piping to prevent condensation in exposed areas.

### B. INSTALLATION

1. Coordinate and direct the work of alterations and renovations to expedite completion sequentially.

# ALTERATION PROJECT PROCEDURES, CUTTING, AND PATCHING

- 2. Remove, cut and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original condition. If original condition is substandard or damaged, restore to level of quality required for new work.
- Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes
- 4. Install Products as specified in individual sections.

# C. TRANSITIONS

- 1. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patched Work to match existing adjacent Work in texture and appearance.
- 2. When finished surfaces are cut so that a smooth transition with new Work is not possible, review condition with architect on site and submit an RFI with photos and dimensions that clearly outlines the challenge and proposed solution.

### D. ADJUSTMENTS

- 1. Where a change of plane occurs, provide a smooth transition
- 2. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.
- 3. Fit work at penetrations of surfaces as described in Cutting and Patching.

### E. REPAIR OF DAMAGED SURFACES

- 1. Patch or replace portions of existing surfaces which are damaged, lifted, discolored or showing other imperfections.
- 2. Repair substrate prior to patching finish.

### F. FINISHES

- 1. Finish surfaces as specified in individual Product sections.
- 2. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

#### 3.03 CUTTING AND PATCHING

### A. EXAMINATION:

- 1. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- 2. After uncovering existing work, inspect conditions affecting performance of work.
- 3. Beginning of cutting or patching means acceptance of existing conditions.

### B. PREPARATION

- Layout and coordinate the cutting work so that new work can be completed free from conflicts with work of other trades and existing conditions / systems not scheduled for removal. Do not proceed with cutting work until conflicts are resolved.
- 2. Provide, erect and maintain temporary barriers and exterior enclosures and protect existing and installed work.
- 3. Provide temporary supports, braces or shoring to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- 4. Provide protection from elements for areas which may be exposed by uncovering work.
- 5. Maintain excavations free of water.

# C. CUTTING AND PATCHING

- 1. Provide the tools and equipment best suited for the specific type of cutting and patching required.
- 2. Plan and execute cutting work in a manner that results in the least negative impact to the surrounding work.
- 3. Execute cutting, fitting and patching including excavation and fill, wherever necessary to construct the work.
- 4. Fit products together, to integrate with other work.
- 5. Uncover work to install ill-timed work.
- 6. Remove and replace defective or non-conforming work.
- 7. Remove samples of installed work for testing, when requested.
- 8. Provide openings in the work for penetration of mechanical and electrical work.

### ALTERATION PROJECT PROCEDURES, CUTTING, AND PATCHING

9. Provide access for installation of items too large to fit through permanent openings.

### D. PERFORMANCE

- 1. Execute work using methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- 2. Employ skilled craftsmen and / or qualified installer to perform cutting and patching for weather exposed and moisture resistant elements, sight-exposed surfaces and warranted work.
- 3. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval. Do not overcut corners of materials exposed to view or where overcutting would weaken its structural integrity.
- 4. Restore work with new products in accordance with requirements of Contract Documents.
- 5. Fit work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- 6. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with fire rated material of equal fire rating.
- 7. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

## 3.04 EXISTING ITEMS FOR REUSE

- A. Walk site prior to start of demolition with owner and architect to review items intended for salvage or reuse.
- B. Remove the existing item carefully so as not to damage the item.
- C. Carefully clean item and store item in a protected location.
- D. If the item is damaged during the removal process, replace with new that matches the existing at the Contractor's expense.
- E. Reinstall item using procedures for installing new work.

## **PART 1 GENERAL**

#### 1.1 SECTION INCLUDES

- A. Definitions.
- B. Industry Standards.
- C. Abbreviations and Acronyms.

### 1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to project site ready for unloading, unpacking, assembly, installation and similar operations
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

#### 1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
- D. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### 1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade &

Professional Associations of the U.S."

# PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Visual mockups.
- B. Constructability mockups.

### 1.2 RELATED REQUIREMENTS

- A. 01 45 00 Quality Control: for general mockup, testing and inspection requirements.
- B. Section 09 90 00 Painting and Coatings.

### 1.3 DEFINITIONS

A. Visual Mockups: Mockups to verify selections made under sample submittals, at scale, and in actual atmospheric or artificial lighting; and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Presubmittal Meeting:
  - 1. Meet two weeks or more prior to submittal to discuss design intent, project specific challenges and pending options of the design.
  - 2. Follow the agenda for a Presubmittal meeting and modify as necessary.
    - a. Agenda will include:
      - 1) Components and finishes of products to be included in mockup.
      - 2) Pending options of the design.
      - 3) Mockup size, configuration, and construction.

## B. Preinstallation Meeting:

- 1. Meet one week prior to beginning installation of mockups.
- 2. Follow the agenda for a Preinstallation meeting and modify as necessary.
  - a. Agenda will include:
    - 1) Typical issues for installation.
    - 2) Location, and temporary or designed lighting provided.
    - 3) Recovery planning for failure of mockup to meet requirements.

- 3. Beyond typical issues for installation discuss scheduling for on-site construction testing and recovery planning for failure of mockup to meet requirements.
- 4. Include process to modify or reconstruct mockups as required to meet requirements.

#### 1.5 SUBMITTALS

- A. Shop Drawings for Visual:
  - 1. Include plans, elevations, sections, and details.
  - 2. Include details of provisions for assembly seismic performance, expansion and contraction, and for draining moisture occurring within the assembly to the exterior.
- B. Shop Drawings for Visual Mockups:
  - 1. Include plans, elevations, sections, and details.
  - 2. Include details showing interactions and connections to adjacent materials.
- C. Photographs:
  - 1. Visual and Constructability Mockup:
    - a. Submit plan, elevation, and axonometric digital color images of completed mockup; if in-place, indicate building location of mockup on photographs.
- D. Field quality-control reports: Test and Inspection reports; include retesting, and modified, reconstructed, or corrective measures as required.

#### 1.6 MOCKUPS - GENERAL

- A. Build mockups at the project site using personnel, materials, and methods of construction that will be used in construction of the project.
- B. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- C. Approved mockups may become part of the completed Work if specifically allowed by the Contract Documents and undisturbed at time of Substantial Completion.
- D. Locate mockups in an area approved by Owner and Architect. Mockup location to allow for frequent access by construction workers, Owner, and Architect during envelope or interior construction.
- E. Mockups to be viewed in atmospheric or artificial lighting representative of the installed condition.

### PART 2 PRODUCTS - NOT USED

#### PART 3 EXECUTION

## 3.1 PREPARATION

A. Prepare test chambers as specified below, to comply with required mockup construction, testing, review, and approval schedule.

#### 3.2 EXAMINATION

A. Inspection required to confirm testing chambers have been built in compliance with testing methods to be performed.

### 3.3 FIELD QUALITY CONTROL

- A. Pass of all performance testing and corrective measures as required and recorded in test reports.
- B. Refer to Field Quality Control requirements in individual specification sections.

### 3.4 SCHEDULE OF MOCKUPS

- A. Mockup #01 Visual Mockup:
  - 1. Description: Paint Swatches for each interior accent color.
  - 2. Reviews:
    - a. Architecture and Owner review.
- B. Mockup #02 Visual Mockup:
  - 1. Description: Installation of Linerar Light Fixture with existing ACT ceiling
  - 2. Reviews:
    - a. Architecture and Owner review .
- C. Mockup #03 Visual Mockup:
  - 1. Description: Glu Lam stair tread with Integrated Nosing
  - 2. Reviews:
    - a. Architecture, Owner, and Lighting Designer review.
    - C. Mockup #03 Visual Mockup:
  - D. All other mockups described in specific specification sections.

#### **SECTION 01 45 00**

#### **QUALITY CONTROL**

### **PART 1 - GENERAL**

#### 1.01 SECTION INCLUDES

A. Administrative and procedural requirements for project quality control.

# 1.02 REFERENCES

- A. References shall be the edition current as of the date of the Contract Documents.
- B. Obtain current copies of referenced standards.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- E. Applicable Standards include but are not limited to all building codes listed on the contract documents drawings as well as:
  - 1. ICC / ANSI A117 Accessible and Usable Buildings and Facilities
  - 2. 2010 ADA Standards for Accessible Design

#### 1.03 CONTRACTOR'S QUALITY ASSURANCE / CONTROL OF CONSTRUCTION

- A. Employ / assign quality control personnel to monitor the work of this project for conformance to the requirements of the Contract Documents and to good construction practices.
  - 1. Prior to starting their work, review the scope of work, performance requirements, materials and workmanship requirements with each trade and subcontractor.
  - 2. Review materials when delivered to the site for conformance to the Contract Documents and submittals.
  - 3. Monitor work in progress for conformance to the Contract Documents and submittals.
- B. Contractor is solely responsible for managing and controlling the quality of the work and conformance with the requirements of the Contract Documents.

- C. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Work shall be performed by trained and experienced workers qualified to produce workmanship of specified quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion and disfigurement.

#### 1.04 ADA TOLERANCES

- A. ADA Tolerances: The ADA tolerances shown on the Drawings represent the allowable tolerances required for conformance with the ADA and ICC / ANSI A117. Strict conformance with the ADA tolerances shown on the Drawings is required for this project; non-conforming work will require correction at Contractor's expense.
  - 1. ADA tolerances shown on the Drawings supersede industry standard tolerances and any other tolerances included in any specification section.
- B. Submittal Review: Review submittals for conformance with the accessibility requirements of ICC / ANSI A117 and the ADA tolerances shown on the Drawings; mark up submittals that have incorrect or missing ADA tolerance information.
- C. Review with Workers: Review the accessibility requirements of ICC / ANSI A117 and the ADA tolerances shown on the Drawings with workers performing work that is required to conform to the accessibility requirements of ICC / ANSI A117.
- D. Monitoring: Monitor the work of this project for compliance with the accessibility requirements of ICC / ANSI A117 and the ADA tolerances shown on the Drawings on work that is required to conform to ICC / ANSI A117.
- E. Inspection: Inspect the completed work that is required to conform to ICC / ANSI A117 for conformance with the ADA tolerances shown on the Drawings. Inspection shall require accurate measurements to confirm that dimensions, slopes and relationships shown on the Drawings have been constructed within the ADA tolerances shown on the Drawings.

## 1.05 MANUFACTURER'S INSTRUCTIONS

- A. Comply with manufacturer's installation / assembly instructions in full detail, including each step in sequence.
- B. Substrates, Site Conditions And Work By Others shall conform to manufacturer's requirements:

- 1. Inspect substrate, site conditions and work by others for conformance to manufacturer's requirements for material and condition prior to starting any work.
- 2. Do not start work if substrate construction, site conditions or work by others does not comply with manufacturer's recommendations; report any problems to Contractor and Architect.
- 3. Start of work / installation indicates installer's acceptance of substrate, site conditions and work by others as meeting manufacturer's requirements.
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Architect before proceeding.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

## **PART 1 GENERAL**

#### 1.1 SECTION INCLUDES

A. Pressurized Air Barrier Testing.

# 1.2 RELATED REQUIREMENTS

A. Division 03, 05, 07 and 08 sections enclosing the building: for components of air barrier.

#### 1.3 DEFINITIONS

- A. Air Barrier System: Combinations of air barrier assemblies that provides designated plane of reduced air flow between different environments of building enclosure system.
- B. Air Barrier Assembly: Air barrier materials and components that provide designated plane of reduced air flow between environments in portions of building enclosure system.
- Air Barrier Material: Primary element that provides designated plane of reduced air flow between different environments.
- D. Accessory Material: Transitional component of air barrier that provides continuity.
- E. Air Leakage Rate: Rate of air flow in liters per second (L/s), per unit area in square meters (m2), per unit of static pressure differential in Pascals (Pa).
- F. Air Permeance Rating: Quantitative measure of air diffusion through set surface area of material within a given time period under pressure differential between two sides of a material (in liters per second per square meter).
- G. Water Vapor Permeability: Coefficient of permeance to unit film thickness. Do not use except where film thickness is known and material is homogeneous.
- H. Water Vapor Permeance: Ratio of unit water vapor transmission ratio (WVTR) to vapor pressure between two parallel surfaces of a flat material of known thickness.
- I. Water Vapor Transmission Rate (WVTR): Steady water vapor flow in unit time through unit area of between specific parallel surfaces of a material, under specific conditions of temperature and humidity at each surface.

#### 1.4 QUALITY ASSURANCE

- A. Air Barrier Testing Agency Qualifications:
  - 1. Accepted by Owner and authorities having jurisdiction to perform testing and investigations of the addition only building air barrier.
  - ABAA affiliated, specializing in work of this Section. Able to show minimum 2 years
    experience testing to determine air leakage of air barrier assembly. Accepted by
    Authority Having Jurisdiction.

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**Building Envelope Air Barrier Testing** 

- 3. Employing qualified personnel to perform testing and inspections required under work of this Section.
  - a. Continuous Air Barrier Pressure Testing Personnel: Able to document minimum 2 years of experience testing to ASTM E779.
  - b. Infrared Thermographer: ANST Level I Certified to perform infrared diagnostic evaluation or documented minimum 2 years experience performing building infrared thermography equivalent in scope and quality as specified by this Section.

#### 1.5 SUBMITTALS

- A. Testing Plan and Procedures: Submit testing plan and procedures. Include a complete set of report forms and sample documentation.
  - Indicate extent of testing area(s) if building is divided into sections. Preparation and testing sequence, temporary construction required including, details for contractor to use when preparing site and openings for testing, location and construction of partitions/separations.
  - 2. Include procedures and coordination with other work in progress and a detailed description of methods and equipment to be used for each operation and of the sequence of operations.
- B. Preliminary Report: Submit preliminary report showing a pass or fail test result, all data used in calculation of test using one of the following: infrared scanning thermal images, smoke tracer, air-flow measuring, generated sound and sound detection, tracer gas detection documenting air leakage and locations of leaks.
  - 1. Include suggested remedies.
- C. Final Report: Submit a final report showing a pass or fail test result, all data used in calculation of test and infrared scanning thermal images, smoke tracer, air-flow measuring, generated sound and sound detection, or tracer gas detection documenting air leakage and locations of leaks.
  - 1. Include suggested remedies.

#### 1.6 PRESSURIZED AIR BARRIER TESTING

- A. Testing Agencies:
  - Morrison Hershfield.
    - a. Website: https://morrisonhershfield.com.
  - 2. Neudorfer Engineers, Inc.
    - a. Website: http://www.neudorferengineers.com.
  - 3. Substitution Requests: Submit under provisions of Section 01 60 00 Product Requirements.

- a. RDH Building Science.
  - 1) Website: https://www.rdh.com.
- 4. Testing Agency Requirements:
  - a. Cooperate with Architect and Contractor in performance of agency's duties.
  - b. As required by Seattle Energy Code:
    - 1) Perform testing and investigations of the addition only conforming to Section C402.5.1.2 and C502.1 of Seattle Energy Code.
    - Where exceeding 0.25 cfm/sq ft at 75 Pascals pressure differential, perform a visual inspection of the air barrier and seal any leaks noted.
    - Complete report prior to occupancy in conformance with 2018 Seattle Energy

Code

- Where exceeding 0.25 cfm/sq ft at 75 Pascals pressure differential, complete an additional report identifying corrective actions taken to seal air leaks.
- 4) A test exceeding 0.40 cfm/sq ft at 75 Pascals shall not be accepted. B.

Contractor Responsibilities:

- 1. Cooperate with testing and inspection agencies.
- 2. Provide access to work in order to expedite provisions of this Section.
- Coordinate, sequence, and schedule construction activities to allow testing and inspections to proceed without interruption or conditions resulting in inconclusive results.
  - a. Give minimum 10 days notice to allow time for assignment of personnel and scheduling of tests by testing and inspection agencies
- 4. Fill plumbing traps with water (toilets, sinks, floor drains, waterless urinals must be primed).
- 5. Shut off the HVAC system or leave in pilot mode (to avoid introducing air movement that is not included in the calculations).
- 6. Disable combustion equipment or leave in "pilot" position.
- 7. Seal all intentional openings in building envelope with air-tight plastic film (such as carpet protection plastic):
  - a. Make-up air intakes.
  - b. Air intake louvers.

- c. Exhaust louvers.
- d. Plumbing exhausts.
- e. Pressure relief dampers or louvers.
- f. Dryer or exhaust vent dampers.
- g. Any other locations where air leakage can occur within the mechanical system during inactive periods.
- h. Any other intentional holes.
- 8. Close and lock exterior windows and doors. Close any vents within window frames.
- 9. Prop interior doors open to create a single uniform zone.
- 10. Where drop ceilings are installed in a location that constitutes a barrier to air flow between the testing equipment and the plane of air tightness of the space being tested, remove ceiling tiles at a rate of one per 500 sq. ft. to prevent movement of tiles during test and to ensure a uniform pressure within plenum space. Additional tiles can be removed to ensure a uniform pressure distribution in the plenum space.
- 11. Install exterior electrical box caps (if applicable)
- Provide temporary air sealing at interfaces between new addition and existing construction.
- 13. Maintain copies of inspections, testing, and laboratory reports at Project Site as Project Record Documents.

#### PART 2 PRODUCTS - NOT USED

# **PART 3 EXECUTION**

#### 3.1 EXAMINATION

- A. General: Prepare for and conduct testing in accordance with ASTM E779 and ASTM E1827 and Testing Plan submitted prior to construction.
- B. Verify that the permanent and temporary portions of the continuous air barrier system are ready for air leakage testing procedures.
- C. Verify temperature differential and wind conditions prior to testing in accordance with ASTM E779 before beginning.

#### 3.2 PRELIMINARY TESTING

A. Test the exterior envelope of the building for air infiltration prior to installation of interior finish and exterior glazing.

# 3.3 FINAL TESTING

**Building Envelope Air Barrier Testing** 

A. Follow preparation, testing, and reporting requirements of ASTM E779, ASTM E1827 and ASTM E1186, along with the approved Testing Plan submitted prior to construction.

# 3.4 DEFECT CORRECTION

- A. Repair or replace Work or portions of the Work not conforming to specified requirements.
  - 1. Review suggested remedies for defects with Architect.
  - 2. Architect will provide direction and details to correct any deficiencies.
  - 3. Retest the Work or portion of the Work.
- B. If, allowed by code and in the opinion of Architect and Owner, it is not practical to repair, or remove and replace the Work, Architect and Owner will direct an appropriate remedy or adjust payment.

**END OF SECTION** 

#### PART 1 - GENERAL 1.1 SUMMARY

- A. Section Includes:
  - 1. General requirements.
  - 2. Electricity, lighting.
  - 3. Heat, ventilation, cooling.
  - 4. Telephone service.
  - Water.
  - 6. Sanitary facilities.
  - 7. Barriers.
  - 8. Closures.
  - 9. Protection of installed work.
  - 10. Security.
  - 11. Safety.
  - 12. Site water control.
  - 13. Cleaning during construction.
  - 14. Project identification.
  - 15. Field offices and sheds.
  - 16. Contractor designated areas.
  - 17. Removal.

#### B. Related Sections:

- 1. 011000 Summary: Contractor use of premises.
- 2. 017421 Construction Waste Management and Disposal: Construction waste management plan.
- 3. 017700 Closeout Procedures: Final cleaning.
- C. This Section applies to all Technical Specification Sections, and supplements the General and Supplemental Conditions.

# 1.2 GENERAL REQUIREMENTS

A. Temporary facilities and controls shall conform to the requirements of the jurisdictional code authorities and not impact workers continuing to occupy the Basement Level and 3<sup>rd</sup> Floor of the building during construction.

#### 1.3 ELECTRICITY, LIGHTING

- A. Use existing power and lighting to the greatest practical extent. When approved by the Owner, provide service required for construction operations, with branch wiring and distribution boxes located as necessary for additional service and lighting
- B. Provide additional temporary lighting for construction operations.
- C. Repair all existing lighting and power equipment, when damaged due to construction operations.
- D. Provide separate metering; reimburse Owner for costs of energy used. The Owner will pay for power used. Take measures to conserve energy.

# 1.4 HEAT, VENTILATION

- A. Project is pursing LEED Silver Certification. Contractor is responsible for providing an IAQ Management Plan prior to the start of construction as well as subsequent documentation during construction to meet the requirements of achieving 1 point for credit EQ 3.
- B. Provide temporary heating and cooling as necessary to maintain specified conditions for Construction operations, to protect materials and finishes from damage due to temperature or humidity.
- C. Provide temporary ventilation of enclosed areas to cure materials, disperse humidity, and prevent accumulations of dust, fumes, vapors, or gases.

- D. Prior to operation of permanent facilities for temporary purposes, verify that installation is approved for operation, and that filters are in place.
- E. Provide and pay for operation, maintenance, and repair.
- F. Take measures to conserve energy.

#### 1.5 WATER

- A. Use existing water outlets to the greatest extent possible. Extend branch piping with outlets only as approved by the Owner.
- B. The Owner will pay the costs for all water used. Conserve water use whenever possible.

#### 1.6 SANITARY FACILITIES

- A. Provide and maintain required portable facilities and enclosures.
- B. Designated existing facilities may be used during construction operations only as approved by the Owner. Maintain in sanitary condition. Provide daily cleaning as necessary to accommodate public use. Coordinate with Owner cleaning operations.

#### 1.7 BARRIERS

- A. Provide as required to prevent public entry to construction areas to provide for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide 6 foot high barriers around construction sites as required by each phase; equip with locked access. Submit means/methods for Owner's approval. Construction: Contractor's option.
- C. Provide barricades and covered walkways as required by governing authorities for public rights-of-way and for public access to existing building.
- D. Provide barriers around trees and plants designated to remain. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water. E. Provide barricades around openings in floors and roof decks.

## 1.8 CLOSURES

#### A. Exterior Closures:

- 1. Provide temporary weather-tight closures as necessary to create proper interior environmental conditions, protection of materials, and to prevent entry of unauthorized persons.
- 2. Where doors are necessary for access by construction personnel, provide self-closing hardware and locks.
- 3. Except as necessary for construction access, do not remove exterior closures until permanent construction is ready to be installed and made weathertight.
- 4. Enclosures shall be constructed to prevent blow off during inclement weather, and shall be sealed to prevent water penetration and excessive air infiltration.

#### B. Interior Closures:

- 1. Provide temporary closures to prevent penetration of dust and moisture into occupied areas separate from work areas, damage to operating systems and components, and to create environmental conditions necessary for the proper installation of materials and systems.
- Construction: Framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces; Flame Spread Rating of 25 in accordance with ASTM E84.
- C. Installed construction which has been damaged due to lack of protection shall be replaced or restored to original or new condition.
- D. Provide temporary roofing as specified in Section 075200.

# 1.9 PROTECTION OF INSTALLED WORK

A. Provide temporary protection for installed work, including protection from impact, water, dust contamination, overspray, and similar damage.

- B. Secure temporary protections as necessary to prevent blow off during inclement weather.
- C. Provide protective coverings at exposed exterior walls and horizontal surfaces, projections, and window and door openings.
- D. Protect finished surfaces from damage caused by traffic, movement of heavy objects, and storage of materials. Where necessary, control traffic in immediate area as necessary to minimize the risk of impact damage.
- E. Prohibit traffic and storage on waterproofed and roofed surfaces, on lawn and landscaped areas.
- F. Installed construction which has been damaged due to lack of protection shall be replaced or restored to original or new condition.

#### 1.10 SECURITY

- A. Provide security program and facilities to protect Work, materials stored off-site, existing facilities, and Owner's operations from unauthorized entry, vandalism, and theft. Coordinate with Owner's security program.
- B. Owner will issue a minimum of three building access cards to Contractor; more are available upon request. Each card will cost Contractor \$100 fee if lost or not returned.

#### **1.11 SAFETY**

A. Furnish safety program and facilities to protect the safety of workers and other persons affected by the Work.

#### 1.12 SITE WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide and operate pumping equipment.

#### 1.13 TEMPORARY CONTROLS

- A. Fire Sprinkler Supervision/Control:
  - Prior to the time of installation of finish materials such as carpet, wall panels, delivery of case work
    to the site, and other similar conditions, provide temporary tamper and water flow supervision
    monitoring of the fire sprinkler system.
  - 2. System shall be monitored, via temporary telephone lines, by a UL listed central station. Contractor shall be responsible to make arrangements for monitoring the system.
  - 3. Perform temporary monitoring up to time of building acceptance by the Owner, or building turnover, whichever is later.

#### B. Dust Control:

- 1. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent airborne dust from dispersing into the atmosphere.
- Provide temporary dust-proof partitions to protect public areas, occupied spaces, and adjacent mall areas.

#### C. Water Control:

- Comply with applicable jurisdictional requirements regarding water usage, conservation, detention, pollution, and permits.
- 2. Provide methods to control surface water to prevent damage to the Project, the site, or adjoining properties.
- 3. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff.
- 4. Provide, operate and maintain pumping equipment of adequate capacity to control surface water, including water accumulated during excavation operations, below grade.
- 5. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas.

#### D. Construction Waste Control:

- Maintain all areas under Contractor's control free of debris.
- 2. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes.
- 3. Schedule periodic collection and disposal of debris to a legal off-site location.
- 4. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent excessive accumulation.
- 5. Clean interior areas prior to start of the finish work. Maintain the areas free of dust and other contaminants during finishing operations.
- 6. Construction Waste Management:
  - Coordinate with the Owner's construction waste management service to select a local waste handler who will maximize recycling, salvaging, and reuse of construction waste.
  - b. Comply with the requirements of the local recycling service and provide space, access, and services necessary to support recycling operations.
  - Instruct jobsite personnel in the appropriate separation and handling methods as set forth by the local recycling service.
  - Keep materials to be recycled sufficiently clean and protect from damage which would render them unrecyclable.
- E. Pollution Control: Provide methods, means and facilities required by law to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.

#### F. Noise Control:

- Construction operations must be performed in accordance with local regulations, ordinances, and jurisdictional Code authorities.
- 2. Use of private radios and other similar portable sound equipment is prohibited.
- G. Smoking, Eating, and Drinking: These activities shall be permitted only in designated locations selected by the Contractor; these activities are not permitted in interior spaces after carpeting and fixtures arrive on site.

#### 1.14 CLEANING DURING CONSTRUCTION

- A. Control accumulation of waste materials and rubbish on a daily basis, and dispose of off-site or in a designated container on site. Conform to Construction Waste Management and Disposal requirements specified in Section 017421.
- B. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.
- C. Remove excess debris from cavities which are to be concealed in the finished Work.

#### 1.15 PROJECT IDENTIFICATION

A. Provide 8 x 6 foot Project identification sign of wood frame and exterior grade plywood construction, painted, with exhibit lettering by professional sign painter, to Architect's design and colors. List title of Project, names of Owner, Architect, professional consultants, Contractor and major subcontractors. Erect on site at location established by Architect.

#### 1.16 FIELD OFFICES AND SHEDS

# A. Field Office:

- 1. Office: Weather-tight, with lighting, electrical outlets, heating, cooling, and ventilating equipment, and equipped with furniture. Provide, in addition, space for Project meetings, with table and chairs to accommodate 6 persons.
- 2. Equipment:
  - a. Copier: Contractor's option; 11 x 17 inch size capability.
  - b. Facsimile Machine: Contractor's option. Connect to public phone lines as required for communication with Architect's office and Contractor's home office.

- c. Communication Service
  - 1) Minimum one dedicated telephone line with instrument.
  - 2) Minimum one dedicated telephone line for facsimile machine. 3) An Internet Service Provider (ISP) account.
  - Com ISDN LAN modem or Office Connect
  - 5) Remote Dual Analog Router (analog or ISDN depending on telephone company service), or approved, for use and communication with Internet Service Provider (ISP).
- d. Computer: Minimum one PC with minimum 8 GB of RAM, including the following or comparable software by others:
  - 1) Windows 10 and Microsoft Office 2016, or later; Internet Explorer 10 or later. 2) Adobe Acrobat Pro DC, or later, at least one station for initiating documents.
    - 3) Adobe Acrobat Reader.
- e. Printer: Minimum 11x17 inch graphics capability.
- f. Sheet-feed or flatbed scanner and related software.
- B. Storage Sheds for Tools, Materials, and Equipment: Weather-tight, with heat and ventilation for Products requiring controlled conditions, with adequate space for organized storage and access, and lighting for inspection of stored materials.

#### 1.17 CONTRACTOR DESIGNATED AREAS

A. The contractor may use any spaces within the scope of work for field offices, material storage, and other laydown area. Any spaces outside of the area of work required by the contractor, including any and all parking, will need to be obtained and secured by the contractor at their own cost.

#### 1.18 REMOVAL

- A. Completely remove temporary materials and equipment when their use is no longer required.

  Conform to Construction Waste Management and Disposal requirements specified in Section 017421.
- B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of 2 feet; grade site as indicated. Restore existing facilities used during construction to specified, or to original, condition.

**END OF SECTION** 

## **PART 1 - GENERAL**

## 1.1 SUMMARY

- A . Section Includes:
  - 1. Description of an Indoor Air Quality (IAQ) Construction Plan
  - 2. IAQ Construction Requirements
- B . Related Sections: Site protection specifications included in this section should be coordinated with the following sections of the Project Manual, including:
  - 1. Section 01 35 15 LEED Certification Procedures
  - 2. Section 01 74 21 Construction Waste Management and Disposal
  - 3. Division 6 Woodwork
  - 4. Division 9 Finishes
  - 5. Division 23 HVAC

#### 1.2 SUBMITTALS

- A . Indoor Air Quality Plan: Within fourteen (14) days after receipt of Notice of Award and prior to any waste removal by the Contractor form the Project, the Contractor shall develop and submit to the Owner for review a plan for mitigating hazardous air quality conditions that may arise from work operations during the project. The plan shall follow the recommended design approaches of SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 Chapter 3 and shall include the following:
  - 1. Protection of stored on-site and installed absorptive materials from moisture
  - 2. Protection of ventilation system and permanently installed air handlers
  - 3. Source control of construction contaminants, including sawdust, drywall dust, ventilation of paint operations
  - 4. Pathway interruption
  - 5. Housekeeping
  - 6. Scheduling of work to minimize contamination
  - 7. Schedule for inspection and maintenance of IAQ measures
  - 8. Prohibit the use of tobacco products inside the building and within 25 feet of the building entrance during construction.
- B . Product Data: Include product data for temporary filtration media (if used) and for filtration media used during occupancy.
- C . Photographs: Provide photographs with date and time stamp taken at two different occasions during construction along with a brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures.

#### 1.3 SUBSTITUTIONS

A . Should the Contractor desire to use procedures, materials, equipment, or products that are not specified but meet the intent of these specifications to protect air quality on the site, the Contractor shall propose these substitutions in accordance with Section 01 25 00 – Product Substitutions.

# **PART 2 - PRODUCTS**

#### 2.1 MATERIALS

A . Low emitting products have been specified in appropriate sections. See Section 01 35 15 – LEED Certification Procedures for listing.

# PART 3 - EXECUTION

#### 3.1 ALL PHASES

- A . The Contractor is minimally required to meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition 2007 to:
  - Protect the ventilation system components from contamination, and/or provide cleaning of the ventilation components exposed to contamination during construction prior to occupancy.
- B . During installation of carpet, paints, furnishings, and other VOC-emitting products, provide supplemental (spot) ventilation for at least 72 hours after work is completed. Preferred HVAC system operation uses supply air fans and ducts only; exhaust provided through building openings. Use exhaust fans to pull exhaust air from deep interior locations. Stair towers and other paths to exterior can be useful during this process.
- C . Conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection, and ventilation rate.
- D . Require VOC-safe masks for workers installing VOC-emitting products (interior and exterior) defined as products that emit 150 g/l or more UNLESS local jurisdiction's requirements (Canadian or US) are stricter, in which case the strictest requirement shall be followed for use of VOC-safe masks.
- E . Use low-toxic cleaning supplies for surfaces, equipment, and worker's personal use.
- F . Use wet sanding for gypsum board assemblies. Exception: Dry sanding allowed subject to owner approval of the following measures:
  - 1. Full isolation of space under finishing
  - 2. Plastic protection sheeting is installed to provide air sealing during the sanding
  - 3. Closure of all air system devices and ductwork
  - 4. Sequencing of construction precludes the possibility of contamination of other spaces with gypsum dust
  - 5. Worker protection is provided

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G . Use safety meetings, signage, and subcontractor agreements to communicate the goals of the indoor air quality construction plan.

**END OF SECTION** 

01 57 21 - 3

#### PART 1 - GENERAL 1.1 SUMMARY

- A. Section Includes:
  - 1. Products.
  - 2. Transportation and handling.
  - 3. Storage and protection.
  - 4. General installation requirements.
  - 5. Product options.
  - 6. Substitutions.

#### B. Related Sections:

- 1. 012500 Substitution Procedures
- 2. 014500 Quality Control: Submittal of manufacturers' certificates.
- 3. 017700 Closeout Procedures: Systems demonstration, operation and maintenance data, warranties and guarantees, spare parts and maintenance materials.
- C. This Section applies to all Technical Specification Sections, and supplements the General and Supplementary Conditions.

#### 1.2 PRODUCTS

- A. Products include material, equipment, and systems.
- B. Comply with size, make, type, and quality specified, unless otherwise approved in writing by the Architect. Specifications and referenced standards are minimum requirements.
- C. All components required to be supplied in quantity shall be identical, whether furnished under one or several Sections of the specifications.
- D. Unless specified or indicated otherwise, materials employed for construction purposes, such as formwork, scaffolding, and temporary lighting, shall not be incorporated into the work.
- E. Unless indicated or specified otherwise, all products incorporated into the Work shall be of the most suitable grade of their respective kinds for the intended use.
- F. Do not use materials and equipment removed from existing structure, except as specifically required, or allowed, by Contract Documents.

#### 1.3 TRANSPORTATION AND HANDLING

- A. Transport by methods to avoid product damage.
- B. Deliver products in manufacturer's original containers or packaging, with identifying labels intact and legible. Where options exist, select container or packaging systems that can be recycled or reused.
- C. Furnish equipment and personnel to handle products by methods to prevent soiling or damage.
- D. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Immediately replace non-conforming products with new conforming products, at no additional cost to the Owner.

## 1.4 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. Store sensitive products in weather-tight enclosures. Maintain within temperature and humidity ranges required by manufacturer's instructions, and as otherwise required to prevent damage.
- C. For exterior storage of fabricated products, place on sloped supports above ground. Protect from soiling or staining through ground contact. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

- D. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.
- E. Arrange storage of products to furnish convenient access for inspection and inventory.

#### 1.5 GENERAL INSTALLATION REQUIREMENTS

- A. Unless indicated or specified otherwise, install each product in accordance with the product manufacturer's instructions.
- B. Distribute copies of manufacturer's instructions to parties involved in the installation.
- C. Maintain one set of complete instructions at the job site during installation and until completion.

#### 1.6 PRODUCT OPTIONS

- A. Product Specified by Reference Standards or by Description Only: Provide product meeting those standards.
- B. Product Specified by Naming One or More Manufacturers with an "or approved" provision: Use specified product or submit a request for substitution in accordance with the specified substitution requirements. When approved a substitute product may be used.
- C. Product Specified by Naming One or More Manufacturers, without a provisions for Substitution: No substitution will be allowed, except as specified under the Article on Substitutions.

#### 1.7 SUBSTITUTIONS

1. See 01 25 00

**END OF SECTION** 

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A. Submittals.
- B. Coordination requirements.
- C. Layout.
- D. Examination requirements.
- E. Preparation requirements.
- F. Installation requirements.
- G. Alterations of existing conditions.
- H. Cutting and patching.
- I. Progress cleaning.
- J. Protection of installed work.

#### 1.2 RELATED REQUIREMENTS

- A. 011000 Summary: limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. 02 41 19 Selective Demolition: for information regarding cutting and patching of specific building components.

#### 1.3 SUBMITTALS

- A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
  - 1. On request, submit documentation verifying accuracy of survey work.
  - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
  - 3. Submit surveys and survey logs for the project record.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.

- Visual qualities of sight exposed elements.
- 5. Work of Owner or separate Contractor.
- 6. Include in request:
  - a. Identification of Project.
  - b. Location and description of affected work.
  - c. Necessity for cutting or alteration.
  - d. Description of proposed work and products to be used.
  - e. Alternatives to cutting and patching.
  - f. Effect on work of Owner or separate contractor.
  - g. Written permission of affected separate contractor.
  - h. Date and time work will be executed. C. Waste Management Plan:
- D. Surveyor's Qualification Statement.
- E. Project Record Documents: Accurately record actual locations of capped and active utilities.

#### 1.4 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in location of the project.

#### 1.5 COORDINATION REQUIREMENTS

- A. See Section 011000 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements. G. Coordinate completion and clean-up of work of separate sections.

Execution

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

#### PART 2 PRODUCTS

#### 2.1 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution as described in Section 012500 Substitution Procedures

# PART 3 EXECUTION 3.1

#### **LAYOUT**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Owner will locate and protect survey control and reference points.
- D. Contractor shall locate and protect survey control and reference points.
- E. Control datum for survey is that established by Owner provided survey.
- F. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- G. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- H. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- I. Utilize recognized engineering survey practices.
- J. Establish a minimum of two permanent benchmarks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- K. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.

- 2. Grid or axis for structures.
- Building foundation, column locations, ground floor elevations. L. Periodically verify layouts by same means.
- M. Maintain a complete and accurate log of control and survey work as it progresses.
- N. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

#### 3.2 EXAMINATION REQUIREMENTS

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

# 3.3 PREPARATION REQUIREMENTS

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

#### 3.4 CUTTING AND PATCHING

- A. Execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform cutting and patching as necessary to:
  - 1. Complete the work.
  - 2. Fit products together to integrate with other work.
  - 3. Provide openings for penetration of mechanical, electrical, and other services.
  - 4. Match work that has been cut to adjacent work.
  - 5. Repair areas adjacent to cuts to required condition.

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- 6. Repair new work damaged by subsequent work.
- 7. Remove samples of installed work for testing when requested.
- 8. Remove and replace defective and non-conforming work.
- D. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.
- E. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- F. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- G. Cut rigid materials using method recommended by manufacture of materials.
- H. Restore work with new products in accordance with requirements of Contract Documents.
- I. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- J. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with approved material to restore the fire rating of the assembly. K. Patching:
  - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  - Match color, texture, and appearance.
  - Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

# 3.5 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

#### 3.6 PROTECTION OF INSTALLED WORK

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- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

**END OF SECTION** 

# TACOMA PUBLIC LIBRARY – MAIN BRANCH RENOVATION SECTION 01 74 21

Construction Waste Management and Disposal

# SECTION 01 74 21 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

#### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Construction waste management requirements by the City of Tacoma.
  - 2. Waste Diversion Plan requirements
  - 3. Deconstruction and Salvage Assessment requirements.
  - 4. Removal and Disposal of Steel Furniture Components
  - 5. Waste Diversion Report
- B. Generate the least amount of waste possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- Reuse, recycle and salvage as much of the waste materials generated as is economically feasible.
- D. Recycle a minimum of 75% of construction waste by weight, including diversion of at least commingled and four material waste streams. Provide calculations on end-of project recycling rates, salvage rates, and landfill rates for all waste streams demonstrating that 75% of construction wastes were recycled or salvaged.
- E. Provide a Waste Management Plan for this Project. Resources are included which may be used in the development of this plan.

# 1.2 **DEFINITIONS**

- A. Commingled or Off-site Separation: Collecting all material types into a single bin or mixed collection system and separating the waste materials into recyclable material types in an off-site facility.
- B. Construction, Demolition and Land Clearing Waste (CDL): For purpose of this section, includes all non-hazardous solid wastes such as building materials, packaging, rubbish, debris and rubble resulting from construction, remodeling, alterations, repair, deconstruction, demolition and land clearing.
- C. Deconstruction; The process of removing existing building materials from renovation and demolition projects for the purposes of reuse, and recycling, in as efficient and safe manner as possible. D. Hazardous Waste: As defined by the state where the Project is located.
- E. Recyclable Materials: Products and materials that can be recovered and remanufactured into new products.
- F. Recycling: The process of sorting, cleaning, treating and reconstituting materials for the purpose of using the material in the manufacture of a new product. Can be conducted on site (as in the grinding of concrete for reuse on site).
- G. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Recycling facilities have their own specifications for accepting materials.
- H. Salvage and Reuse: Existing usable product or material that can be saved and reused in some manner on the project site. Materials that can be salvaged and reused on site must comply with the applicable technical specifications.

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- I. Salvage for Resale: Existing usable product or material that can be saved and removed intact (as is) from the project site to another site for resale to others without remanufacturing.
- J. Source-Separated Materials: Materials that are sorted at the site for the purpose of reuse or recycling.
- K. Sources Separation: Sorting the recovered materials into specific material types with no or a minimum amount of contamination on site.
- L. Time-Based Separation: Collecting waste during each phase of construction or deconstruction that results in primarily one major type of recovered material. The material is removed before it becomes mixed with the material from the next phase of construction.
- M. Trash: Product or material unable to be salvaged for resale, salvaged and reused, returned, or recycled.
- N. Waste: Excess materials generated by the construction and demolition operations of the Project that are produced on site or brought to the site. Waste includes, without limitation, packaging materials such as banding, crates, pallets, plastic film, polystyrene, and cardboard. Waste does not include excavated soils, rocks, vegetation, and hazardous waste removed from the site

#### 1.3 SUBMITTALS

- A. LEED® Submittal: Submittal of progress and final reports described below will fulfill requirements of LEED® MR Prerequisite 2 and MR Credit 5.
- B. Draft Waste Management Plan, as described below.
- C. Final Waste Management Plan, as described below.
- D. Progress Reports: The Contractor shall submit a summary of Waste generated at the Project with each Application for Payment. The Summary shall be submitted on a form acceptable to the Owner and shall contain the following information:
  - 1. A record of each material stream recycled, reused, or salvaged from the Project, the amount (in tons of material), and the receiving party. Attach manifests, weight tickets, receipts and invoices.
  - 2. The amount (in tons of material) disposed of as garbage from the Project, and the location of the Receiving Facility. Include manifests, weight tickets, receipts, and invoices.
  - 3. Materials above may be described in cubic yards of material, if both items 1 and 2 are described in this manner and throughout the project in the same manner.
- E. Final Report: The Contractor shall submit within 14 days of completing the project a final report on waste generated at the Project. The final report shall be submitted on a form acceptable to the Owner and shall contain the following information:
  - 1. For each material stream recycled, reused, or salvaged from the Project, the total amount (in tons of material), and the receiving party.
  - 2. The total amount (in tons of material) disposed of as garbage from the Project, and the receiving facility.

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3. Materials above may be described in cubic yards of material, if both items 1 and 2 are described in the same manner.

#### 1.2 GENERAL REQUIREMENTS

- A. Burying of construction waste shall be prohibited in compliance with local and state requirements.
- B. Recycle Antifreeze, Oil and Oil Filters at Appropriate Outlets.
- C. Dispose of Non-recyclable Hazardous Waste at Legally Permitted Facilities.
- D. Establish and Post Cleanup Procedures for Spills to Prevent Illegal Discharges: Contractor shall include cleanup procedures as a component of Contractor's safety program. Cleanup procedures shall be posted in a prominent location and referenced during safety meetings.
- E. Reduce Hazardous Waste Through Good Jobsite Housekeeping: Minimize sources of hazardous waste, minimize spills and promptly respond to spills and leakages to eliminate sources of hazardous waste.

# 1.3 DRAFT WASTE MANAGEMENT PLAN

- A. Within fourteen working days of receipt of Notice of Award of Bid, or prior to waste removal, whichever occurs sooner, submit 3 copies of the Draft Waste Management Plan to the Architect.
- B. The Draft Plan shall contain the following:
  - 1. Identify five material waste streams targeted for diversion during the course of the Project.
  - 2. Separation requirements.
  - 3. On-site storage method for each waste stream.
  - 4. Transportation method for each waste stream.
  - 5. Destination of each waste stream.
- C. Include the following minimum list of materials:
  - 1. Steel shelving and furniture
  - 2. Cardboard.
  - 3. Clean dimensional wood.
  - 4. Land clearing debris.
  - 5. Concrete.
  - 6. Bricks.
  - 7. Concrete Masonry units (CMU's).
  - 8. Asphalt.

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- 9. Metals from banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
- 10. Gypsum.
- 11. Excavated soils.
- D. The Draft Plan shall include the names of subcontractors who will transport solid or hazardous waste from the site and the name of the Receiving Facility that will accept waste for disposal.

#### 1.4 FINAL WASTE MANAGEMENT PLAN

- A. The Owner shall determine which of the recycling options addressed in the above draft Waste Management Plan are acceptable. The Contractor shall then submit, within 14 working days, a Final Waste Management Plan.
- B. The Final Waste Management Plan shall contain the following:
  - 1. Analysis of the proposed jobsite waste to be generated, including types.
  - 2. List commingled and four material waste streams from the Project that will be separated for reuse, salvage or recycling.
  - 3. Separation and storage requirements for each waste type: A description of the means by which any waste materials identified in above will be protected from contamination, and a description of the means employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
  - 4. Recycling Vendor: Name of the recycling processor for each material. If recycling vendor handles comingled waste, provide monthly diversion rate for the vendor.
  - 5. Receiving Facilities: The name of the Receiving Facilities intended for receipt of non-recycled CDL materials. If a receiving facility handles waste and recyclables, provide monthly diversion rate for the facility.
  - 6. Transportation: A description of the means of transportation of the recyclable or waste materials. Include the names of haulers.
  - 7. Meetings: A description of information to be addressed at Project meetings regarding training and updates on waste management requirements.

#### **PART 2 - PRODUCTS - NOT APPLICABLE**

#### **PART 3 - EXECUTION**

#### 3.1 MANAGEMENT PLAN IMPLEMENTATION

- A. Designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.
- B. Provide on-site instruction of appropriate separation, handling separation, handling, and recycling, salvage, reuse and return methods to be used by all parties at the appropriate stages of the Project.
- C. Distribution: Distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner and the Architect.

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- D. Separation facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse and return. Recycling and waste bin areas are to be kept clean and clearly marked in order to avoid contamination of materials.
- E. Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

#### 3.2 REMOVAL AND DISPOSAL OF STEEL FIXTURES AND FURNITURE ITEMS

- A. The project scope includes the removal and disposal of a great number of steel cantilevered bookshelves and miscellaneous steel furniture from the existing library space. Prior to removal, contractor is to present a disposal plan to the owner for one of the following:
  - 1. Donation of all shelving and furniture to a verified re-use supplier. Provide receipt documentation of value to owner for recording purposes
  - 2. Scrap of all steel to a recycler. Provide credit for the amount obtained for steel scrap to owner as a deductive change order proposal to the project.

# 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

#### 3.4 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Clean and stack undamaged, whole masonry units on wood pallets.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- E. Metals: Separate metals by type.

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- 1. Structural Steel: Stack members according to size, type of member, and length.
- 2. Remove and recycle as allowed: bolts, nuts, washers, and other rough hardware.
- F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
  - 1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- J. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- K. Plumbing Fixtures: Separate by type and size.
- L. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- M. Lighting Fixtures: Separate lamps by type and protect from breakage.
- N. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- O. Conduit: Reduce conduit to straight lengths and store by type and size.

# 3.5 RECYCLING CONSTRUCTION WASTE

# A. Packaging:

- 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
- 2. Polystyrene Packaging: Separate and bag materials.
- 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
- 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

## B. Wood Materials:

- 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
- 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
  - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

## 3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

# TACOMA PUBLIC LIBRARY – MAIN BRANCH RENOVATION SECTION 01 74 21

Construction Waste Management and Disposal

- 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
- 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01 7419

#### PART 1 - GENERAL 1.1 SUMMARY

- A. Section Includes:
  - 1. Closeout procedures.
  - 2. Final cleaning.
  - 3. Project record documents.
  - 4. Operation and maintenance data.
  - 5. Operation instruction.
  - 6. Manufacturer's warranties.
  - 7. Guarantees
  - 8. Spare parts and maintenance materials.
- B. Related Sections:
  - 1. 011000 Summary: Partial Owner occupancy,
  - 2. 015000 Temporary Facilities and Controls: Cleaning during construction.
  - 3. 017421 Construction Waste Management and Disposal: Construction waste management plan.
  - 4. Division 23 and 26 for special closeout requirements for mechanical and electrical systems.
- C. This Section applies to all Technical Specification Sections, and supplements the General and Supplemental Conditions.

#### 1.2 CLOSEOUT PROCEDURES

- A. Comply with procedures stated in General Conditions of the Contract for Substantial and Final Completion.
- B. Certain areas will be subject to partial occupancy or use as specified in Section 011000.
- C. Submit all certificates of approval issued by the governing authorities, including, without limitation, the following:
  - 1. Certificate of occupancy.
  - 2. Certificates of inspection for elevators.
- D. Prior to final payment, submit the following affidavits using the forms listed below:
  - 1. Contractor's Affidavit of Payment of Debts and Claims AIA Document G706.
  - 2. Consent of Surety to Final Payment AIA Document G707.
  - 3. Contractor's lien release, and lien releases from each subcontractor; Contractor's Affidavit of Release of Liens AIA Document G706A
- E. Submit final Application for Payment identifying total adjusted contract sum, previous payments, and sum remaining due.
- F. Submit building permit documents and building inspection signoff sheets to the Owner. 1.3

# **FINAL CLEANING**

- A. Execute prior to final inspection.
- B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces. C. Clean equipment and fixtures to a sanitary condition.
- D. Clean or replace filters of mechanical equipment.
- E. Clean roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas, rake clean other surfaces.

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- G. Remove waste and surplus materials, rubbish, and construction facilities from the Project and from the site. Conform to Construction Waste Management and Disposal requirements specified in Section 017421.
- H. Maintain a complete set of record documents which clearly and neatly indicate all changes from the Contract Documents, and all uncovered existing conditions which will be subsequently concealed.
- I. Record documents shall include:
  - 1. Contract drawings.
  - 2. Specifications.
  - 3. Reviewed shop drawings, product data, and samples
- J. Record documents shall be used for no other purpose and shall be stored separate from those used for construction.
- K. Keep documents current; do not permanently conceal any work until required information has been recorded.
- L. Mark specifications legibly and record at each Product section a description of actual products installed. Include the manufacturer's name and product model and number.
- M. Drawings shall indicate exact installed locations and dimensions of all concealed work, including, without limitation, conduit, piping, ducts, mechanical and electrical equipment, and foundations. Indicate all changes to details which involve concealed construction.
- N. Prior to approving each Payment Request, the Architect reserves the right to inspect the Record Documents. The Payment Request may not be approved until the record documents are current to the Date of the Payment Request.
- O. At Contract Closeout, submit documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

#### 1.4 OPERATION AND MAINTENANCE DATA

- A. Furnish published operation and maintenance information covering all equipment and finish materials installed on the project. Whether specified or not, furnish published information whenever special maintenance procedures are required to assure the proper operation and durability of project material, equipment, and finishes.
- B. Number of copies: Unless otherwise specified, submit two hard copies and two digital, bookmarked, PDFs on USB thumb drives of each at time of project substantial completion.
- C. Submit operation data and maintenance data bound in a three ring binder. Include divider tabs to separate data for each component. Include name of Project, Contractor, and Architect. D. Information shall be submitted by the General Contractor through the Architect.

#### 1.5 OPERATION INSTRUCTION

- A. Prior to Final Completion, instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment and systems. Provide instruction at mutually agreed upon times.
- B. Use experienced personnel trained and experienced in the operation and maintenance of the building equipment or system involved.
- C. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.
- D. Refer to the individual technical Sections for additional requirements for instruction of Owner's personnel.

#### 1.6 MANUFACTURER'S WARRANTIES

A. Furnish original and duplicate copies of each manufacturer warranty executed to the Owner.

- B. Execute Contractor's submittals to the manufacturers, and assemble documents executed by the manufacturers.
- C. Provide table of contents and assemble in binder with durable plastic cover.
- D. Submit material prior to final application for payment in accordance with Section 013300. For equipment put into use with Owner's permission during construction, submit warranty within 10 days after first operation. For items of Work delayed materially beyond Date of Substantial Completion, furnish warranty within ten days after acceptance, listing date of acceptance as start of warranty period.

#### 1.7 GUARANTIES

A. Furnish written guaranty, executed to the Owner, from each subcontractor performing work on work covered by the additional guaranty requirements specified in the technical sections. The guaranty shall commence on the date of Owner acceptance of that portion of the work. B. Transmit through the Architect in accordance with Section 013300.

#### 1.8 SPARE PARTS AND MAINTENANCE MATERIALS

A. Furnish products, spare parts, and maintenance materials in quantities specified below and in each Section, in addition to that used for construction of Work. Coordinate with Owner, deliver to Project site and obtain receipt prior to final payment.

1. Carpet: 8 to 10%

2. Walk-off mat: 8 to 10%

3. Paint: 1 gallon per color/sheen

4. Rubber Base: 5 to 8%

5. Resilient flooring: 8 to 10%

6. Acoustic panels: 8 to 10%

7. Storefront Touchup Paint: all colors

- B. Unless specified otherwise, deliver materials in manufacturer's original factory cartons or containers.
- C. Materials shall be clearly labeled, and shall include designations used in the Contract Documents.

## **1.9 KEYS**

- A. Deliver properly identified and tagged keys and hardware maintenance tools to the Owner. Obtain itemized receipt for all keys and tools.
- C. Send all master keys by registered mail directly from manufacturer to Owner's representative as later directed.

## **END OF SECTION**

# **PART 1 - GENERAL**

#### 1.1 SUMMARY

#### A. Section Includes:

- 1. Description of Work
- 2. Payment Requirements and Commissioning Schedule of Values
- 3. Commissioning Coordination and Meetings
- 4. Scheduling Commissioning Activities
- 5. Submittals
- 6. Duties of Commissioning Authority
- 7. Duties of Contractor
- 8. Duties of Contractor's Commissioning Coordinator
- 9. Back-Charging Provisions
- 10. Documentation Requirements
- 11. Start-up Requirements
- 12.Installation Verification Requirements
- 13. Functional Testing Requirements
- 14. Commissioning Issue Documentation and Correction
- 15. Performance Period
- 16. Project Closeout
- 17. Seasonal Testing
- 18. Near Warranty End Review

#### B. Related Sections:

- 1. Coordinate this section with the requirements of LEED EA Prerequisite Fundamental Commissioning and Verification.
- 2. General Requirements to include the following sections, exact titles may vary.

Sustainable Building Requirements Indoor Air Quality Management

**Project Management and Coordination** 

Submittals

**Closeout Procedures** 

Operation and maintenance Data

Demonstration and training

3. The following sections specify the commissioning activities for this project:

20 08 00 Commissioning of Mechanical

26 08 01 Commissioning of Electrical Systems

3. All sections related to the following commissioned systems may contain start-up, testing and/or commissioning related activities:

**DIVISION 20 - MECHANICAL** 

**DIVISION 22 - PLUMBING** 

**DIVISION 23 - HVAC** 

DIVISION 25 – INTEGRATED AUTOMATION FACILITY CONTROLS

**DIVISION 26 – ELECTRICAL SYSTEMS** 

#### 1.2 DESCRIPTION OF WORK

- A. Work includes the completion of formal commissioning procedures on selected equipment and systems as outlined in the paragraph Related Sections above. Commissioning is defined as the process of verifying and documenting that the installation and performance of selected building systems meet the specified design criteria and therefore satisfies the design intent and the Owner's operational needs. The Contractor shall be responsible for participation in the commissioning process as outlined herein, and in subsequent sectional references and attachments throughout the Contract Documents. Commissioning procedures will be designed and conducted under the direction of a Commissioning Authority (CxA) hired by the Owner.
- B. This section contains the general requirements for commissioning and a description of the commissioning process to be applied across all commissioned systems.

#### 1.3 PAYMENT

- A. Equipment and systems shall not be accepted by the Owner, and final payment shall not be made by the Owner, until commissioning activities identified in the specifications are complete, commissioning issues are resolved to the Owner's satisfaction and the performance period standards have been met.
- B. Payment is subject to satisfying the Washington State Energy Code, Commercial Provision Section 408.1.4 which requires that commissioning be completed "Prior to the final mechanical, plumbing and electrical inspections or obtaining a certificate of occupancy".
- C. Payment is subject to the conditions of the Actual Damages clause of the General Conditions.

#### 1.4 COMMISSIONING COORDINATION AND MEETINGS

A. A representative for the Contractor, each commissioned system Contractor and the Contractor's Commissioning Coordinator (CCC) shall attend scheduled commissioning meetings as required.

#### 1.5 SCHEDULE

- A. The Contractor is responsible for coordination and scheduling of commissioning activities into the master schedule. The schedule shall contain the following activities and detail as a minimum.
  - 1. Contractor review and comment on preliminary commissioning plan documents
  - 2. Start-up Plan Development
  - 3. Start-up Activities by Equipment and Systems
  - 4. Installation Verification Activities by Equipment and Systems
  - 5. Functional Testing Activities by Equipment and Systems
  - 6. Training
  - 7. O&M
  - 8. Seasonal Testing

- B. The CCC shall develop and maintain a 2-week look-ahead schedule of commissioning activities including, but not limited to: meetings, start-up, installation verification, Functional Performance Testing (FPT) and FPT demonstration. The schedule shall be updated and distributed weekly, or if any currently scheduled activities in the 2-week period change.
- C. The Owner and the CxA will allocate their time based on the 2-week look-ahead schedule. If the Owner or CxA is not available for the scheduled activity then the Contractor may proceed as scheduled. If a scheduled activity does not take place due to lack of Contractor participation or inaccurate scheduling, the Contractor is subject to back-charging as outlined herein.

#### 1.6 SUBMITTALS

- A. Commissioning Documentation: Provide one copy of submittals in addition to those quantities specified elsewhere. Include the manufacturer's recommended installation and start-up procedures with associated checklists for each unique piece of equipment under a separate tab titled "Installation/Start-up". These procedures and forms shall be for the specific piece of equipment to be provided.
- B. The Contractor shall provide the CxA with copies of approved submittals, manufacturer's recommended installation/start-up documents, proposed testing formats, training plans, as-built documentation, O&M Manuals and other commissioning related materials as requested by the CxA. The CxA will review and approve this material for commissioning related activities.
- C. The CCC is responsible for managing the submittal process with the CxA. A tracking document for selected submittals is included in the schedules at the end of the individual divisional commissioning specifications for systems to be commissioned. These schedules outline activities that will require specific submittal information by the Contractor. Assignment of Contractors responsible for commissioned systems and due dates will be determined at the initial commissioning coordination meeting.
- D. O&M manuals for each piece of commissioned equipment are to be submitted with the proposed installation, testing and start-up documents.
- E. The Contractor is responsible for providing the CxA with copies of the following information for inclusion in the Systems Manual. The CxA will review this material for compliance with Project Documents and will note and report issues for resolution by the responsible party. The CxA will compile the final Systems Manual based on the submitted documentation.
  - 1. As-built documents
  - 2. Description of systems, including capabilities and limitations
  - 3. Operating procedures for all normal, abnormal, and emergency modes of operation
  - 4. Sequence of operation as actually implemented, with control systems data including all set points, calibration data, etc. This includes but is not limited to the building automation system, packaged controls, programmable logic controllers and lighting controls.
  - 5. Location of all control sensors and test ports.
  - 6. Seasonal start-up and shutdown procedures.
  - 7. Control schematics and computer graphics for all control systems including those noted in item 4.
  - 8. Complete terminal interface procedures and capabilities for all control systems including those noted in item 4.
  - 9. A list of recommended operational recordkeeping procedures including sample forms, trend logs, or others, and a rationale for each
  - 10. Maintenance procedures for all building systems.

#### 1.7 COMMISSIONING AUTHORITY

- A. The information provided herein regarding the Commissioning Authority's (CxA) responsibilities is provided to the Contractor for information only and is not a part of the work scope. The CxA is hired under direct contract with the Owner.
- B. The CxA for this project shall be Keithly Barber Associates (KBA), Inc. (206) 835-8254, www.keithlybarber.com. KBA is a Building Commissioning Certification Board (BCCB) Certified Commissioning Firm. KBA has on staff Building Commissioning Association (BCxA members and Building Commissioning Certification Board (BCCB) Certified Commissioning Providers (CCP).
- C. Responsibilities: The CxA responsibilities include, but are not limited to the following:
  - 1. Approve selection of the CCC.
  - 2. Participate in the initial on-site commissioning coordination meeting and subsequent commissioning meetings.
  - 3. Conduct site observations and provide site observation reports.
  - 4. Review and approve the start-up plan and commissioning schedule as developed by the CCC and the Contractor.
  - 5. Develop the commissioning plan including start-up plan, installation verification checklists and functional test documents
  - 6. Review and approve various Contractor completed documents including CCLs, start-up documents and data sheets as they are completed.
  - Witness, spot check or otherwise verify successful completion of selected functional testing by Contractor.
  - 8. Review the TAB report. Witness or spot check a sample of the systems to verify conformance to design and the report.
  - 9. Prepare and submit final commissioning report with recommendation for system acceptance to the Owner. Report is developed with material provided by CCC and Contractor.

#### 1.8 CONTRACTOR

#### A. Contractor Responsibilities

- 1. Support the commissioning process including integrating related commissioning activities into the construction process and schedule.
- 2. Assure the participation and cooperation of subcontractors as required to complete the commissioning process as outlined herein and the individual divisional commissioning specifications.
- 3. Assign a Commissioning Coordinator dedicated to the project.
- 4. Provide all submittal material as requested by the CxA and as required by the contract documents.
- 5. Attend commissioning meetings as scheduled.
- 6. Provide access to commissioned systems including ladders, lifts, scaffolding, access panels and other equipment as required.
- 7. Install and start-up equipment per the contract documents and start-up plan.
- 8. Conduct functional testing per the contract documents and commissioning plan
- 9. Provide required test instrumentation and equipment as needed to conduct functional testing per the commissioning plan.
- 10. Resolve issues as noted on the commissioning issues list and communicate resolution to the CxA.
- 11. Support seasonal testing as required.
- 12. Support the near-warranty-end review and correct any noted issues prior to warranty end.

#### 1.9 CONTRACTOR'S COMMISSIONING COORDINATOR

#### A. Contractor's Commissioning Coordinator (CCC) Qualifications

- The CCC shall be a regular employee of the Contractor assigned to the project. The CCC shall be responsible for coordination of Contractors responsible for commissioned system regardless of the Contractors they represent.
- 2. The CCC responsibilities shall not be shared by multiple parties, one individual shall be designated.
- 3. The individual designated as the CCC shall be available on site from the beginning of construction to final acceptance.
- 4. The individual designated as the CCC may have other construction or project related assignments, but only to the extent that they will be able to fulfil the CCC responsibilities outlined herein.
- 5. The individual designated as the CCC shall be identified by the Contractor during the submittal process.
- 6. Submit the name, company, contact information (address, phone, cell phone, FAX and email) and other project duties for the proposed CCC.

#### B. Contractor's Commissioning Coordinator Responsibilities

- Overall management and coordination of the commissioning work performed by the Contractors responsible for commissioned systems including responsibilities identified as the CCC's responsibility in each section on commissioned systems.
- 2. Coordinate Owner and CxA participation in scheduled commissioning activities. Notify Owner and CxA a minimum of 5 working days in advance of commissioning activities.
- 3. Collect, review and submit commissioning material and documentation to the CxA for approval prior to proceeding with commissioning activities including, but not limited to, the following:
  - a. Review and comment on preliminary functional tests provided by CxA. Contractors responsible for the systems to be commissioned shall also review this information.
  - b. Develop, manage and update commissioning schedule with commissioning activities
  - c. Proposed Manufacturer's installation and start-up documents
  - d. Proposed cleaning, flushing, testing, disinfection forms
  - e. Proposed Static tests and calibration forms
  - f. Start-up plan
  - g. Proposed functional performance test forms
  - h. Completed Manufacturer's installation and start-up documents
  - i. Completed cleaning, flushing, pressure testing, disinfection forms
  - j. Completed static tests and calibration forms
  - k. Completed Contractor Checklists
  - I. Completed functional performance test forms
  - m. TAB agenda
  - n. TAB preliminary and final report
  - o. Signed off issues lists
  - p. Proposed O&M Manuals
  - g. Training plans and agenda
  - r. Final O&M Manuals
- 4. Develop, manage and update commissioning schedule. Integrate commissioning activities into master schedule. Provide a 2-week look-ahead schedule of commissioning activities, updated weekly or as scheduled commissioning activities change during 2-week period.

- 5. Distribute issues lists to Contractors responsible for the commissioned systems.
- 6. Assemble, manage and update the start-up plan.
- 7. Attend regularly scheduled construction and Owner's meetings and review commissioning activities with Contractors responsible for the commissioned systems and design team. Include commissioning activity items in construction meeting minutes.
- 8. Participate in and lead commissioning meetings as necessary to coordinate contractor activities in the commissioning process. Meetings are generally to be scheduled once every two weeks during initial construction of commissioned systems, and weekly during start-up and functional test phases. The CxA shall lead commissioning meetings when on site and the CCC shall lead all other meetings.
- 9. Provide material for, participate in the development of, and review the final report.
- 10. Coordinate and participate in seasonal testing.

#### 1.10 BACK-CHARGING

- A. The Contractor and CCC are responsible to schedule and coordinate installation, start-up and testing activities with the CxA as specified herein and in each section on commissioned systems. Scheduled installation, start-up or testing activities that are not executed because of lack of preparation or coordination by the Contractor that result in unnecessary trips by the CxA are subject to back-charges to the Contractor.
- B. Functional testing shall be performed on the systems that are fully complete as reported by the Contractor. Systems that are reprogrammed or have had a software upload that can be shown to invalidate completed functional testing shall be retested to demonstrate proper operation. Tests reconducted by the Contractor shall be performed at no additional cost to the contract. Tests reconducted by the CxA shall result in a back-charge to the Contractor.
- C. The Contractor shall reimburse the Owner for costs associated with any additional efforts required to witness installation, start-ups, testing activities or for excessive back-checking as indicated above. These costs shall include salary, travel costs and per diem lodging costs (where applicable) for the Commissioning Authority. Rates to be used will be per the contract between the Owner and Commissioning Authority.

# **PART 2 – PRODUCTS**

# 2.1 DOCUMENTATION

- A. Schedule-A (located at the end of each section on commissioned systems, XX-08-00) contains sample versions of the Contractor Checklists (CCL) to be used for the systems to be commissioned.
- B. Schedule-B (located at the end of each section on commissioned systems, XX-08-00) contains a Functional Performance Test Summary Table that outlines each functional test to be conducted for the systems to be commissioned. Part 4 of each section on commissioned systems contain sample versions of functional performance test procedures and data sheets. These do not represent all functional tests that will be required and are intended only to demonstrate the rigor of functional testing required.

# 2.2 INSTALLATION VERIFICATION

A. The CxA shall conduct an independent Installation Verification using checklists based on the Contractor Checklists provided in Schedule – A, located at the end of each section on commissioned systems.

## 2.3 STARTUP FORMS

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A. Any installation and start-up checklists that are provided by the manufacturer shall be used in the equipment start-up process. Non-manufacturer developed forms must be approved by the CxA prior to use. Start-up forms must be submitted to the CCC for inclusion in the Start-up plan at least one month prior to system start-up to allow for review and approval by the CxA. Documentation for static testing, cleaning, flushing, calibration and other activities required by project documents are considered start-up forms. Schedule – A (located at the end of each section on commissioned systems) outlines the required documents to be submitted by the Contractor.

# 2.4 FUNCTIONAL PERFORMANCE TEST FORMS

- A. The functional performance test procedures and data sheets shall be developed by the CxA as outlined in Schedule B (located at the end of each section on commissioned systems), with input from the CCC and Contractor as required.
- B. The Contractor has specific responsibilities for developing, performing and documenting functional test procedures as directed by the CxA. See Schedule B for minimum testing and documentation requirements.
- C. In addition to the testing outlined in Schedule B, wherever the Project Documents require testing, test reports, checklists, verifying operation, demonstrating proper operation or other similar language with respect to the systems to be commissioned, written testing procedures and documentation of tests will be required from the Contractor, whether specified or not in the commissioning sections.
- D. A tracking document for these submittals is included in Schedule B which outlines which of these activities will require submittal information by the Contractor. Contractors responsible for the systems to be commissioned and due dates will be determined at the initial commissioning coordination meeting.

# 2.5 COMMISSIONING ISSUES LIST

A. The CxA shall maintain the Commissioning Issues List. At any time an issue is discovered where the installation or performance of the commissioned system does not meet contract document requirements, an individual issue shall be generated. As issues are resolved and verified by additional inspections or tests, the issues list shall be updated. The issues list shall be a running history of the status of the issue.

### 2.6 TEST EQUIPMENT

- A. The Contractor shall provide all test equipment as required to prove performance during static and functional tests.
- B. The test equipment shall be provided in sufficient quantities to execute functional testing in an expedient fashion.
- C. The test equipment shall be of industrial quality and suitable for testing and calibration with accuracy within the tolerances necessary to demonstrate system performance.
- D. Equipment shall be certified to an accuracy of 10% of the smallest tolerance to be measured. For example, if a temperature gage is required to be +2 degrees F, the calibration device must have an accuracy of +0.2 degrees F.
- E. The test equipment shall have calibration certification per equipment manufacturer's interval level or within one year if not specified.

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F. Where sensors for specific gases are used (e.g. carbon monoxide, nitrogen dioxide, refrigerant leak detectors, etc.) the Contractor shall provide appropriate test gases in order to validate calibration of sensors. Test gases shall be provided so as to validate sensor output for 0, 50 and 100 percent of the sensor range.

# **PART 3 – EXECUTION**

#### 3.1 DOCUMENTATION

- A. Checklists, start-up documentation, test forms and other commissioning related documentation required by contract shall be neatly and legibly completed and provided to the CxA via the CCC in a clear and easily readable condition.
- B. Required checklists, start-up documentation, test forms and other commissioning related documentation shall be provided to the CxA via the CCC in a timely fashion and according to the commissioning and construction schedule.
- C. In every case where the Contractor is unable to comply with an item as listed on the checklist or form, the Contractor shall immediately notify the CxA in writing as to the reasons for non-compliance.

### 3.2 ACCESS TO EQUIPMENT AND SYSTEMS

- A. The Contractor shall provide access to all equipment and systems to be commissioned both during construction and after occupancy as necessary. The Contractor shall coordinate with other trades to assure that access to commissioned equipment is available to the CxA and other trades at the proper times and with sufficient duration.
- B. The Contractor shall provide all ladders, lifts, scaffolding, access doors, removal/installation of ceiling tiles and any other materials or activities as necessary to allow the CxA to easily access equipment and systems.
- C. During the commissioning process, the Contractor shall coordinate the installation of ceiling tiles and other finishes to allow all trades and the CxA to perform their work without having to remove or reinstall ceiling tiles or other finished work. Note that above-ceiling access is required to perform Installation Verification and Functional Performance Testing of systems. Ceiling tiles typically must be in place during Testing and Balancing activities. Since Testing and Balancing may occur between Installation Verification and Functional Performance Testing, some ceiling tiles may require multiple removal/reinstallation cycles.
- D. In the event that system commissioning is not fully completed after occupancy, the Contractor shall be responsible for coordinating with the owner for access to the equipment or system for testing, backchecking and other commissioning activities. This requirement shall include providing access to equipment as indicated above.

## 3.3 COMMISSIONING MEETINGS

A. Commissioning status meetings shall be scheduled to occur during the construction and closeout phase to monitor progress and to help facilitate the commissioning process. Contractor representatives for commissioned systems shall be required to attend these meetings. Meetings will generally be scheduled to occur with scheduled construction or management meetings. The CCC shall schedule, coordinate and lead the meetings including providing meeting minutes. These meetings can coincide with, or be a subset of, the normal subcontractor meetings. The CxA shall attend and lead selected meetings at their discretion.

- B. Commissioning shall be included in the general construction and Owner's meetings. The CCC will attend these meetings and discuss commissioning related topics there. Commissioning information and issues shall be documented in the meeting minutes.
- C. After functional testing and during the issue correction period, the Contractor shall hold and document weekly meetings (as a minimum) to coordinate and review outstanding commissioning issues. These meetings shall be coordinated and led by the general contractor's CCC and attended by all subcontractors responsible for commissioned systems. The meetings shall be required until all issues are resolved. The CxA shall attend and lead selected meetings at their discretion.
- D. The contractor shall make available the option to host the commissioning meetings via videoconferencing, in whole or in part, to include internet connection, video monitor and audio services at the on-site meeting room.

### 3.4 SITE OBSERVATIONS

A. The CxA may perform periodic site visits during construction to monitor commissioning activities. The purpose of these observations will be to evaluate compliance to contractual obligations such as cleanliness, capping ductwork, access to equipment, maintainability and so forth to identify concerns before they are repeated throughout the project. Any issues identified will be noted on a Site Observation Report. The Contractor shall review these reports and take action to resolve issues as needed and deemed appropriate in consultation with the Owner, CxA, and Design Team.

### 3.5 CONTROLS INTEGRATION MEETING – BUILDING AUTOMATION AND LIGHTING

- A. The controls integration meetings (CIM) shall be conducted after the building automation and lighting controls submittals are complete and the CxA has reviewed the submittals. The meetings are to be conducted prior to finalizing the functional test procedures and shall be attended by the CxA, the BAS control contractor, the VRF control contractor, the lighting controls contractor, the mechanical/electrical engineers and a representative of the Owner's maintenance group at a minimum. The CIM shall include, but not be limited to, the following topics:
  - 1. Sequence of Operations
  - 2. Alarm Points List
  - 3. Trend Points List
  - 4. Displayed/Adjustable Point List
  - 5. Graphical Interface
  - 6. Integration with packaged equipment
  - 7. Lighting control interface
  - 8. Point-to-Point Checkout and Commissioning of Existing Equipment 9. Method of Conducting Cx Functional Testing

#### 3.6 PRE-STARTUP ACTIVITIES

- A. The CxA shall develop a preliminary commissioning plan with input from the Contractors via the CCC.
- B. As soon as possible after the bid award, approval of submittals and development of the preliminary commissioning plan, the CxA shall conduct an initial commissioning coordination meeting with the CxA, CCC, Contractors, Owner's Representative and the A/E Team. The CxA will explain the commissioning process in detail, and identify specific commissioning related responsibilities. The preliminary commissioning plan shall be provided to the Contractors at this time. The requirements for submittal material shall be reviewed along with a preliminary schedule of commissioning activities.

- C. The Contractor shall submit to the CxA via the CCC preliminary O&M manuals prior to developing the Start-up and Commissioning Plan by the CxA.
- D. The Contractor shall submit to the CCC the proposed start-up and Contractor required testing documentation for assembly into the Start-up and Commissioning Plan by the CxA.
- E. The CxA shall develop a Start-up Plan based on Contractor submittals and the start-up requirements of the contract documents. It details the procedures and forms for individual pieces of equipment and systems that have start-up and testing requirements. It shall be a three-ring binder indexed by system or equipment. The binder shall be populated with procedures and blank forms and used to file the completed forms as the procedures are completed by the Contractor. The Start-up Plan shall include, but is not limited to, the following:
  - 1. List of commissioning team members.
  - 2. Start-up document tracking forms.
  - 3. Master list of equipment/systems for installation and start-up.
  - 4. Start-up and static testing schedule.
  - 5. Manufacturer and Project Document required installation, start-up and testing procedures 6. Blank copies of start-up and testing forms for each type of equipment/system.
  - 7. Contractor checklists for each system.
- F. The CxA shall develop the final commissioning plan. The commissioning plan typically includes, but is not limited to, the following:
  - 1. Project overview.
  - 2. Commissioning Authority scope of work.
  - 3. Contractor's Commissioning Coordinator scope of work.
  - 4. Roles and responsibilities of commissioning participants.
  - 5. A schedule with sequential description of commissioning activities.
  - 6. A complete list and description of equipment and systems to be commissioned.
  - 7. The Start-up Plan
  - 8. Installation verification data forms for systems and equipment to be commissioned.
  - 9. Functional performance test criteria, test forms and data forms for systems and equipment designated to be functionally tested including trending needed for the performance period.
  - 10. System integration testing plan.
  - 11. Sample commissioning issues list.
  - 12. Project closeout activities
- G. The Contractor shall be responsible for the liability and safety of conducting tests. The CCC and Contractor shall review the Functional Performance Test (FPT) documents provided by the CxA prior to including them in the final commissioning plan. The Contractor is to review preliminary and final test procedures to verify that they:
  - 1. Will not pose a risk of injury to any personnel.
  - 2. Will not pose a risk of damage to equipment, structure or any physical element of the building.
  - 3. Will not negate any equipment or system warranties.
  - 4. Are executable with the personnel and equipment available to the Contractor.

### 3.7 EQUIPMENT INSTALLATION AND START-UP

A. Installation and Start-up activities include procedures outlined by the contract documents and the equipment manufacturer including cleaning, static testing, calibration and other related activities. The CxA shall provide the Contractor with a start-up plan based on Contractor submitted procedures and checklists.

- B. The CxA may witness selected equipment start-up and testing performed during construction. The CCC shall keep the CxA informed of commissioning activities with regular status reports and updates to the commissioning plan, start-up plan and schedules
- C. The Contractor shall perform equipment start-up per the approved start-up plan and start-up forms. The Contractor shall correct issues as they are discovered. The Contractor shall complete the installation and start-up forms as the work is complete and place the fully completed installation and start-up forms in the start-up binder.
- D. Upon completing the start-up activities for a given system, the associated Contractor Checklists (CCL) shall be completed by the Contractor and placed in the appropriate tab section of the start-up binder. The completed and signed CCL is to be provided with the equipment manufacturer's recommended start-up form for each piece of equipment or system. The completed CCL is the Contractor's certification that they have completed all required installation and start-up activities and the system is ready for the installation verification audit by the CxA and subsequent functional performance testing.
- E. The start-up binder shall be maintained by the Contractor's Commissioning Coordinator. The Contractor is responsible for maintaining the start-up book in good order and to turn the completed document over to the CxA at the conclusion of start-up. If the start-up binder is lost or stolen, it shall be the responsibility of the Contractor to recreate the binder and its contents, including re-conducting start-up activities if necessary.
- F. Upon completion of all start-up activities including the required documentation, the Contractor shall submit the start-up binder to the CxA via the CCC for review and approval.

### 3.8 INSTALLATION VERIFICATION (IV)

- A. The IV process shall begin when signed off CCLs and start-up documents are received from the Contractor.
- B. The CxA shall conduct an independent installation verification audit on selected systems to verify conformance with manufacturer's installation instructions and project documents. The CxA shall use the completed CCL from the contractor to verify installation. Discrepancies discovered will be reported on the Commissioning Issues List by the CxA. A copy of the issues list will be transmitted to the Contractor via the CCC with a copy to the Owner and Design Team.
- C. The Contractor shall correct any issues discovered and note the action taken on the issues log and return it to the CxA via the CCC.
- D. The CxA shall back-check and verify that the issues are resolved prior to proceeding with FPT.

# 3.9 FUNCTIONAL PERFORMANCE TESTS (FPT)

- A. FPT includes the documented testing of system parameters, under actual or simulated operating conditions. Final performance testing of systems will begin only after the Contractor certifies that systems are 100% complete and ready for functional testing, by providing completed and signed-off copies of the start-up plan and providing completed Contractor Checklists.
- B. Any testing procedures and forms which the Contractor is required to provide must be provided by the CCC to the CxA at least one month prior to start of installation of the equipment and as needed to complete the commissioning plan.
- C. Functional performance testing of commissioned systems shall begin after all critical issues discovered during the start-up and installation verification process have been corrected. The CxA and

Contractor shall conduct functional performance tests on selected systems to verify functional performance criteria as outlined in Schedule - B (located at the end of the individual divisional commissioning specifications) and as required in the Project Documents and approved by the CxA in the Commissioning Plan. Discrepancies discovered will be reported on the Commissioning Issues List by the CxA. A copy of the issues list will be transmitted to the Contractor via the CCC.

- D. Functional tests that have excess failure rates or are aborted due to lack of Contractor participation or scheduling are subject to the back-charging provisions of the paragraph Back Charging.
- E. The Contractor shall make available to the CxA a method of interfacing with any commissioned control systems at the building site including but not limited to the building automation system, packaged control systems, programmable logic controllers and lighting control systems. This interface shall be made available regardless of whether or not a permanent local work station is specified elsewhere in the contract documents. The on-site interface shall be made available from the time of completion of start-up activities until trending is complete and all commissioned systems are accepted by the owner. The Contractor shall also make available to the CxA a method of remote access to the control system(s) beginning at the time of completion of start-up activities and extending for one year after system acceptance. Remote and local access shall include all software, licensing, software keys and anything else required to facilitate full access to the system(s). The local and remote interfaces shall include all contract required interfaces including, but not limited to, all graphics, trends and alarms. The CxA shall be given an account with full security access privileges to the system(s).

# 3.10 COMMISSIONING ISSUE DOCUMENTATION AND CORRECTION

- A. The commissioning issues list is generated and maintained by the CxA to include a description of the issue, date of posting, the current status of issues, assignment to the responsible party and the date of final resolution as confirmed by the CxA. Items listed may include issues where design, products, execution or performance does not appear to satisfy the Contract Documents and the design intent. The resolution of issues identified on this list may or may not be the responsibility of the Contractor.
- B. Once issues have been identified and assigned to a Contractor on the Commissioning Issues List, the Contractor shall be required to investigate and resolve these issues in a timely manner. After correcting issues noted on the Commissioning Issues List, the Contractor shall sign off on each issue and return the list to the CxA via the CCC for initiation of back-checking by the CxA.
- C. In the event that an issue has been assigned to the wrong Contractor or resolution of the issue requires multiple trades, Contractor with the initial assignment shall take the lead in working with the CCC and CxA to reassign the issue or coordinating the multiple trades to resolve the issue.
- D. The CxA shall back-check and verify that the commissioning issues are resolved and update the issues list. Excessive back-checking by the CxA due to issues reported as complete not actually being resolved are subject to the back-charging provisions of the paragraph Back Charging.
- E. After functional testing and during the issue correction period, the Contractor shall hold weekly onsite meetings (as a minimum) to coordinate and review outstanding commissioning issues. These meetings shall be coordinated and led by the general contractor's CCC and attended by all subcontractors responsible for commissioned systems. The meetings shall be required until all issues are resolved.

#### 3.11 PERFORMANCE PERIOD

A. Performance Period: The performance period is a set length of time designated to demonstrate proper facility operation prior to acceptance. The performance period commences after successful completion of all functional testing. Parameters evaluated for heating and ventilation systems typically include zone temperature stability, optimum start/stop, warm-up period and other related functions. For lighting control the parameters include lighting levels, occupancy switching and daylight control. As part of this process the Contractor will be required to set up and provide trends of building automation system parameters per the direction of the CxA. The specific trending needed will be outlined in the commissioning plan, the Contractor should assume that all points in the building automation system will be trended. Lighting control parameters will be trended if system capabilities exist, otherwise the Contractor will provide stand-alone data loggers to demonstrate operation of systems.

- B. The CxA shall prepare a performance period test plan including measured variables and success criteria based on performance characteristics described in the Project Documents. The CxA will provide the Contractor with a list of trend log definitions or stand-alone data logger requirements based on the performance period test plan included in the Commissioning Plan.
- C. The Contractor will review the performance period test plan and set up the trend log definitions and stand-alone data loggers. Trend logs shall be set up for all inputs/outputs, both digital and analog, for all points in the system both physical and virtual. Trend interval shall be 5 minutes unless otherwise directed by the CxA. The minimum trend period shall be 14 days. Trend log point headings as displayed on system graphs and data tables shall be adequately descriptive for the point but no longer than 12 characters unless approved by the CxA. System default names are not acceptable. The heading titles shall contain no extraneous characters that are not needed to describe the point. The contractor shall provide the trends to the Commissioning Authority in electronic format, in MS Excel or a comma delimited file with related system parameters grouped together for easy comparison. If building automation system resident memory is limited or there are other issues with the trending requirements, the Contractor will work with the CxA to redefine the test plan.
- D. The performance period will commence within one week of the final functional tests and run for a minimum of 14 days. A similar performance period may be required for seasonal testing. If failures are encountered, the performance period shall be aborted. After corrections are made, the performance period shall be re-started at day one. Systems shall run per the final sequences of operation for 30 days without adjustments or corrections before the warranty period will commence.

## 3.12 SEASONAL TESTING

- A. Seasonal testing is required to demonstrate the system's ability to meet design conditions associated with seasonal extremes, typically peak heating and peak cooling conditions.
- B. Seasonal testing may also be required when ambient conditions will not support the operation of specific equipment.
- C. Seasonal testing is required to demonstrate the performance for a fully occupied building or portion of the building as well as for systems that are occupancy sensitive.
- D. The Contractor shall provide labor and material for seasonal testing and make corrections to any Contractor related issues discovered.

### 3.13 PROJECT CLOSEOUT

- A. Post construction Contractor responsibilities include providing O&M manuals, warranties, spares and training that meet the requirements of the project documents. The CxA will provide a commissioning report.
- B. O&M Manual

1. The Contractor is responsible for providing the CxA with copies of the balancing reports, asbuilt drawings, O&M manuals relevant to the systems commissioned and the Contractor provided material required for the systems manual (if applicable). The CxA shall review this material for compliance with project documents and report issues for resolution by the responsible party.

#### C. Warranties

1. The Contractor is responsible for providing the CxA with copies of the equipment warranties for each commissioned system. The CxA shall review this material for compliance with project documents and report issues for resolution by the responsible party.

## D. Spares

The Contractor is responsible for providing the CxA with copies of the spare parts transmittals.
 The CxA shall review this material for compliance with project documents and report issues for resolution by the responsible party.

### E. Training

- Training on related systems and equipment operation and maintenance shall only be scheduled to commence after functional testing is satisfactorily completed, O&M manuals have been delivered and approved, the systems manual (if applicable) is complete and systems are verified to be 100% complete and functional.
- 2. Each Contractor is responsible to provide a topical outline of the subjects to be covered in the training session(s), the expected length of time for the training sessions, and a brief resume listing the qualifications of the proposed training presenters.
- 3. The CCC is responsible for developing the training plan with input from the Contractor and directing any videotaping efforts. The training plan is to be submitted to the Owner, Design Team and CxA for approval prior to conducting training. The CCC is responsible for coordinating training with the Owner and CxA and to verify execution of the training plan.
- 4. Training Plans: For all Owner instruction, the Contractor shall submit a system-specific training plan for review and approval by the Commissioning Authority and the Owner. The training plan shall contain the following as a minimum:
  - a) Attendee sign-off sheet.
  - b) Required training hours specified in the project documents.
  - c) Detailed list of subject to be covered and durations.
  - d) Qualifications of training provider.
  - e) Training schedule including duration of each training session.
- F. Upon completion of commissioning activities the CxA will prepare and submit to the owner the Final Commissioning Report detailing the commissioning plan and commissioning activities and recommending acceptance to the Owner. The CCC will support this effort by coordinating the Contractor provided documentation.

### 3.14 NEAR-WARRANTY-END REVIEW

A. Approximately two months prior to the end of warranty on commissioned systems, the Contractor shall participate in a review of the commissioned systems with the owner, design team and the CxA to

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identify any operational and outstanding issues. For this review, the Contractor shall schedule the attendance of appropriate parties with project specific knowledge, including but not limited to the following:

General Contractor Mechanical Contractor Building Management System Contractor Variable Refrigerant Flow System Startup and Controls Contractor(s) Lighting Controls Contractor(s)

- B. The review shall consist of a meeting on site with the Contractor with follow up testing and verification by the Contractor.
- C. A list of issues will be developed by the owner and CxA. Once issues have been identified, the Contractor shall investigate, test and inspect systems as necessary to identify and resolve warranty issues in a timely manner.
- D. The Contractor shall ensure the cooperation of appropriate Contractors responsible for the commissioned systems in any follow-up meetings, testing, inspections and investigation regarding warranty issues and in resolving, prior to the end of the warranty, any warranty issues discovered.
- E. Issues identified in this review will remain warranty items until satisfactory completion, even if the warranty period expires during the review and correction period.

END OF SECTION 01 91 13

## **PART 1 GENERAL**

#### 1.1 SECTION INCLUDES

- A. Delegated design of components or supports requiring structural engineering before, during, or after demolition; or any engineering for cutting into structural assemblies.
- B. Selective demolition of building elements.
- C. Utility Services and Mechanical/Electrical System.
- D. Salvaged and removal of building elements.
- E. Removal and disposal of existing hazardous materials by a certified party as required to complete work.

### 1.2 RELATED REQUIREMENTS

- A. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- B. 01 35 15 LEED Certification Procedures and Scorecard

#### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 30 00 Administrative Requirements.
- Review preparation and installation procedures and coordinating and scheduling required with related work.
- 2. Review Owner salvage requirements and conduct a walk-through with Owner present.

#### 1.4 SUBMITTALS

- A. Qualification Data: For demolition contractor listing projects and references, including requirements for hazardous material abatement expertise as outlined in the hazardous materials survey.
  - 1. Contractor is to use (2) separate subconsultants for this work, a submittal of description and scope of work is to accompany each.
- B. Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

- 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of partitions, barricades and fences.
- 2. Include procedures and coordination with other work in progress, a disconnection schedule of utility services, and a detailed description of methods and equipment to be used for each operation and of the sequence of operations.
- 3. Identify demolition firm and submit qualifications.
- 4. Include a summary of safety procedures.
- D. Engineering Survey.
- E. Existing Condition Survey.
- F. Shop Drawings: extents of demolition, locations of existing utilities, and locations of utility capping. Indicate structural members and elements that will be demolished.
- G. Closeout Submittals: Accurately record actual locations of capped and active utilities and subsurface construction.

### 1.5 QUALITY ASSURANCE

- A. Demolition Contractor Qualifications: Company specializing in selective demolition comparable in scope, environmental and historical sensitivity of work specified in this section with minimum 5 years experience.
- B. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.

### **PART 2 PRODUCTS**

# 2.1 DESCRIPTION

- Selectively demolish existing elements to accommodate tie-in of new work to existing conditions.
- B. Existing building hazardous material and asbestos surveys has been completed by Owner, and survey is included in the Appendix. Contractor is responsible for the legal abatement and disposal of all elements as required to complete contract work. \

## 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. 29 CFR 1910: Occupational Safety and Health Standards.
- B. 29 CFR 1926 U.S. Occupational Safety and Health Standards; current edition.
- C. NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

- D. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.
- G. Comply with governing EPA notification regulations before beginning selective demolition.
- H. Comply with hauling and disposal regulations of authorities having jurisdiction.

# 2.3 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

# **PART 3 EXECUTION**

# 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before start of work.
- Review record documents provided by Owner and schedule listing salvage and remove for reuse items.
- C. Engage a professional engineer to perform an engineering survey to determine if removing indicated elements may result in a structural deficiency or unsafe condition during scope of work.
- D. Perform a survey of existing conditions by use of measured drawings and preconstruction photographs.
- E. A hazardous materials report has been completed by the Owner and is included as an Appendix. Contractor is required to legally remove and dispose of materials as required to complete work.
  - 1. If suspected hazardous materials are encountered, beyond those described in the report, do not disturb; immediately notify Architect and Owner.

## 3.2 PREPARATION

- A. Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- B. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

### 3.3 SELECTIVE DEMOLITION OF BUILDING ELEMENTS

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations.
- B. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.
- D. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

### 3.4 SALVAGE AND REMOVAL OF BUILDING ELEMENTS

- A. Removed and Salvaged Items:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area designated by Owner.
  - Protect items from damage during transport and storage. B. Removed and

#### Reinstalled Items:

- 1. Clean and repair items to functional condition adequate for intended reuse.
- 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
- 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- C. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flamecutting operations.
- D. Maintain fire watch during and for at least two hours after flame-cutting operations.
- E. Dispose of demolished items and materials promptly.

### 3.5 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition. Return adjacent areas to condition existing before selective demolition rations began.
- B. Remove demolition waste materials from Project site and dispose of them in an EPAapproved construction and demolition waste landfill acceptable to authorities having jurisdiction.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Dispose of all waste material in accordance with project's Waste Management Plan.
  - 1. See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

### 3.6 PROTECTION

A. Remove temporary barricades and protections where hazards no longer exist.

#### 3.7 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Arrange to shut off utilities with utility companies.
  - 2. If services/systems are required to be removed, relocated or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 3. Disconnect, demolish, and remove plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Equipment to be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

## 3.8 SCHEDULE

- A. Locations and extent in accordance with demolition drawings, including but not limited to:
  - 1. Selective demolition of portions of exterior walls at locations of new openings

- 2. Demolition of existing communicating stair from level 1 to 2
- 3. Selective Demolition of existing nonbearing walls and ceilings at floors 1 and 2
- 4. Selective Demolition of toilet rooms and plumbing fixtures as described
- 5. Selective Demolition to allow new work of routing plumbing, structure, and HVAC
- 6. Removal of finishes as described. Note removal and salvage of areas of ACT ceiling for reuse within project.
- B. Delegated Design Items: See Section 01 11 50 Delegated Design and Deferred Submittals.

### **END OF SECTION**

## **PART 1 GENERAL**

#### 1.1 SUMMARY

- A. Section includes historic treatment procedures in the form of special types of selective demolition work for designated historic spaces, areas, rooms, and surfaces and the following specific work:
  - 1. Salvage and protection of existing wood doors and frames to be re-used.
  - 2. Removal of carpet from marble stairs in Carnegie Building
  - 3. Debris hauling.
  - 4. Salvage of existing items to be reused or recycled.
- B. Related Sections
  - 1. 020000 Existing Conditions
  - 2. 080000 Openings (for doors, windows and storefronts)

### 1.2 DEFINITIONS

- A. Dismantle: To disassemble or detach a historic item from a surface, or a nonhistoric item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- B. Existing to Remain: Existing items that are not to be removed or dismantled, except to the degree indicated for performing required work.
- C. Remove: To take down or detach a nonhistoric item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Retain: To keep existing items that are not to be removed or dismantled.
- E. Salvage: To protect removed or dismantled items and deliver them to Owner, ready for reuse.

### 1.3 PRECONSTRUCTION MEETINGS

- A. Preconstruction Conferences: Conduct conferences at Project site.
  - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to removal and dismantling procedures and protection of historic areas and surfaces.
  - 2. Review list of items indicated to be salvaged.
  - 3. Verify qualifications of personnel assigned to perform removal and dismantling.

Historic Removal and Dismantling

- 4. Inspect and discuss condition of each construction type to be removed or dismantled.
- 5. Review requirements of other work that depends on condition of substrates exposed by removal and dismantling work.
- 6. Review methods and procedures related to removal and dismantling work, including, but not limited to, the following:
- 7. Historic removal and dismantling specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
  - a. Materials, material application, sequencing, tolerances, and required clearances.
  - b. Fire prevention.

### 1.4 SUBMITTALS

- A. Qualification Data: For historic masonry removal and dismantling specialist (and field supervisors and historic carpentry dismantling and removal specialist (and field supervisors).
- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's removal and dismantling operations.
- C. Removal and Dismantling Historic Treatment Program: Submit 30 days before work begins.
- D. List of Items Indicated to Be Salvaged: Prepare a list of items indicated on Drawings to be salvaged for Owner's use or for reinstallation. Submit 15 days before preconstruction conference.
- E. Inventory of Salvaged Items: After removal or dismantling work is complete, submit a list of items that have been salvaged.
  - 1. Include item description, item condition, number of items if more than one of a type, and tag number. Include photo of item in original location.
  - As work proceeds, include on the inventory items that were indicated to be salvaged and items of historic importance discovered during the work. Document reasons, if any, why an item indicated to be salvaged was not salvaged.

# 1.5 QUALITY ASSURANCE

- A. Historic Removal and Dismantling Specialist Qualifications: A qualified historic treatment specialist. General selective demolition experience is insufficient experience for historic removal and dismantling work.
- B. Removal and Dismantling Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of removal and dismantling work, including protection of surrounding and substrate materials and Project site.

Historic Removal and Dismantling

- 1. Dust and Noise Control: Include locations of proposed temporary dust- and noisecontrol partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
- 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- C. Mockups: Prepare mockups of specific historic removal and dismantling procedures specified in this Section to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- D. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

# 1.6 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
  - 1. Before removal and dismantling, Owner will remove the following items:
    - a. Library materials, including but not limited to books, periodicals, CDs, DVDs, etc.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.
  - If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
    - a. In the case of asbestos, stop work in the area of potential hazard, shut off fans and other air handlers ventilating the area, and rope off area until the questionable material is identified. Reassign workers to continue work in unaffected areas.
       Resume work in the area of concern after safe working conditions are verified.
- D. Hazardous Materials: Hazardous materials are present in construction affected by removal and dismantling work. A report on the presence of hazardous materials is included in the appendix of this Project Manual for review and use. Examine report to become aware of locations where hazardous materials are present.
  - Hazardous material remediation is specified elsewhere in the Contract Documents.
  - Do not disturb hazardous materials or items suspected of containing hazardous materials, except under procedures specified elsewhere in the Contract Documents.

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- If unanticipated asbestos is suspected, stop work in the area of potential hazard, shut
  off fans and other air handlers ventilating the area, and rope off area until the
  questionable material is identified. Reassign workers to continue work in unaffected
  areas. Resume work in the area of concern after safe working conditions are verified.
- E. Storage or sale of removed or dismantled items on-site is not permitted unless otherwise indicated.

# PART 2 PRODUCTS (NOT USED)

# **PART 3 EXECUTION**

- 3.1 HISTORIC REMOVAL AND DISMANTLING EQUIPMENT
  - A. Removal Equipment: Use only hand-held tools, except as follows or unless otherwise approved by Architect on a case-by-case basis:
    - 1. Light jackhammers are allowed subject to Architect's approval.
    - 2. Large air hammers are not permitted.
  - B. Dismantling Equipment: Use manual, hand-held tools, except as follows or otherwise approved by Architect on a case-by-case basis:
    - Hand-held power tools and cutting torches are permitted only as submitted in the historic treatment program. They must be adjustable so as to penetrate or cut only the thickness of material being removed.
    - 2. Pry bars more than 18 inches long and hammers weighing more than 2 lb are not permitted for dismantling work.

## 3.2 EXAMINATION

- A. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures are necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.
  - 1. Verify that affected utilities are disconnected and capped.
  - Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage. Enter this information on the submittal of inventory of salvaged items.
  - Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
  - 4. Engineering Survey: Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or

unplanned collapse of any portion of structure or adjacent structures as a result of

- B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and preconstruction video recordings.
- C. Perform surveys as the Work progresses to detect hazards resulting from historic removal and dismantling procedures.

### 3.3 HISTORIC REMOVAL AND DISMANTLING

removal and dismantling work.

- A. General: Have removal and dismantling work performed by a qualified historic removal and dismantling specialist. Ensure that historic removal and dismantling specialist's field supervisors are present when removal and dismantling work begins and during its progress.
- B. Perform work according to the historic treatment program
  - 1. Perform removal and dismantling to the limits indicated.
  - Provide supports or reinforcement for existing construction that becomes temporarily weakened by removal and dismantling work, until the Project Work is completed unless otherwise indicated.
  - 3. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work.
  - Do not operate air compressors inside building unless approved by Architect in each case.
  - 5. Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.
  - 6. Dispose of removed and dismantled items off-site unless indicated to be salvaged or reinstalled.
- C. Water-Mist Sprinkling: Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment according to the historic treatment program to ensure that such water does not create a hazard or adversely affect other building areas or materials.
- D. Unacceptable Equipment: Keep equipment that is not permitted for historic removal or dismantling work away from the vicinity where such work is being performed. E.

Removing and Dismantling Items on or Near Historic Surfaces:

- 1. Use only dismantling equipment and procedures within 12 inches of historic surface. Do not use pry bars. Protect historic surface from contact with or damage by tools.
- 2. Unfasten items in the opposite order from which they were installed.
- 3. Support each item as it becomes loosened to prevent stress and damage to the historic surface.

- 4. Dismantle anchorages. F. Masonry Walls:
- 1. Remove masonry carefully, and erect temporary bracing and supports as needed to prevent collapse of materials being removed.
- Dismantle top edge and sides before removing wall. Stop removal work and immediately inform Architect if any structural elements above or adjacent to the work show signs of distress or dislocation during any phase of removal work.
- 3. Remove wall in easily managed pieces.
- 4. During removal, maintain the stability of the partially remaining wall. Notify Architect of the condition of temporary bracing for wall if work is temporarily stopped during the wall's removal. G. Steelwork:
- 1. Expose structural steel for examination by Architect and Contractor's professional engineer before proceeding with removal or dismantling.
- 2. If distress in structure is apparent during performance of the work, stop removal or dismantling and take immediate precautionary measures to ensure safety of the structure. Inform Architect of the problem, steps taken, and proposed corrective actions.
- 3. Brace and support structural steel being removed and remaining during removal and dismantling.
- 4. Concrete-Encased Steel: Where steel is known to be encased by concrete that is being removed, saw cut with blades that can cut no deeper than the thickness of the concrete cover, with an adequate margin for error in the location of the steel. Isolate sections of concrete by saw cutting before beginning removal.

H. Loose Plaster: Identify loose, nonhistoric plaster, and separate it from its substrate by tapping with a hammer and prying with a chisel or screwdriver. Do not use pry bars. Leave sound, firmly adhered plaster in place. Do not damage, remove, or dismantle historic plasterwork, except where indicated or where it is an immediate hazard to personnel and as approved by Architect. I. Anchorages:

- 1. Remove anchorages associated with removed items.
- 2. Dismantle anchorages associated with dismantled items.
- 3. In nonhistoric surfaces, patch holes created by anchorage removal or dismantling according to the requirements for new work.
- 4. In historic surfaces, patch or repair holes created by anchorage removal or dismantling according to Section that is specific to the historic surface being patched.

# 3.4 HISTORIC REMOVAL AND DISMANTLING SCHEDULE

- 1. Existing Items/Construction to Be Removed/Dismantled:
  - a. Wood doors and frames where described per plans for salvage and reuse

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- Original wood doors, frames, trim, and decorations that are removed as required to achieve new Work in Carnegie Building
- 2. Existing Items to Remain:
  - a. All interior and exterior elements not noted to be removed per plans

END OF SECTION

## **PART 1 - GENERAL**

#### 1.1 SECTION INCLUDES

- A . Cleaning of existing concrete surfaces.
- B . Repair of exposed structural, shrinkage, and settlement cracks.
- C . Resurfacing of concrete surfaces having spalled areas and other damage.
- D . Repair of deteriorated concrete.
- E . Repair of internal concrete reinforcement.
- F . Scope of Work: As discovered during construction.

#### 1.2 RELATED REQUIREMENTS

A . Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

# 1.3 REFERENCE STANDARDS

- A . ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.
- B . ASTM A706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
- C . ASTM C33/C33M Standard Specification for Concrete Aggregates 2018.
- D . ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.
- E . ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens) 2021.
- F . ASTM C150/C150M Standard Specification for Portland Cement 2021.
- G . ASTM C928/C928M Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs 2020a.
- H . ASTM C1059/C1059M Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete 2021.
- I . ASTM C1708/C1708M Standard Test Methods for Self-leveling Mortars Containing Hydraulic Cements 2019.
- J . AWS B2.1/B2.1M Specification for Welding Procedure and Performance Qualification 2014 (Amended 2015).
- K . AWS D1.4/D1.4M Structural Welding Code Steel Reinforcing Bars 2018.
- L . ICRI 310.2R Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair 2013.

# 1.4 ADMINISTRATIVE REQUIREMENTS

A . Scheduling: Perform blast cleaning only between the hours of 7 am (9 am on weekends and legal holidays) to 10 pm.

### 1.5 SUBMITTALS

- A . See Section 01 30 00 Administrative Requirements, for submittal procedures.
- B . Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
- C. Designer's Qualification Statement.
- D. Manufacturer's Qualification Statement.
- E. Cleaner's Qualification Statement, F. Installer's Qualification Statement.
- G . Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and no more than 12 months before start of scheduled welding work.
- H . Project Record Documents: Accurately record actual locations of structural reinforcement repairs and type of repair.

## 1.6 QUALITY ASSURANCE

- A . Designer Qualifications: Design reinforcement splices under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B . Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- C . Cleaner Qualifications: Company specializing in, and with minimum of 3 years of experience in, the type of cleaning specified.
- D . Installer Qualifications: Company specializing in performing work of the type specified and with minimum of 3 years of documented experience.
- E . Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.4/D1.4M and dated no more than 12 months before start of scheduled welding work.

## 1.7 MOCK-UP(S)

- A . Test each type of maintenance procedure required on each type of existing construction, to determine the most appropriate procedures to use and as a record of expected results.
- B. Crack Injection: Prepare one sample of each type of injection.
- C . Horizontal Surface Repair: Total of 10 foot square area, demonstrating each type of repair.
- D. Vertical Surface Repair: Total of 10 foot square area, demonstrating each type of repair.

- E . Where color or texture matching is required, first prepare a small size sample on cementitious board.
- F . Locate mock-up(s) where directed.
- G . Re-work mock-up(s) until satisfactory to Owner.
- 1.8 DELIVERY, STORAGE, AND HANDLING
  - A . Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

# **PART 2 - PRODUCTS**

- 2.1 CLEANING MATERIALS
  - A . Degreaser:
    - 1. Manufacturers:
      - a. Euclid Chemical Company; Euco Clean and Strip: www.euclidchemical.com/#sle.
      - b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; CITREX: www.lmcc.com/#sle.
      - c. Nox-Crete, Inc; Bio-Clean Plus: www.nox-crete.com/#sle.
      - d. SpecChem, LLC; Orange Peel-Citrus Cleaner: www.specchemllc.com/#sle.
      - e. United Gilsonite Laboratories; DRYLOK® Concrete Cleaner and Degreaser: www.ugl.com/#sle.
      - f. W. R. Meadows, Inc; [ ]: www.wrmeadows.com/#sle.
      - g. Substitutions: See Section 01 60 00 Product Requirements.
  - B . Detergent: Non-ionic detergent.
  - C . Acidic Cleaning Agent:
    - 1. Manufacturers:
      - a. United Gilsonite Laboratories; DRYLOK® Concrete and Masonry Etch and Cleaner: www.ugl.com/#sle.
      - b. Substitutions: See Section 01 60 00 Product Requirements.
  - D . Strippers and Cleaners for Removal of Existing Coatings:
    - 1. Manufacturers:
      - a. Nox-Crete, Inc; Deco-Peel Series: www.nox-crete.com/#sle.
      - b. Substitutions: See Section 01 60 00 Product Requirements.
- 2.2 CEMENTITIOUS PATCHING AND REPAIR MATERIALS
  - A . Manufacturers:
    - 1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
    - 2. ARDEX Engineered Cements: www.ardexamericas.com/#sle.

- 3. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
- 4. Euclid Chemical Company: www.euclidchemical.com/#sle.
- 5. Kaufman Products Inc: www.kaufmanproducts.net/#sle.
- 6. Master Builders Solutions; www.master-builders-solutions.com/en-us/#sle.
- 7. The QUIKRETE Companies: www.quikrete.com/#sle.
- 8. SpecChem, LLC: www.specchemllc.com/#sle.
- 9. Stauf USA LLC: www.staufusa.com/#sle.
- 10. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
- 11. Substitutions: See Section 01 60 00 Product Requirements.
- B . Bonding Slurry: Water-based latex admixture complying with ASTM C1059/C1059M, combined with Portland cement and sand in accordance with admixture manufacturer's instructions.
  - Admixture Manufacturers:
    - a. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - b. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
    - c. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
    - d. W. R. Meadows, Inc; Acry-lok: www.wrmeadows.com/#sle.
    - e. Substitutions: See Section 01 60 00 Product Requirements.
- C . Cementitious Resurfacing Mortar: One- or two-component, factory-mixed, polymer-modified cementitious mortar designed for continuous thin-coat application.
  - 1. In-place material resistant to freeze/thaw conditions.
  - Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
  - 3. Integral corrosion inhibitor.
  - 4. Recommended Thickness: Feather edge to 1/8 inch.
  - 5. Color: Gray.
  - 6. Manufacturers:
    - a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
    - b. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - c. Euclid Chemical Company; THIN TOP SUPREME: www.euclidchemical.com/#sle.
    - d. Kaufman Products Inc; HiCap FT: www.kaufmanproducts.net/#sle.
    - e. Kaufman Products Inc; DressUp: www.kaufmanproducts.net/#sle.
    - f. Kaufman Products Inc; Patchwell: www.kaufmanproducts.net/#sle.
    - g. Kaufman Products Inc; Patchwell Kit: www.kaufmanproducts.net/#sle.
    - h. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Duracrete: www.lmcc.com/#sle.
    - i. SILPRO Corporation; Raeco Skimwall: www.silpro.com/#sle.

- j. SILPRO Corporation; TDQ Thin: www.silpro.com/#sle.
- k. Master Builders Solutions; MasterEmaco T 1061: www.master-builderssolutions.com/en-us/#sle.
- I. SpecChem, LLC: Duo Patch: www.specchemllc.com/#sle.
- m. SpecChem, LLC: RevCrete: www.specchemllc.com/#sle.
- n. SpecChem, LLC: Final Finish: www.specchemllc.com/#sle.
- o. Xypex Chemical Corporation; XYPEX Megamix II: www.xypex.com/#sle.
- p. W. R. Meadows, Inc; Parge-All AF: www.wrmeadows.com/#sle.
- q. W. R. Meadows, Inc; Meadow-Patch T2: www.wrmeadows.com/#sle.
- r. Substitutions: See Section 01 60 00 Product Requirements.
- D . Cementitious Repair Mortar, Trowel Grade: One- or two-component, factory-mixed, polymer-modified cementitious mortar.
  - In-place material resistant to freeze/thaw conditions.
  - 2. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
  - 3. Dry Material: Complies with ASTM C928/C928M.
  - 4. Integral corrosion inhibitor.
  - 5. Manufacturers:
    - ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
    - b. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - c. Euclid Chemical Company; EXPRESS REPAIR: www.euclidchemical.com/#sle.
    - d. Euclid Chemical Company; EucoRepair V100: www.euclidchemical.com/#sle.
    - e. Five Star Products, Inc; Five Star Structural Concrete V/O: www.fivestarproducts.com/#sle.
    - f. Kaufman Products Inc; Patchwell V/O: www.kaufmanproducts.net/#sle.
    - g. Koster American Corporation; [\_\_\_\_]: www.kosterusa.com/#sle.
    - h. Master Builders Solutions; MasterEmaco T 1060: www.master-builderssolutions.com/en-us/#sle.
    - i. SpecChem, LLC; OverCrete: www.specchemllc.com/#sle.
    - j. SpecChem, LLC; RepCon V/O: www.specchemllc.com/#sle.
    - k. SpecChem, LLC; SpecPatch: www.specchemllc.com/#sle.
    - SpecChem, LLC; Duo Patch: www.specchemllc.com/#sle.
    - m. Stauf USA LLC; Quick Feather Float QFF-560: www.staufusa.com/#sle.
    - n. W. R. Meadows, Inc; Meadow-Patch T1, Meadow-Patch T2, Meadow-Patch 5, or Meadow-Patch 20: www.wrmeadows.com/#sle.
    - o. W. R. Meadows, Inc; Meadow-Crete GPS: www.wrmeadows.com/#sle.
    - p. Substitutions: See Section 01 60 00 Product Requirements.

- E . Cementitious Repair Mortar, Form and Pour/Pump Grade: Flowable, one- or two-component, factory-mixed, polymer-modified cementitious mortar; in-place material resistant to freeze/thaw conditions.
  - 1. Mixed with water in proportions as recommended by manufacturer.
  - 2. Integral corrosion inhibitor.
  - 3. Manufacturers:
    - a. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - b. Euclid Chemical Company; EUCOCRETE: www.euclidchemical.com/#sle.
    - c. Euclid Chemical Company; EUCOCRETE SUPREME: www.euclidchemical.com/#sle.
    - d. Five Star Products, Inc; Five Star Structural Concrete: www.fivestarproducts.com/#sle.
    - e. Kaufman Products Inc; Patchwell Deep: www.kaufmanproducts.net/#sle.
    - f. SpecChem, LLC; Duo Patch; www.specchemllc.com/#sle.
    - g. SpecChem, LLC; RepCon H-350; www.specchemllc.com/#sle.
    - h. W. R. Meadows, Inc; Meadow-Crete FNP: www.wrmeadows.com/#sle.
    - i. W. R. Meadows, Inc; Meadow-Crete FNP Extended: www.wrmeadows.com/#sle.
    - j. Substitutions: See Section 01 60 00 Product Requirements.
- F . Cementitious Pavement Repair Mortar: Fast hardening, flowable; composed of cement, sand, and additives; capable of setting in cold weather conditions without the aid of chloride- or gypsum-based accelerators; in-place material resistant to freeze/thaw conditions.
  - 1. Dry Material: Complies with ASTM C928/C928M.
  - 2. Integral corrosion inhibitor.
  - 3. Time To Open To Traffic: 6 hours, maximum.
  - 4. Time to Top-Coating: 4 hours, maximum.
  - 5. Manufacturers:
    - a. ARDEX Engineered Cements; ARDEX TRM: www.ardexamericas.com/#sle.
    - b. ARDEX Engineered Cements; ARDEX ERM: www.ardexamericas.com/#sle.
    - c. ARDEX Engineered Cements; ARDEX CD: www.ardexamericas.com/#sle.
    - d. ARDEX Engineered Cements; ARDEX Fine CD: www.ardexamericas.com/#sle.
    - e. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - f. Euclid Chemical Company; EUCO RE-COVER: www.euclidchemical.com/#sle.
    - g. Euclid Chemical Company; VERSASPEED LS: www.euclidchemical.com/#sle.
    - h. Kaufman Products Inc; Duracrete II: www.kaufmanproducts.net/#sle.
    - i. Kaufman Products Inc; Duracrete II FT: www.kaufmanproducts.net/#sle.
    - j. Kaufman Products Inc; Duracrete II VOFT: www.kaufmanproducts.net/#sle.
    - k. SpecChem, LLC; RepCon 928: www.specchemllc.com/#sle.
    - I. SpecChem, LLC; RepCon 928 FS: www.specchemllc.com/#sle.

- m. W. R. Meadows, Inc; Futura-15: www.wrmeadows.com/#sle.
- N. R. Meadows, Inc; Futura-45 or Futura-45 Extended: www.wrmeadows.com/#sle.
- Substitutions: See Section 01 60 00 Product Requirements.
- G . Cementitious Hydraulic Waterstop: Very fast setting, low slump, hand formable, and capable of stopping active water leaks; in-place material resistant to freeze/thaw conditions.
  - Manufacturers:
    - a. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - b. Euclid Chemical Company; SPEED PLUG: www.euclidchemical.com/#sle.
    - c. Kaufman Products Inc; SurePlug regular set: www.kaufmanproducts.net/#sle.
    - d. Kaufman Products Inc; HiCap: www.kaufmanproducts.net/#sle.
    - e. SpecChem, LLC; SpecPlug or Super SpecPlug; www.specchemllc.com/#sle.
    - f. United Gilsonite Laboratories; FAST PLUG® Hydraulic Cement: www.ugl.com/#sle.
    - g. W. R. Meadows, Inc; Meadow-Plug or Meadow-Patch 5: www.wrmeadows.com/#sle.
    - h. Substitutions: See Section 01 60 00 Product Requirements.
- H . Exterior Self-Leveling Concrete Topping: Portland cement-based; suitable as wear surface topping in exterior and wet locations as well as underlayment for applied materials.
  - 1. Compressive Strength: 4300 pounds per square inch, minimum, at 28 days, when tested in accordance with ASTM C109/C109M. air cured.
  - 2. Flexural Strength: 1000 pounds per square inch, minimum, at 28 days, when tested in accordance with ASTM C348.
  - 3. Manufacturers:
    - a. ARDEX Engineered Cements; ARDEX K301: www.ardexamericas.com/#sle.
    - b. Kaufman Products Inc; SureFlow 042: www.kaufmanproducts.net/#sle.
    - c. Substitutions: See Section 01 60 00 Product Requirements.
- I Exterior Self-Leveling Concrete Floor Topping:
  - Minimum Compressive Strength at 28 Days, ASTM C1708/C1708M: 7,000 pounds per square inch.
  - 2. Manufacturers:
    - a. LATICRETE International, Inc; LATICRETE SUPERCAP SC650-MC: www.laticrete.com/#sle.
    - b. LATICRETE International, Inc; NXT Level SP: www.laticrete.com/#sle.
    - c. Substitutions: See Section 01 60 00 Product Requirements.
- J . Pre-Blended Concrete Mix for Small Projects: Construction-grade Portland cement uniformly blended with aggregates and other approved concrete ingredients, requiring only the addition of water.

- 1. Compressive Strength: 4000 pounds per square inch, minimum, at 28 days, when tested in accordance with ASTM C39/C39M.
- 2. Manufacturers:
  - a. Substitutions: See Section 01 60 00 Product Requirements.

### 2.3 EPOXY PATCHING AND REPAIR MATERIALS

#### A . Manufacturers:

- 1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
- 2. Chase Construction Products: www.chasecorp.com/#sle.
- 3. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
- 4. Euclid Chemical Company: www.euclidchemical.com/#sle.
- 5. Kaufman Products Inc.: www.kaufmanproducts.net/#sle.
- 6. SpecChem, LLC: www.specchemllc.com/#sle.
- 7. Sto Corp: www.stocorp.com/#sle.
- 8. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
- 9. Substitutions: See Section 01 60 00 Product Requirements.
- B . Epoxy Repair Mortar: Epoxy resin mixed with aggregate and other materials in accordance with manufacturer's instructions for purpose intended; comply with pot life and workability limits.
  - 1. Manufacturers:
    - a. ARDEX Engineered Cements; ARDEX BACA: www.ardexamericas.com/#sle.
    - b. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - c. Euclid Chemical Company; DURALFLEX FASTPATCH: www.euclidchemical.com/#sle.
    - Kaufman Products Inc; SurePoxy Mortar, SurePoxy HMLV, or SurePoxy HMLV Class B: www.kaufmanproducts.net/#sle.
    - e. LATICRETE International; SPARTACOTE™ Epoxy Fill Coat: www.laticrete.com/#sle.
    - f. Rust-Oleum Corporation; TurboKrete Concrete Patching Compound: www.rustoleum.com/#sle.
    - g. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000 or SpecPoxy 3000 FS: www.specchemllc.com/#sle.
    - h. W. R. Meadows, Inc; Rezi-Weld Gel Paste, Rezi-Weld Gel Paste State, Rezi-Weld 1000, Rezi-Weld LV, or Rezi-Weld LV State: www.wrmeadows.com/#sle.

# C . Epoxy Injection Adhesive:

- 1. Manufacturers:
  - a. CTS Cement Manufacturing Corporation; Ultra-Fast Anchoring Adhesive: www.CTScement.com/#sle.
  - b. CTS Cement Manufacturing Corporation; Fast Anchoring and Repair Adhesive: www.CTScement.com/#sle.

- c. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
- d. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
- e. Kaufman Products Inc; SurePoxy HM, SurePoxy HMLV, SurePoxy HMLV Class B, or SurePoxy HMSLV: www.kaufmanproducts.net/#sle.
- f. SpecChem, LLC; SpecPoxy 1000; www.specchemllc.com/#sle.
- g. W. R. Meadows, Inc; Rezi-Weld LV, Rezi-Weld LV State, Rezi-Weld (IP), or ReziWeld Gel Paste: www.wrmeadows.com/#sle.
- h. Substitutions: See Section 01 60 00 Product Requirements.
- D . Epoxy Bonding Adhesive: Non-sag, two-component, 100 percent solids; recommended by manufacturer for purpose and conditions under which used.
  - 1. Non-Load-Bearing Applications: ASTM C881/C881M Type I, II, III, IV, or V, whichever is appropriate to application.
  - 2. Load-Bearing Applications: ASTM C881/C881M Type IV or V, whichever is appropriate to application.
  - 3. Other Applications: ASTM C881/C881M Type as appropriate to application.
  - 4. Manufacturers:
    - a. ARDEX Engineered Cements; ARDEX BACA: www.ardexamericas.com/#sle.
    - b. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - c. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
    - d. Euclid Chemical Company; DURALFLEX GEL: www.euclidchemical.com/#sle.
    - e. Euclid Chemical Company; DURALFLEX LV: www.euclidchemical.com/#sle.
    - f. Euclid Chemical Company; DURAL 452 GEL, DURAL 452 LV, or DURAL 452 MV: www.euclidchemical.com/#sle.
    - g. Kaufman Products Inc; SurePoxy HM Gel: www.kaufmanproducts.net/#sle.
    - h. Pecora; Dynapoxy Healer/Sealer: www.pecora.com/#sle.
    - i. Pecora; Dynapoxy Low-Mod Epoxy: www.pecora.com/#sle.
    - j. SpecChem, LLC; SpecPoxy 2000: www.specchemllc.com/#sle.
    - k. SpecChem, LLC; SpecPoxy 3000: www.specchemllc.com/#sle.
    - I. SpecChem, LLC; SpecPoxy 3000 FS: www.specchemllc.com/#sle.
    - m. W. R. Meadows, Inc; Rezi-Weld Gel Paste: www.wrmeadows.com/#sle.
    - n. W. R. Meadows, Inc; Rezi-Weld Gel Paste State: www.wrmeadows.com/#sle.
    - o. W. R. Meadows, Inc; Rezi-Weld 1000: www.wrmeadows.com/#sle.
    - p. Substitutions: See Section 01 60 00 Product Requirements.

### 2.4 URETHANE PATCHING AND REPAIR MATERIALS

#### A . Manufacturers:

- 1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
- 2. ARDEX Engineered Cements: www.ardexamericas.com/#sle.

- 3. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
- 4. Euclid Chemical Company: www.euclidchemical.com/#sle.
- 5. Substitutions: See Section 01 60 00 Product Requirements.
- B . Polyurea-Modified Repair Gel: Rapid setting, two-component, 100 percent solids; use with or without aggregate to repair cracks and spalls in concrete surfaces.
- C . Polyurethane Repair Gel: Rapid setting, two-component; use with or without aggregate to repair cracks and spalls in concrete surfaces.
  - 1. Manufacturers:
    - a. ARDEX Engineered Cements; ARDEX ArdiFix: www.ardexamericas.com/#sle.
    - b. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - c. Euclid Chemical Company; EUCO QWIKstitch: www.euclidchemical.com/#sle.
    - d. Rust-Oleum Corporation; Fast Cure High Strength Concrete Repair: www.rustoleum.com/#sle.
    - e. Substitutions: See Section 01 60 00 Product Requirements.
- D . Hybrid Urethane Patching Material: Rapid setting, two-component, 100 percent solids; for rapid joint repair and crack filling where no future slab movement is anticipated.
  - Manufacturers:
    - a. Curecrete Distribution, Inc; CreteFill Spall Repair: www.curecrete.com/#sle.
    - b. Curecrete Distribution, Inc; CreteFill Crack Repair EZ Shave: www.curecrete.com/#sle.
    - c. Substitutions: See Section 01 60 00 Product Requirements.

### 2.5 ACCESSORIES

- A . Anchoring Adhesive: Self-leveling or non-sag as applicable.
  - 1. Self-Leveling Polyester-Based Products:
    - a. W. R. Meadows, Inc; Poly-Grip: www.wrmeadows.com/#sle.
    - b. Substitutions: See Section 01 60 00 Product Requirements.
  - 2. Self-Leveling Epoxy Products:
    - a. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
    - b. SpecChem, LLC; SpecPoxy 2000; www.specchemllc.com/#sle.
    - c. W. R. Meadows, Inc; Rezi-Weld 1000, Rezi-Weld (IP), or Rezi-Weld 3/2: www.wrmeadows.com/#sle.
    - I. Substitutions: See Section 01 60 00 Product Requirements.
  - 3. Non-Sag Epoxy Products:
    - a. Dayton Superior Corporation; www.daytonsuperior.com/#sle.
    - Euclid Chemical Company; DURAL FAST SET GEL: www.euclidchemical.com/#sle.
    - c. SpecChem, LLC; SpecPoxy 3000 or SpecPoxy 3000 FS:

www.specchemllc.com/#sle.

- d. W. R. Meadows, Inc; Rezi-Weld Gel Paste or Rezi-Weld Gel Paste State: www.wrmeadows.com/#sle.
- e. Substitutions: See Section 01 60 00 Product Requirements.
- B . Portland Cement: ASTM C150/C150M, Type I, grey.
- C . Sand: ASTM C33/C33M or ASTM C404; uniformly graded, clean.
- D . Water: Clean and potable.
- E . Reinforcing Steel: ASTM A615/A615M Grade 60 (60,000 psi) billet-steel deformed bars, unfinished.
- F. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade60 (280), Type A.
  - 1. Galvanized in accordance with ASTM A767/A767M, Class I.
  - 2. Epoxy coated in accordance with ASTM A775/A775M.
- G . Stirrup Steel: ASTM A1064/A1064M.

## **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A . Notify Architect seven days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.
- B . Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries. At columns and walls make boundaries level and plumb unless otherwise indicated.
- C . Pachometer Testing: Locate at least three reinforcing bars using a pachometer, and drill test holes to determine depth of cover. Calibrate pachometer using depth of cover measurements, and verify depth of cover in removal areas using pachometer.
- D . Perform surveys as the Work progresses to detect hazards resulting from concrete-maintenance work.

### 3.2 PREPARATION

- A . Prepare concrete surfaces to be repaired according to ICRI 310.2R.
- B . Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.
- C . Preparation for Removal of Deteriorated Concrete: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.
  - 1. Verify that affected utilities have been disconnected and capped.

- 2. Inventory and record the condition of items to be removed for reinstallation or salvage.
- 3. Provide and maintain shoring, bracing, and temporary structural supports as required to preserve stability and prevent unexpected or uncontrolled movement, settlement, or collapse of construction being demolished and construction and finishes to remain.
- D . Protect persons, surrounding surfaces of building being restored, building site from harm resulting from concrete maintenance work.
  - 1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
  - 2. Use only proven protection methods appropriate to each area and surface being protected.
  - 3. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
  - 4. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
  - 5. Protect floors and other surfaces along haul routes from damage, wear, and staining.
  - 6. Provide supplemental sound-control treatment as required to comply with the Seattle Noise Ordinance to isolate removal and dismantling work from neighboring properties.
  - 7. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
  - 8. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
  - 9. Dispose of debris and runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- E . Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.
  - Prevent solids such as aggregate or mortar residue from entering the drainage system.
     Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance work.
  - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

## F . Concrete Removal:

- Provide shoring, bracing, and supports as necessary. Contractor responsible for determining shoring loads. Strengthen or add new supports when required during progress of removal work.
- 2. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch. Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.
- 3. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.

- 4. Remove additional concrete if necessary to provide a depth of removal of at least 1/2 inch over entire removal area.
- 5. Where half or more of the perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least a 3/4-inch clearance around bar.
- 6. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.
- 7. Provide surfaces with a fractured profile of at least 1/8 inch that are approximately perpendicular or parallel to original concrete surfaces. At columns and walls, make top and bottom surfaces level unless otherwise directed.
- 8. Thoroughly clean removal areas of loose concrete, dust, and debris.
- G . Reinforcing-Bar Preparation: Remove loose and flaking rust from reinforcing bars by highpressure water cleaning abrasive blast cleaning needle scaling or wire brushing until only tightly adhered light rust remains.
  - Where section loss of reinforcing bar is more than 20 percent, or 10 percent in two or more adjacent bars, cut bars and remove and replace per the Structural Drawings. Remove additional concrete as necessary to provide at least 3/4-inch clearance at existing and replacement bars. Splice replacement bars to existing bars according to ACI 318, welding, or using mechanical couplings.
- H . Surface Preparation for Corrosion-Inhibiting Treatment: Clean concrete to remove dirt, oils, films, and other materials detrimental to treatment application.
  - 1. Use low-pressure water cleaning detergent scrubbing or sand blasting.
  - 2. Allow surface to dry before applying corrosion-inhibiting treatment.

## 3.3 CLEANING EXISTING CONCRETE

- A . Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.
- B . Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
  - 1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
  - 2. Clean out cracks and voids using same methods.
- C. The following are acceptable cleaning methods, in order from gentlest to less gentle:
  - 1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
  - 2. Increasing the water washing pressure to maximum of 400 psi.
  - 3. Adding detergent to washing water; with final water rinse to remove residual detergent.
  - 4. Steam-generated low-pressure hot-water washing.
  - 5. Alkaline cleaning agent applied for the least amount of time that is effective, followed by slight acid rinse and water rinse.

- 6. Acidic cleaning agent applied for the least amount of time that is effective, followed by water rinse. Test acidic cleaning agents on mock-up surfaces prior to use.
- Abrasive blasting: Use only abrasive media that have been proven not to damage concrete by testing on mock-up.
- D . Do not use any of the following cleaning methods, unless otherwise indicated:
  - 1. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, sodium hydroxide, caustic soda, or lye.
  - 2. Soap or detergent that is not non-ionic.
  - 3. Water washing pressure to over 100 psi.
  - 4. Steam-cleaning or steam-generated hot-water washing.
  - 5. Alkaline cleaning agents.
  - 6. Acidic cleaning agents.
  - 7. Abrasive blasting.
- A . Shotcrete RepairComply with Section 03 37 13 "Shotcrete."

## 3.4 CONCRETE STRUCTURAL MEMBER REPAIR

- A . See drawings for specific areas to be repaired.
- B . Remove broken and soft concrete at least 1/4 inch deep.
- C . Mechanically cut away damaged portions of reinforcement.
- D . Remove corrosion from steel and clean mechanically.
- E . Blast clean remaining exposed reinforcement surfaces.
- F . Repair by welding new bar reinforcement to existing reinforcement using sleeve splices.
  - 1. Perform welding work in accordance with AWS D1.4/D1.4M.
  - Make welded sleeve splices to achieve strength to exceed strength of new reinforcement.
- G . Follow repair product manufacturer's written installation instructions.
- H . Cover exposed steel reinforcement with epoxy mortar.
- I . Work epoxy mortar into broken surface and build up patch to match original.
- J . Feather edges of repairs flush to sound surface and trowel surface to match surrounding area.

## 3.5 CRACK REPAIR USING EPOXY ADHESIVE INJECTION

- A . Repair exposed cracks.
- B . Follow epoxy adhesive manufacturer's written installation instructions.

- C . Provide temporary entry ports spaced to accomplish movement of fluids between ports; no deeper than the depth of the crack to be filled or port size diameter no greater than the thickness of the crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.
- D . Inject adhesive into ports under pressure using equipment appropriate for particular application.
- E . Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.
- F . Remove temporary seal and excess adhesive.
- G. Clean surfaces adjacent to repair and blend finish.
- 3.6 EPOXY-MODIFIED, CEMENTITIOUS BONDING AND ANTICORROSION AGENT:
  - A . Apply to reinforcing bars by stiff brush or hopper spray according to manufacturer's written instructions.
  - B . Apply to reinforcing bars in two coats, allowing first coat to dry two to three hours before applying second coat.
  - C . Allow to dry before placing patching mortar or concrete.

## 3.7 EPOXY BONDING AGENT:

- A . Apply to reinforcing bars by brush, roller, or spray according to manufacturer's written instructions, leaving no pinholes or other uncoated areas.
- B . Apply to reinforcing bars in at least two coats, allowing first coat to dry before applying second coat.
- C . Place patching mortar or concrete while epoxy is still tacky. If epoxy dries, recoat before placing patching mortar or concrete.
- 3.8 MORTAR SCRUB COAT FOR JOB-MIXED PATCHING MORTAR AND CONCRETE:
  - A. Dampen repair area and surrounding concrete 6 inches beyond repair area.
  - B . Remove standing water and apply scrub coat with a brush, scrubbing it into surface and thoroughly coating repair area. If scrub coat dries, recoat before placing patching mortar or concrete.
- 3.9 SLURRY COAT FOR CEMENTITIOUS PATCHING MORTAR:
  - A . Wet substrate thoroughly and then remove standing water. Scrub a slurry of neat patching mortar into substrate, filling pores and voids.
- 3.10 PLACING PATCHING MORTAR: Place as follows unless otherwise recommended in writing by manufacturer:
  - A . Provide forms where necessary to confine patch to required shape.
  - B . Wet substrate and forms thoroughly and then remove standing water.

- C . Pretreatment: Apply specified bonding agent, mortar scrub coat, slurry coat, bonding agent and slurry coat per the patching mortar manufacturer's written instructions.
- D . General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.
- E . Vertical Patching: Place material in lifts of not more than 1-1/2 inches nor less than 1/4 inch in accordance with manufacturer's written instructions. Do not feather edge.
- F . Overhead Patching: Place material in lifts of not more than 1-1/2 inches nor less than 1/4 inch in accordance with manufacturer's written instructions. Do not feather edge.
- G . Consolidation: After each lift is placed, consolidate material and screed surface.
- H . Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.
- I . Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a surface matching adjacent concrete.
- J . Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

# 3.11 FIELD QUALITY CONTROL

- A . An independent testing agency, as specified inDivision 01, will perform field inspection and testing.
  - 1. Test concrete for calcium chloride content during the execution of the Work.
- B . Perform the following tests and inspections:
  - 1. Packaged, Cementitious Patching Mortar: three randomly selected sets of samples for each type of mortar required, tested according to ASTM C 928.
- C . Product will be considered defective if it does not pass tests and inspections.
- D . Prepare test and inspection reports.

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

## 1.2 SUMMARY

- A. Section includes:
  - Structural steel.
  - 2. Field-installed shear connectors.
- B. Related Requirements:
  - Section 05 50 00 Metal Fabrications: for miscellaneous steel fabrications and other steel items not defined as structural steel.
  - 013515 LEED Certification Procedures: for additional requirements of LEED Certification.

#### 1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

#### 1.4 COORDINATION

- A . Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

## 1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

# 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product
- B. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Include embedment Drawings.
  - Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
  - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

- C . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet
  - Materials and Resources Submittals:
    - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessments or EPDs in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).

## 1.7 INFORMATIONAL SUBMITTALS

- A . Qualification Data: For Installer, fabricator, and testing agency.
- B. Welding certificates.
- C . Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D . Mill test reports for structural steel, including chemical and physical properties.
- E . Product Test Reports: For the following:
  - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  - 2. Direct-tension indicators.
  - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
  - 4. Shear stud connectors.
  - 5. Shop primers.
- F. Source quality-control reports.
- G. Field quality-control reports.

## 1.8 QUALITY ASSURANCE

- A . Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C . Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D . Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- E. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC 303.
  - 2. AISC 360.
  - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

# 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

## **PART 2 - PRODUCTS**

## 2.1 PERFORMANCE REQUIREMENTS

- A. Moment Connections: Type FR, fully restrained.
- B. Construction: Combined system of moment frame, braced frame, and shear walls.

#### 2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M, except ASTM A 572/A 572M, Grade 50 for shapes indicated as steel with Fy = 50 ksi.
- C . Plate and Bar: ASTM A 36/A 36M, except ASTM A 572/A 572M, Grade 50 for shapes indicated as steel with Fy = 50 ksi .
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
  - 1. Weight Class: Standard, Extra strong, or Double-extra strong, as indicated.
  - 2. Finish: Black except where indicated to be galvanized.
- F. Welding Electrodes: Comply with AWS requirements.

# 2.3 BOLTS, CONNECTORS, AND ANCHORS

A . High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish, except Hot-dip zinc coating, ASTM A 153/A 153M, Class C in perimeter walls, exterior locations, indoor pool area pool mechanical room.

- Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish, except Hot-dip zinc coating, ASTM A 153/A 153M, Class C in perimeter walls, exterior locations, indoor pool area pool mechanical room.
- B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- C . Headed Anchor Rods: ASTM F 1554, Grade 36, straight. Fabricate items with joints tightly fitted and secured.
  - Nuts: ASTM A 563 hex carbon steel.
  - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
  - 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
  - 4. Finish: Plain, except Hot-dip zinc coating, ASTM A 153/A 153M, Class C in perimeter walls, exterior locations, indoor pool area pool mechanical room.
- D. Threaded Rods: ASTM A36/ A36M.
  - 1. Nuts: ASTM A 563 hex carbon steel.
  - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
  - 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
  - 4. Finish: Plain, except Hot-dip zinc coating, ASTM A 153/A 153M, Class C in perimeter walls, exterior locations, indoor pool area pool mechanical room.
- E. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.
  - Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Amscot Structural Products Corp.
    - b. Fluorocarbon Company Limited.
    - c. GRM Custom Products.
    - d. R.J. Watson Bridge & Structural Engineered Systems.
  - 2. Mating Surfaces: PTFE and PTFE or PTFE and mirror-finished stainless steel.
  - 3. Coefficient of Friction: Not more than 0.06.
  - 4. Design Load: Not less than 2,000 psi.
  - 5. Total Movement Capability: 2 inches.
- F. F. Loose Bearing and Leveling Plates.
  - 1. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
  - 2. Galvanize plates.

# 2.4 PRIMER

- A. Primer: SSPC-Paint 25 BCS, Type I, zinc oxide, alkyd, linseed oil primer.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 or ASTM A780/ A780M.

#### 2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.Maximum Offset Between Faces: 1/16 inch.
  - 1. Camber structural-steel members where indicated.
  - 2. Fabricate beams with rolling camber up.
  - Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
  - 4. Mark and match-mark materials for field assembly.
  - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning" or SSPC-SP 3, "Power Tool Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G . Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  - 2. Baseplate Holes: Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.6 SHOP CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

## 2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
  - 3. Galvanized surfaces.

- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." Hand-tool cleaning and power tool cleaning are not acceptable deviations.
- C . Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  - Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

## 2.8 GALVANIZING

- A . Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M
  - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
  - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

## 2.9 SOURCE QUALITY CONTROL

- A. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
  - 1. Liquid Penetrant Inspection: ASTM E 165.
  - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
  - 3. Ultrasonic Inspection: ASTM E 164.
  - 4. Radiographic Inspection: ASTM E 94.
- B . In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- C . Prepare test and inspection reports.

## **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
  - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
  - Do not remove temporary shoring supporting composite deck construction until cast-inplace concrete has attained its design compressive strength.

## 3.3 ERECTION

- A . Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B . Baseplates, Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C . Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.

- F. Do not use thermal cutting during erection.
- G . Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

#### 3.4 FIELD CONNECTIONS

- A . High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.

## 3.5 INSTALLING LEVELING AND BEARING PLATES

- A . Clean concrete and masonry bearing surfaces of bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

#### 3.6 FIELD QUALITY CONTROL

- A . Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - Verify structural-steel materials and inspect steel frame joint details.
  - 2. Verify weld materials and inspect welds.
  - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

## 3.7 REPAIRS AND PROTECTION

A . Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780/A780M.

- B . Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 powertool cleaning.

**END OF SECTION** 

# **PART 1 - GENERAL**

## 1.1 SECTION INCLUDES

A. Architecturally exposed structural-steel (AESS)

## 1.2 RELATED REQUIREMENTS

- A . 01 30 00 Administrative Requirements: For additional requirements of preinstallation meeting.
- B. 013515 LEED Certification Procedures: for additional requirements of LEED Certification.
- C. 01 60 00 Product Requirements: For substitution and additional product requirements.
- D. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E . 09 90 00 Painting and Coating: For surface preparation, priming, and topcoat requirements.

## 1.3 DEFINITIONS

A . Architecturally Exposed Structural Steel: Structural steel designated as "architecturally exposed structural steel" or "AESS" in Contract Documents.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 30 00 Administrative Requirements.
  - Review preparation and installation procedures and coordinating and scheduling required with related work.

## 1.5 SUBMITTALS

- A. Qualification Data: For fabricator and installer.
- B. Shop Drawings: Show fabrication of AESS components.
  - Indicate welds by standard AWS symbols. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
  - 2. Indicate type, size, and length of bolts. Indicate orientation of bolt heads.
- C . Samples: Submit sample of AESS to set quality standards for exposed welds.
  - 1. Two steel plates, 3/8 by 8 by 4 inches (9.5 by 200 by 100 mm), with long edges joined by a groove weld and with weld ground smooth.
  - 2. Steel plate, 3/8 by 8 by 8 inches (9.5 by 200 by 200 mm), with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches (100 by 150 by 9.5 mm), welded to plate with a continuous fillet weld and with weld ground smooth and blended.

- D . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet
  - 2. Materials and Resources Submittals:
    - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessments or EPDs in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
    - MR Credit BPDO Material Ingredients: Manufacturer's documentation demonstrating product claims of extended producer responsibility program, recycled content, or FSC certified wood, in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
      - Include manufacturer documentation confirming city/ state/ country of material extraction, manufacturer, and purchase and air distance from these locations in project site for products extracted and manufactured within 100 miles of the project site.
- E. Welder's Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- F. Maintenance Data: For users operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

# 1.6 QUALITY ASSURANCE

- A . Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- B . Fabricators Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, AISC 201.
- C. Shop-Painting Qualifications: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Preinstallation Conference: Conduct conference at Project site.

# 1.7 DELIVERY, STORAGE, AND HANDLING

- A . Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
- B . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- C. As required by SMACNA (OCC) and Section 018113 Sustainable Design Requirements.

## 1.8 PROJECT CONDITIONS

A . Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

# 1.9 COORDINATION

A . Coordinate application of shop primers and topcoats with requirements of Division 09 painting sections.

# **PART 2 - PRODUCTS**

## 2.1 DESCRIPTION

- A. In accordance with AISC 303:
  - 1. Category 1 AESS: Basic elements.
  - 2. Category 2 AESS: Feature elements viewed at a distance greater than 20 ft.
  - Category 3 AESS: Feature elements viewed at a distance less than 20 ft.
  - 4. Category 4 AESS: Showcase elements with special surface and edge treatment beyond fabrication.
  - Category 5 AESS: Custom elements with characteristics described in the contract documents.

## 2.2 BOLTS, CONNECTORS, AND ANCHORS

- A . Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3123/F3125M, Type 1, round-head assemblies. Provide acorn nuts at exposed locations.
  - 1. Finish: natural steel with clear top coat.
- B. Corrosion-Resisting (Weathering Steel), Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Type 3, round-head assemblies.

## 2.3 FABRICATION

- A . Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.
- B . Category 1 AESS: Basic elements: In addition to special care used to handle and fabricate AESS, employ the following fabrication techniques.
  - 1. Surface preparation to SSPC-SP 6; prior to blast cleaning, grease and oil are removed by solvent cleaning to meet SSPC-SP 1.
  - 2. Surface condition of steel given in ASTM A6/A6M shall be acceptable.
  - 3. Sharp edges ground smooth; rough surfaces are deburred and ground smooth. Sharp edges resulting from flame cutting, grinding and especially shearing are softened.
  - 4. Continuous weld appearance; intermittent welds are made continuous, either with additional welding, caulking or body filler. For corrosive environments, all joints are seal welded. Seams of hollow structural sections are acceptable as produced.

- 5. Standard structural bolts; all bolt heads in connections are on the same side, as specified, and consistent from one connection to another.
- Weld shall meet AWS D1.1/D1.1M and spatters removed; Weld spatter, slivers, surface discontinuities are removed. Weld projection up to 1/16 in. is acceptable for butt and plug welded joints.
- 7. Seams of HSS shall be acceptable as produced.
- 8. Weld show-through shall be acceptable as produced.
- 9. The permissible tolerances for member depth, width, out of square, and camber and sweep shall be as specified in ASTM A6/A6M and ASTM A500/A500M.
- C . Category 2 AESS: Feature elements viewed at a distance greater than 20 ft.: in addition to the requirements specified for fabrication of Category 1 AESS, employ the following:
  - Visual samples are optional at the request of an Architect, visual samples are either a 3-D rendering, a physical sample, a first-off inspection, a scaled mock-up or a full-scale mock-up, as specified in the contract documents.
  - 2. The as-fabricated straightness tolerance for the member as a whole shall be one-half standard fabrication tolerance for standard structural steel as specified in ASTM A6/A6M and ASTM A500/A500M.
  - 3. Fabrication marks not apparent; members markings during the fabrication and erection processes are not visible.
  - 4. Welds uniform and smooth.,
  - 5. Seams of HSS shall be acceptable as produced.
  - 6. Weld show-through shall be acceptable as produced.
- D . Category 3 AESS: Feature elements viewed at a distance less than 20 ft. In addition to the requirements specified for fabrication of Category 2 AESS, employ the following:
  - 1. Mill marks removed; all mill marks are not visible in the finished product.
  - 2. Butt and plug welds ground smooth and filled; caulking or body filler is acceptable.
  - 3. HSS weld seam oriented for reduced visibility; seems are oriented away from view or as indicated.
  - 4. Cross sectional abutting surface aligned; the matching of abutting cross sections is required.
  - 5. Joint gap tolerances minimized; similar to C.2 above, a clear distance between abutting members of 1/8 in. is required.
  - All welded connections; hidden bolts may be considered and approved by Architect.
  - 7. Weld show-through shall be acceptable as produced.
  - 8. Copes, miters and cuts in surfaces exposed to view shall have a gap that is uniform within 1/8 in., if shown to be an open joint. If instead the joint is shown to be in contact, the contact shall be uniform within 1/16 in.
- E . Category 4 AESS: Showcase elements with special surface and edge treatment beyond fabrication: In addition to the requirements specified for fabrication of Category 3 AESS, employ the following:
  - 1. HSS seam not apparent; HSS seams are treated so they are not apparent.

- 2. Welds contoured and blended; in addition to a contoured and blended appearance, welded transitions between members also are contoured and blended.
- 3. Surfaces filed and sanded; steel surface imperfections are filled and sanded.
- 4. Weld show-through minimized; weld show-through on the back side of a welded element can be minimized by hand grinding the back side surface. The degree of weldthrough is a function of weld size and material. Address weld show-through in mock-up.
- F. Category C AESS: Custom: Employ the following:

## G. Curved AESS:

- For curved structural members, whether composed of a single standard structural shape or built-up, thee as-fabricated variation from the theoretical curvature shall be equal to or less than the standard camber and sweep tolerances permitted for straight members in ASTM A6/ A6M and ASTM A500/ A500M.
- H . The fabricator shall handle the steel with care to avoid marking or distorting the steel members:
  - 1. Slings shall be nylon-type or chains or wire rope with softeners.
  - 2. Care shall be taken to minimize damage to any shop paint or coating.
  - 3. When temporary braces or fixtures are required during fabrication or shipment, or to facilitate erection, care shall be taken to avoid blemishes or unsightly surfaces resulting from the use or removal of such temporary elements.
  - 4. Track welds no incorporated into final welds shall be treated consistently with requirements for final welds.
  - 5. All backing and runoff tabs shall be removed and the welds ground smooth.
  - 6. All bolt heads in connections shall be on the same side, as specified, and consistent from one connection to another.
- I. Members fabricated of unfinished, reused, galvanized or weathering steel that are to be AESS may still have erection marks, painted marks or other marks on surfaces in the completed structure. Special requirements, if any, shall be specified as Category AESS C.
- J . Bolt Holes: Cut, drill, thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- K . Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burring.
  - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.4 SHOP CONNECTIONS

A . High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts" for type of bolt and type of joint specified.

- 1. Joint Type: Per structural notes.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:
  - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
  - Use weld sizes, fabrication sequence, and equipment that limit distortions to allowable tolerances.
  - 3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS is exposed to weather.
  - 4. Provide continuous welds of uniform size and profile where AESS is welded.
  - 5. Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch (plus 1.5 mm, minus 0 mm).
  - Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch (plus 1.5 mm, minus 0 mm). Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
  - 7. Remove backing bars or runoff tabs; back-gouge and grind steel smooth.
  - 8. At locations where welding on the far side of an exposed connection of AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
  - 9. Make fillet welds oversize and grind to uniform profile with smooth face and transition.
  - 10. Make fillet welds of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

## 2.5 FINISHES

- A. Mil marks, welds, and natural steel finish to remain.
- B. Surface to be cleaned and receive clear top coat finish.

# 2.6 GALVANIZING

- A . Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M:
  - Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
  - 2. Fill vent and drain holes that will be exposed I the finished work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

#### 2.7 ACCESSORIES

A. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 – LEED Certification Procedures.

## **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A . Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 013515 LEED Certification Procedures.
- B . Verity, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
  - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- C . Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 ERECTION

- A . Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment.
  - 1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed work.
- B. Set AESS accurately in locations and to elevations indicated and according to AISC S303 and AISC 360.
  - 1. Erect AESS to the tolerances specified in AISC S303 for steel that is designated AESS.
- C . Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

## 3.3 FIELD CONNECTIONS

- A . High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Per structural.
  - 2. Orient bolt heads in same direction for each connection and to maximum extent possible in same direction for similar connections.

#### B. Weld Connections:

- 1. Remove backing bars or runoff tabs; back-gouge and grind steel smooth.
- 2. Remove erection bolts, fill holes, and grind smooth.
- 3. Fill weld access holes and grind smooth.

## 3.4 FIELD QUALITY CONTROL

- A . Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AESS as specified in Division 05 Section "Structural Steel Framing." The testing agency will not be responsible for enforcing requirements relating to aesthetic effect.
- B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

#### 3.5 INSTALLATION

A . All paints and coatings, including accessories, applied on site must comply with the VOC limits, emissions testing and Submittal requirements for IEQ Credit Low-Emitting Materials as specified in Section 013515 – LEED Certification Procedures (LEEDv4).

#### 3.6 CLEANING

A. Dispose of all waste material in accordance with Section 01 74 19 - Construction Waste Management and Disposal and project's Waste Management Plan.

## 3.7 REPAIRS AND PROTECTION

- A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed work. Grind steel smooth.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing with molten zinc repair method in accordance with ASTM A4780/A780M.

## 3.8 SCHEDULE

- A . (AESS-1): Category 1:
  - 1. Locations: steel channels over new openings; exterior fence and gate enclosure
- B. (AESS-3): Category 3:
  - 1. Location: Communicating Stair, Canopies, stringers, supports, and rails

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 SECTION INCLUDES

- A. Delegated design of metal fabrications.
- B . Metal Fabrications, including custom gate and security enclosure panels and supports at northwest entry, custom interior stair supports and stringers, and cast stair nosings.

#### 1.2 RELATED REQUIREMENTS

- A . 013515 LEED Certification Procedures: For additional requirements of LEED Certification.
- B. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- C . 057300 Decorative Metal Railings: Fabrications associated with decorative railings.
- D . 09 90 00 Painting and Coating: For surface preparation, priming, and topcoat requirements.

## 1.3 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 30 00 Administrative Requirements.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.
  - 2. Review FM and Owner requirements for quality assurance and testing

# 1.4 SUBMITTALS

- A. Qualification Data: For fabricator and design engineer.
- B. Delegated-Design Submittal:
  - For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 2. Stamped engineering calculations for ladders and connections to structure.
- C. Product Data: On all cleaning, galvanizing, and finishing products, including VOC content.
- D. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- E . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - 1. LEED Submittal Coversheet.
  - 2. Low-Emitting Materials Submittals:

- EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
   Documentation certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method V1.1-2010 or later.
- EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 – LEED Certification Procedures.
- 3. Materials and Resources Submittals:
  - a. MR Credit BPDO Material Ingredients: Manufacturer's documentation demonstrating product claims of extended producer responsibility program, recycled content, or FSC certified wood, in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
    - Include manufacturer documentation confirming city/ state/ county of material extraction, manufacturer and purchase and air distance from these locations to project site for products extracted and manufactured within 100 miles of the project site.
- F. Welder's Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.
- G. Maintenance Data: For users operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

#### 1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
- B . Fabricators Qualifications: A qualified fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172). Company specializing in performing the work of this section with minimum 5 years' experience on projects of similar size and complexity.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
  - B . As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

## **PART 2 - PRODUCTS**

#### 2.1 DESCRIPTION

A . Items designated and shop fabricated out of steel and aluminum sections, tubing, plates and pipe for exposed and concealed locations.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Provide materials that meet the guidelines in Section 013515 LEED Certification Procedures.
  - EQ Credit Low Emitting Materials, Option 1: Meet emissions testing and requirements of CDPH Standard Test Method V1.1 – 2010 or later.
  - EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management Distruct (SCAQMD) Rule 113, effective June 3, 2011.
    - Applies only to interior paints and coatings, wet-applied onsite within the weather barrier.

## 2.3 MATERIALS

## A. Steel:

- 1. Steel Sections:
  - a. ASTM 36/A36M.
- 2. Steel Tubing:
  - a. ASTM A500/A500M, Grade B cold-formed structural tubing.
- Plates:
  - a. ASTM A283/A283M.
- 4. Pipe:
  - a. ASTM A53/A53M, Grade B Schedule 40, black finish.
- 5. Slotted Channel Framing:
  - a. ASTM A653/A653M, Grade 33.
- Slotted Channel Fittings:
  - a. ASTM A1011/A1011M.
- 7. Fasteners:
  - a. Metal: Match fasteners exposed to view with the material and color/finish of material being used.
    - 1) Profile: countersunk head with square drive on fasteners.
  - o. Galvanized Steel: Fasteners not exposed to view unless otherwise noted.
    - 1) Profile: countersunk head with square drive on fasteners.
- 8. Bolts, Nuts, and Washers:
  - a. ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.
- 9. Welding Materials:
  - a. AWS D1.1/D1.1M; type required for materials being welded.
- 10. Touch-Up Primer for Galvanized Surfaces: See Section 09 90 00.

# B. Cast Metals

## Metal Stair Nosing

- a. 5/16" thick surface, 1/4" angled nose, 3" depth, length to match tread
- Basis of Design: Ferro-Grit Abrasive Cast Safety Treads and Nosing by Wooster Products.
- c. Type 101: for recessed installation on wood stair treads.
- d. Finish: Non-slip.
- e. Location: New interior stair
- f. Finish: Black; fasteners to match

#### 2.4 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C . Continuously seal joined members by continuous welds.
- D . Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

## 2.5 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

#### 2.6 FINISHES

#### A. Steel:

- 1. Prime paint all steel items.
  - a. Exceptions:
    - 1) Galvanize items to be embedded in concrete or masonry.
    - 2) Galvanize items specified for galvanized finish.
    - 3) Do not prime surfaces indicated for spray fire proofing, weathering steel, clear finish, or blackened steel finish.

- 4) Field welding is required.
- b. See Section 09 90 00 Painting and Coating for field finish painting
- 2. Prime Painting: One coat.
- Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
- 4. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

## 2.7 ACCESSORIES

- A . All accessory materials required by the fabricator for a complete installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. All accessory materials required to comply with EQ Credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

## **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.
- B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 013515 LEED Certification Procedures.

## 3.2 INSTALLATION

- A . Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated.
- D. Perform field welding in accordance with AWS D1.1/D1.1M
- E . After erection, prime welds, abrasions, and surfaces no shop primed or galvanized, except surfaces to be in contact with concrete.
- F. All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

## 3.3 INSTALLATION

A . All paintings and coatings, including accessories, applied on site must comply with the VOC limits, emissions testing and Submittal requirements for IEQ Credit Low-Emitting Materials.

#### 3.4 INSTALLATION TOLLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative
- B. Maximum Offset From True Alignment: 1/4 inch.

C . Maximum Out-of-Position: 1/4 inch

# 3.5 CLEANING

A . Dispose of all waste material in accordance with Section 01 74 19 - Construction Waste Management and Disposal and project's Waste Management Plan.

# 3.6 PROTECTION

A . Protect installed work as required by the fabricator to maintain finishes, product performance, design criteria, and warranty.

**END OF SECTION** 

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# **PART 1 - GENERAL**

## 1.1 SECTION INCLUDES

A. Delegated design of decorative metal railings

#### 1.2 RELATED REQUIREMENTS

- A . 01 30 00 Administrative Requirements: For additional requirements of preinstallation meeting.
- B . 01 35 15 LEED Certification Procedures: For additional requirements of LEED Certification.
- C . 01 60 00 Product Requirements: For substitution and additional product requirements.
- D. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E. 06 06 60 Translucent Resin Panel System for guardrail infill.
- F. 09 90 00 Paints and Coatings

#### 1.3 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 30 00 Administrative Requirements.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

#### 1.4 SUBMITTALS

- A. Qualification Data: For installer
- B. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.
- C . Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
- E. Manufacturer's Installation Instructions.
- F . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. Low-Emitting Materials Submittals:

- EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
   Documentation certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method V1.1-2010 or later.
- EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 – LEED Certification Procedures.

#### 3. Materials and Resources Submittals:

- a. MR Credit BPDO Material Ingredients: Manufacturer's documentation demonstrating product claims of extended producer responsibility program, recycled content, or FSC certified wood, in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
  - Include manufacturer documentation confirming city/ state/ county of material extraction, manufacturer and purchase and air distance from these locations to project site for products extracted and manufactured within 100 miles of the project site.
- G. Maintenance Data: Manufacturer's instruction for care and cleaning.
- H . Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

## 1.5 QUALITY ASSURANCE

- A . Installer Qualifications: Company specializing in installing glazed railing systems and acceptable to manufacturer.
- B . Mockups: Construct a railing of each type specified. Locate mockups where directed. Mockups may remain as part of the work.

# 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver railing materials in factory provided protective coverings and packaging.
- B. Protect railing materials against damage during transit, delivery, storage, and installation at site.
- C . Inspect railing materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.
- D. Prior to installation, store materials and components under cover, in a dry location.
- E . As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

#### 1.7 WARRANTY

A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

# **PART 2 - PRODUCTS**

#### 2.1 DESCRIPTION

A. Delegated design of steel guardrails, flat bars, angles and steel cables for decorative railing.

## 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Comply with applicable accessibility requirements of ADA Standards.
- B. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- C . Linear Loads: Design railing assembly, wall rails, and attachments to resist a linear load of 50 pounds per linear foot, or as amended by local code, applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.
- D. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated load of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.
- E . Provide materials that meet the guidelines in Section 013515 LEED Certification Procedures.
  - EQ Credit Low Emitting Materials, Option 1: Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 or later.
  - EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
    - Applies only to interior paints, coatings, wet-applied onsite within the weather barrier.

# 2.3 MATERIALS

#### A. Steel:

- 1. Steel Sections: ASTM 36/A36M.
- 2. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.
- Plates: ASTM A283/A283M.
- 4. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- 5. Fasteners: To suit application. Generally fasteners exposed to view shall match the materials and color/ finish; fasteners not exposed to view shall be galvanized.
- Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/ A153M where connecting galvanized components.
- 7. Welding Materials: AWS D1.1/ D1.1M; type required to develop strength of particular grade and section welded.

# 2.4 RAILING FABRICATION

- A . Railings General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
  - 1. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
  - 2. Joints: Tightly fitted and secured, machined smooth with hairline seams.
  - 3. Field Connections: Provide sleeves to accommodate site assembly and installation.
  - 4. Welded and Brazed Joints: Make exposed joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
    - Ease exposed edges to small uniform radius.
    - b. Welded Joints:
      - 1) Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.

## 2.5 ACCESSORIES

- A . All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.
- B. Non-Weld Mechanical Fittings:
  - Slip-on, fabricated fittings, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- C. Welding Fittings:
  - 1. Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.
- D. Anchors and Fasteners:
  - 1. Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
    - a. For anchorage into existing masonry per structural (drilled epoxy anchors).
    - b. Exposed Fasteners: No exposed bolts or screws.
- E. Sealant:
  - 1. Silicone; black.
- F. Finish Touch-Up Materials: As recommended by manufacturer for field application.

## **PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Verify that substrate and site conditions are acceptable and ready to receive work.
- B. Verify field dimensions of locations and areas to receive work.

- C. Notify Architect immediately of conditions that would prevent satisfactory installation.
- D. Do not proceed with work until detrimental conditions have been corrected.
- E . Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates and supports for attachment of anchors.
- F . Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 013515 LEED Certification Procedures.

## 3.2 PREPARATION

- A. Protect existing work.
- B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instruction, and direction for installation of anchorages and fasteners.
- C . Clean surfaces to receive units. Remove materials and substance detrimental to the installation.

## 3.3 INSTALLATION

- A. Comply with manufacturer's drawings and written instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.
- C. Anchor securely to structure.
- D . Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E . Isolate dissimilar materials with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion.

#### 3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative
- B. Maximum Offset From Adjoining Pieces: 1/32 inch.
- C. Maximum Offset From True Alignment: 1/4 inch.
- D. Maximum Out-of-Position: 1/4 inch

## 3.5 FIELD QUALITY CONTROL

A . Field Services: Provide the services of the manufacturer for field observation of installation of railings.

## 3.6 CLEANING

A . Remove protective film from exposed metal surfaces.

- B . Metal: clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that many damage the material or finish.,
- C . Dispose of all waste material in accordance with Section 017419 Construction Waste Management and Disposal and project's Waste Management Plan.

## 3.7 PROTECTION

- A . Protect installed components and finishes from damage after installation.
- B . Repair damage to exposed finishes to be indistinguishable from undamaged areas.
  - If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

**END OF SECTION** 

## **PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to this Section.

#### 1.2 SUMMARY

- A . This Section includes the Resin Fabrication as shown and specified in the described system(s):
  - 1. Guardrail Panels
- B. Related Sections include the following:
  - 1. Section 013515 LEED Certification Procedures for LEED compliance requirements.
  - 2. Section 057300 Decorative Metal Railings
  - 3. Section 062000 Finish Carpentry.

#### 1.3 SUBMITTALS

- A . General: Submit the following in accordance with conditions of contact and Division 1 specification section 01 33 00 "Submittal Procedures."
- B . Product Data: Indicate product description, fabrication information, and compliance with specified performance requirements.
- C . Submit material test results or certifications indicating each type and class of panel system complies with the project performance requirements
  - 1. Test results required are:
    - a. Rate of Burning (ASTM D 635)
    - b. Flame Spread and Smoke Developed (ASTM E 84)
    - c. Impact Strength (ASTM D 3763)
  - 2. Certifications
    - a. Certified Recycled Content
    - b. Greenguard Indoor Air Quality
- D . Shop Drawings: Indicate field verified panel sizes, geometries, and attachment points.
- E. Samples for Initial Selection:
  - 1. Submit minimum 3.5 inch by 3.5 inch samples.
  - 2. Indicate full color, texture, and pattern variation.
  - 3. Provide all proposed and applicable fasteners as samples.
  - 4. Approved samples will be retained as standards for work.
- F. Samples for Verification:

 Submit minimum 8 inch by 8 inch sample for each type, texture, pattern and color of Resin.

#### G. Mockups:

- Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects.
  - a. 1 mock-up panel of each color/ finish is required including support stock and fasteners.
- Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.
- H . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. Materials and Resources Submittals:
    - MR Credit BPDO Material Ingredients: Manufacturer's documentation demonstrating product claims of extended producer responsibility program, recycled-content, or FSC certified wood, in accordance with Section 01 35 15 – LEED Certification Procedures (LEEDv4).
      - Include manufacturer documentation confirming city/state/country of material extraction, manufacturer and purchase and air distance from these locations to project site for products extracted and manufactured within 100 miles of the project site.
    - MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 01 3515 - LEED Certification Procedures (LEEDv4).
- I. Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions. Include in Project closeout documents.

#### 1.4 QUALITY ASSURANCE

## A. Manufacturer's Qualifications

- 1. Manufacturer must demonstrate leadership in the field of resin encapsulation with patents or similar proof of ownership of intellectual property or expertise.
- 2. Materials and systems shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least 7 consecutive years.
- 3. Manufacturer must offer access to a network of recycling centers nationwide to recycle panels at the end of life with minimal travel distance to reduce carbon impact. Return process is preceded by the requirements in Section 02 42 00 Removal and Salvage of Construction Materials.

## B. Performance Criteria

1.	Rate of Burning (ASTM D 635)	CC1
2.	Self-Ignition Temperature (ASTM D 1929)	Minimum 800°F
3.	Density of Smoke (ASTM D 2843)	Maximum 39%
4.	Flame Spread (ASTM E 84)	Maximum Flame Spread

5. Smoke Developed (ASTM E 84) Maximum Smoke Developed 450

60

6. Room Corner Burn Test (NFPA 286) Pass (up to 3/8" Gauge)

7. Impact Strength (ASTM D 3736) 1.7 ft-lb/in.

8. Safety Glazing Impact Resistance (ANSI Z97.1-2004)

9. UPITT Test for Combustion Product Toxicity

## C. Certification Requirements

Certified Recycled Content Maximum 40% Post Industrial

Greenguard Indoor Air Quality Pass

D. Manufacturer to have available qualified installers/ fabricators upon demand.

## E. Allowable Tolerances:

1. Flatness: 1/16" maximum deviation over `12"

Thickness: ±10%
 Height/ Width: ±1/2"

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver no components to project site until areas are ready for installation.
- B. Handle materials to prevent damage to finished surfaces and edges.
- C. Keep protective masking in place while fabricating.
- D . Provide protective coverings to prevent damage or staining following installation for duration of project.
- E . Store components on edge, fully supported at 10 off vertical, indoors where atmospheric conditions are controlled to avoid temperature extremes and exposure to ultraviolet light and moisture.
- F. Follow Manufactures recommendations for storage and handling.
- G. Before installing Resin Fabrications, permit them to reach room temperature.

## 1.6 PROJECT CONDITIONS

A . Environmental Limitations: Do not install Resin Fabrications until spaces are enclosed and weatherproof, and ambient temperatures and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## 1.7 WARRANTY

- A . Provide manufacturers 1 year warranty against defects in materials. Warranty shall provide material to repair, or replace, defective materials.
- B. The warranty shall not deprive the owner of other rights or remedies the Owner may have under other provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

# **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

#### A. Manufacturer:

1. Lumicor, Inc., Renton, WA, USA / 888-LUMICOR / www.lumicor.com

#### 2.2 MATERIALS

- A. Material: Lumiform™.
  - 1. Engineered PETG resin with a minimum of 40% post industrial recycled content with class A fire rating.
  - 2. Sheet Size: All panels as designed to be fabricated from Standard 4' x 8' sheets without joints
  - 3. Thickness: ½" to be verified based on deflection.
  - Finishes: Architect to select from manufacturer's standards
  - 5. Options: colored and patterned interlayers and ability for full customization required
  - 6. Basis of Design Product: The design of Resin Fabrications is based on Lumiform ™ panels as provided by Lumicor, Inc. Products from other manufacturers must be approved by the Architect or Designer prior to bidding in accordance with the Instructions to Bidders and Section 10 60 00 "Product Requirements".

# B. Description

- 1. Minimum ½" per manufacturers requirements dependent upon span. Lumiform™, one standard decorative interlayer, cut to size, edge sealed per Lumicor Fabrication Guide, and installed per architect's drawings.
- C . Interlayer Materials: Compatible with acrylic and bonding process to create a monolithic sheet of material when complete.

#### 2.3 FABRICATION

- A . General: Fabricate Resin Fabrications to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes, profiles and other characteristics are indicated on the drawings.
- B. Comply with manufacturer's written recommendations for fabrication.
- C . Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.
  - 1. Sawing: Select equipment and blades suitable for type of cut required.
  - 2. Drilling: Drills specifically designed for use with Resin products.
  - 3. Milling: Climb cut where possible.
  - 4. Routing
- D . Forming: Form products to shapes indicated using the appropriate method listed below. Comply with manufacturer's written instructions.
  - Cold Bending

- 2. Hot Bending
- 3. Thermoforming
- 4. Drape Forming
- 5. Matched Mold Forming
- 6. Mechanical Forming
- E . Laminating: Laminate to substrate indicated using adhesives and techniques recommended by manufacturer.

### 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaner: Mild soap and water or common acrylic cleaners such as Novus or Gel-Gloss.
- C . Fasteners: Button fastener standoffs. Use screws designed specifically for Resins. Provide threaded metal or nylon inserts for applications requiring frequent disassembly such as light fixtures.
- D. Bonding Cements: Solvent or adhesives, suitable for use with product and application.
- E . Drilled Panel Wall Anchors: As provided by the manufacturer. Provide extensions to accommodate thicknesses scheduled or illustrated.

# **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

A . Examine substrates, areas, and conditions where installation of Resin Fabrications will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

#### 3.2 INSTALLATION

- A . General: Comply with manufacturer's written instructions for the installation of Resin Fabrications. Directions for Lumiform<sup>™</sup> materials can be found at <a href="http://www.lumicor.com/technical-information/">http://www.lumicor.com/technical-information/</a>.
- B. Shop fabricates items to the greatest degree possible.
- C . Utilize fasteners, adhesives and bonding agents recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed or discolored as a result of installation or fabrication methods will be rejected.
- D . Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
- E . Form field joints using manufacturer's recommended procedures. Locate seams in panels so that they are not directly in line with seams in substrates.

# 3.3 CLEANING AND PROTECTION

- A . Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to Architect's satisfaction. Refinishing instructions for Lumiform™ products can be found at http://www.lumicor.com/technical-information/.
- B. Dispose of all waste material in accordance with Section 017419 Construction Waste Management and Disposal and project's Waste Management Plan.

**END OF SECTION** 

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# **PART 1 - GENERAL**

### 1.1 SECTION INCLUDES

- A. Fire-retardant-treated wood materials,
- B. Preservative treated wood materials,
- C . Miscellaneous wood mailers, furring, and grounds.

#### 1.2 RELATED REQUIREMENTS

- A . 013000 Administrative Requirements: For additional requirements of preinstallation meeting.
- B . 013515 LEED Certification Procedures: For additional procedures required for LEED Certification.
- C. 014339 Mockups: For additional requirements related to the mockups in this section.
- D. 016000 Product Requirements: For substitution and additional product requirements.
- E . 017419 Construction Waste Management and Dispose: Limitations on disposal of removed materials; requirements for recycling.
- F . 055000 Metal Fabrications: Miscellaneous steel connectors and support angles for rough carpentry.
- G. Structural Notes: For additional Requirements.

# 1.3 DEFINITIONS

- A . Fire-Retardant-Treated Wood: Wood products that, when impregnated with chemicals by a pressure process or other means during manufacture, exhibit reduced surface-burning characteristics and resist propagation of fire.
  - When tested in accordance with ASTM E84 or UL 723, a listed flame spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. Additionally, the flame front shall not progress more than 10-1/2 feet beyond the centerline of the burners at any time during the test.
- B. Preservative-treated wood: Wood products that, conditioned with chemicals by a pressure process or other means, exhibit reduced susceptibility to damage by fungi, insects or marine borers.

# 1.4 ADMINISTRATIVE REQUIREMENTS

A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 013000 - Administrative Requirements.

### 1.5 SUBMITTALS

A. Qualification Data: For fabricator.

- B. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.
- C . Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
- D. LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - 1. LEED Submittal Coversheet.
  - Low-Emitting Materials Submittals:
    - EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
       Documentation certifying all paints and coatings, ceilings, flooring and insulation, products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later.
  - 3. Materials and Resources Submittals:
    - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessments or EPDs in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
    - MR Credit BPDO Material Ingredients: Manufacturer's documentation demonstrating product claims of extended producer responsibility program, recycled content, or FSC certified wood, in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
      - Include manufacturer documentation confirming city/ state/ country of material extraction, manufacturer and purchase and air distance from these locations to project site for products extracted and manufactured within 100 miles of the project site.
- E. Accessory Material VOC Content Certification

### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualification: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B . Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.
- 1.7 DELIVERY, STORAGE, AND HANDLING
  - A . Fire-Retardant-Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.
- 1.8 DELIVERY, STORAGE, AND HANDLING
  - A . General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
  - B. Preservative Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.
  - C . As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures

# **PART 2 - PRODUCTS**

#### 2.1 DESCRIPTION

A. Provide miscellaneous rough carpentry items including fire retardant treated wood materials, preservative treated wood materials, miscellaneous wood nailers, furring, and grounds.

#### 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Provide Preservative-Treated Wood in locations required by ICC (IBC)-2018, Section 2304.12.1 through 2304.12.7, "Locations requiring water-borne preservatives or naturally durable wood," complying with the following requirements:
  - 1. Comply with American Wood Protection Association AWPA U1 and AWPA M4.
  - 2. Identification of Preservative-Treated Wood:
    - a. Provide all preservative-treated wood, identified in accordance with ICC (IBC)-2018, Section 2303.1.9.1, to include: identification of the treating manufacturer; type of preservative used; minimum preservative retention (pcf); end use for which the product is treated; AWPA standard to which the product was treated; identity of the accredited inspection agency.
  - 3. Moisture Content of Preservative-Treated Wood:
    - a. Where preservative-treated wood is used in enclosed locations where drying in service cannot readily occur, such wood shall be at a moisture content of 19 percent or less before being covered with insulation, interior wall finish, floor covering or other materials; in accordance with ICC (IBC)-2018, Section 2302.1.9.2.
  - 4. Fastener requirements at Preservative-Treated Wood:
    - Fasteners and connectors in contact with preservative-treated wood and fireretardant-treated wood, in accordance with ICC (IBC)-2018, Section 2304.10.5; ASTM A153/A153M, ASTM F1667.
      - 1) Fasteners or connectors for preservative-treated wood, including exceptions, in accordance with ICC (IBC)-2018, Section 2304.10.5.1.
- B . Provide Fire-Retardant-Treated (FRT) Wood in accordance with the following requirements:
  - 1. Fire-retardant-treated wood to be manufactured, tested, and labeled in accordance with ICC (IBC)-2018, Section 2303.2.
  - 2. Labeling of FRT Wood:
    - a. Provide all FRT wood, labeled in accordance with ICC (IBC)-2018, Section 2303.2.4, to include: identification mark of an approved agency in accordance with Section 1703.5; identification of the treating manufacturer; name of the fireretardant treatment; species of wood treated; flame spread and smokedeveloped index; method of drying after treatment; and conformance with appropriate standards in accordance with Sections 2303.2.5 through 2303.2.8.
      - For FRT wood exposed to weather, damp or wet locations, include the words "No increase in the listed classification when subjected to the Standard Rain Test" as required by ASTM D2898 and identified as "Exterior," in accordance with ICC (IBC)-2018, Section 2303.2.4.
      - 2) Provide FRT sawn lumber, identified in accordance with sawn lumber labeling requirements of ICC (IBC)-2018, Section 2303.1.1.

 Provide FRT wood structural panels, identified in accordance with wood structural panel labeling requirements of ICC (IBC)-2018, Section 2303.1.5.

### 3. Moisture Content

- Interior FRT wood shall be dried to a moisture content of 28 percent or less in accordance with ASTM D3201/D3201M procedures at 92 percent relative humidity, in accordance with ICC (IBC)-2018, Section 2303.2.7.
- b. FRT wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for wood structural panels before use, in accordance with ICC (IBC)-2018, Section 2303.2.8.

### 4. Flame Spread Rating:

- a. In order for FRT wood to be substituted for non-combustible materials, it must have a Class A rating.
- Classified as Class A or I : Flame spread Index 25 or less when tested in accordance with ASTM E84 or UL 723.
- 5. Required strength adjustment modifications to engineering calculations due to design values for FRT wood to be modified in accordance with ICC (IBC)-2018, Section 2303.2.5; ASTM D5516, ASTM D5664, ASTM D6305, and ASTM D6841.
  - In-field modifications outside of standard sawing and fastening may modify the burning characteristics of the products.
- 6. Fastener requirements at FRT Wood:
  - Fasteners and connectors in contact with preservative-treated wood and fireretardant-treated wood, in accordance with ICC (IBC)-2018, Section 2304.10.5; ASTM A153/ A153M, ASTM F1667.
    - 1) Fasteners for fire-retardant-treated wood used in exterior applications or wet or damp locations, in accordance with ICC (IBC)-2018, 2304.10.5.3.
    - 2) Fasteners for fire-retardant-treated wood used in interior applications in accordance with ICC (IBC)-2018, 2305.10.5.4.

#### 2.3 MATERIALS

### A. Lumber, General:

 Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee's (ALSC) Board of Review. Provide dressed lumber, S4S, with each piece factory marked with grade stamp of inspection agency.

### B. Wood-Preservative-Treated Materials:

Comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood).
 Mark each treated item with the Quality Mark Requirements of an inspection agency
 approved by ALSC's Board of Review. Dimension Lumber: Provide dimension lumber of
 grades indicated according to the ALSC National Grading Rule (NGR) provisions of the
 inspection agency indicated. Refer to Structural "General Notes" located in the
 Drawings.

### C . Fire-retardant-Treated Materials:

- 1. Basis of Design Products:
  - a. Exterior Fireproofing: Hoover Treated Products "Exterior Fire-X."

- Interior Fireproofing: Clear finish product, Lonza Wood Protection "Dricon," Hoover Treated Wood Products "Pyro-Guard," or Koppers Performance Chemicals, "FirePRO."
- Classification: Class A.

#### D. Miscellaneous Lumber:

 Provide No. 3 or Standard grade lumber of any species for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, and similar members.

### 2.4 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Fasteners and Anchors:
  - 1. Metal and Finish: Stainless steel for exterior, high humidity or preservative-treated wood location, unfinished steel elsewhere.
- C. Sill Flashing:
  - 1. Sill Flashing: As specified in Section 076200 Sheet Metal Flashing and Trim.
- D . All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

### **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.
- B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 015721 Indoor Air Quality Controls.

### 3.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

#### 3.3 INSTALLATION – GENERAL

A . Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

#### 3.4 FRAMING INSTALLATION

- A . Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- B. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

# 3.5 BLOCKING, NAILERS, AND SUPPORTS

- A . In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- C . In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

#### 3.6 INSTALLATION OF CONSTRUCTION PANELS

- A . Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.
- B. Subflooring: Glue and nail to framing; staples are not permitted.
- C . Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
  - At long edges provide solid edge blocking where joints occur between roof framing members.
- D. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
  - 1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally.
  - 2. Provide inlet diagonal bracing at corners.

# 3.7 TOLERANCES

A. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

# 3.8 CLEANING

- A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.
- C . Waste Disposal: Comply with the requirements of Section 017419 Construction Waste Management and Disposal.

# 3.9 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

# 3.10 SCHEDULE

- A . Preservative-treated wood materials:
  - 1. Any wood required to be treated by the local authority having jurisdiction.
  - 2. Classification and location as indicated.
  - 3. Preservative-treated products by location:
    - a. Wood framing members less than 8-inches above grade.
    - b. Wood contacting concrete and masonry, roofing membrane and elsewhere as indicated or required.
    - c. Wood floor plates that are installed over concrete slab-on-grade.
    - d. Plywood where indicated or required.
    - e. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, coping substrate and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
    - f. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
    - g. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

### B . Fire-retardant-treated wood materials:

- 1. Any wood required to be treated by the local authority holding jurisdiction.
- 2. Classification and location as indicated.
- FRT products by location: any wood in fire rated walls and assemblies. Any exterior
  walls in type II-B construction including the modifications to exterior envelope at Main
  Building.

**END OF SECTION** 

### **PART 1 - GENERAL**

# 1.1 SECTION INCLUDES

- A. Finish carpentry materials.
- B. Wood handrails.
- C. Glu-Lam Stair Treads

#### 1.2 RELATED REQUIREMENTS

- A . 013515 LEED Certification Procedures: For additional procedures required for LEED Certification.
- B. 016000 Product Requirements: For substitution and additional product requirements.
- C . 017419 Construction Waste Management and Dispose: Limitations on disposal of removed materials; requirements for recycling.
- D. 055213 Pipe and Tube Railings: Steel railings for handrail supports
- E. 057300 Decorative Metal Railings: Steel railing for handrail supports.
- F. 061000 Rough Carpentry: for additional carpentry items.
- G. 064100 Architectural Wood Casework
- H. 074623 Wood Siding
- I. 099000 Painting and Coating: for field finish of finish carpentry items.
- J. 123600 Countertops

### 1.3 SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Data:
  - 1. Provide data on fire retardant treatment materials and application instructions,
  - 2. Provide instructions for attachment hardware and finish hardware.
- C . Shop Drawings: Indicate materials, component profiels, fastening methods, jointing details, and accessories.
  - Minimum Scale of Detail Drawings: 1-1/2 in to 1 foot.
  - 2. Provide the information required by AWI/ AWMAC/WA (AWS) Architectural Woodwork Standards.
- D. Sample: Submit three samples of each type of wood exposed to view, 11 inches by width of board (or 8 inches max) inch in size illustrating wood grain and specified finish.
- E . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - 1. LEED Submittal Coversheet.

- 2. Low-Emitting Materials Submittals:
  - EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
     Documentation certifying all paints and coatings, ceilings, flooring and insulation, products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later.
- Materials and Resources Submittals:
  - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessments or EPDs in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
  - MR Credit BPDO Sourcing of Raw Materials: Manufacturer's documentation demonstrating product claims of extended producer responsibility program, recycled content, or FSC certified wood, in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
    - Include manufacturer documentation confirming city/ state/ country of material extraction, manufacturer and purchase and air distance from these locations to project site for products extracted and manufactured within 100 miles of the project site.
- F. Maintenance Data: For users operation and maintenance of system including:
  - 1. Methods for maintaining systems's materials and finishes.
  - 2. Precautious about cleaning materials and methods that could be detrimental to components, finishes, and performance.

#### 1.4 QUALITY ASSURANCE

- A . Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
  - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
  - 2. Single Source Responsibility: Provide and install this work from single fabricator.
- 1.5 DELIVERY, STORAGE, AND HANDLING
  - A . Fire-Retardant-Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A . As required by the Quality Certification Program for installation of the installed products to meet the Performance and Design Criteria.
  - B. As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

### **PART 2 - PRODUCTS**

# 2.1 DESCRIPTION

A. Wood frames, dimensional lumber and plywood, wall base, and other wood trim, moldings, bases, casings, and miscellaneous trim for doors, glazed lights, window sills, loose shelving. Carpentry items shop fabricated and finished in accordance with AWI/AWMAC/WI (AWS) Architectural Wood Work standards.

# 2.2 PERFORMANCEAND DESIGN CRITERIA

#### A . FINISH CARPENTRY ITEMS

 Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI (AWS) Architectural Woodwork Standards for Premium Grade.

#### B. Wood Handrails:

- 1. Comply with applicable accessibility requirements of ADA Standards.
- 2. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
- Linear Loads: Design railing assembly, wall rails, and attachments to resist a linear load
  of 50 pounds per linear foot, or as amended by local code, applied to the top of the
  assembly and in any direction, without damage or permanent set. Test in accordance
  with ASTM E935.
- 4. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated load of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

#### 2.3 MATERIALS

#### A. Interior Woodwork Items:

- 1. Handrails:
  - a. Species and Finish: Species to match stair tread with clear varnish finish.
  - b. Profile: As indicated on drawings.
- 2. PTD Wood Base, Window and other Trims:
  - a. Species and Finish: Pre-primed finger-jointed paint grade wood trim.
  - b. Profiles: As indicated.
- 3. Glu-Lam Treads for Feature Stair
  - Species and Finish: Premium grade Douglas Fir. No stamps are to be visible after installation
  - b. Size and Profiles: As indicated in details. A single glu-lam shall be used for each tread; no field splicing
  - c. Tread should be modified so nosing will be recessed and flush with finished walking surface.
  - d. Finish should be Bona Traffic AD Anti-Slip Commercial Satin Waterbourne Finish or approved equal. Product must meet slip resistance and VOC standards. Prep and apply coats per manufacturer's instructions.

### B. Lumber Materials:

1. Softwood Lumber: fir species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

#### C. Sheet Materials:

Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; glue type as recommended for application.

- 2. Softwood Plywood Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B; glue type as recommended for application.
- D . Flame Retardant: WT-103 by FireTect. Finish: Clear Matte. Performance: Provides ASTM E84 Class B.

# E. Shop Finishing:

- Sand work smooth and set exposed nails and screws.
- 2. Apply wood filler in exposed nail and screw indentations.
- 3. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- 4. Finish work in accordance with AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, Section 5 Finishing for Grade specified and as follows:
  - a. Transparent:
    - 1) Clear Varnish: Handrails and other high-touch locations; Red List free.
  - b. Opaque:
    - 1) Back prime woodwork items to be field finished, prior to installation.

# F. Site Finishing:

1. In accordance with Section 099000 – Painting and Coating.

### 2.4 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures..

# **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A . Verify existing conditions meet the requirements of the quality standard specified before starting work.
- B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 015721 Indoor Air Quality Controls.

# 3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with quality standard specified.

#### 3.3 INSTALLATION

A . General: Install all materials in accordance with quality standard specified based on conditions present.

- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - Scribe and cut to fit adjoining work. Refinish and seal cuts as recommended by quality standard.
  - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
  - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32 inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
  - 4. Install stairs with no more than 3/16 inch variation between adjacent treads and risers and with no more than 3/8 inch variation between largest and smallest treads and risers within each flight.
- C . Install with trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.
- D . All paints and coatings, including accessories applied on site must comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

### 3.4 CLEANING

A . Dispose of all waste material in accordance with Section 017419 – Construction Waste Management and Disposal and project's Waste Management Plan.

### 3.5 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

**END OF SECTION** 

# **PART 1 GENERAL**

# 1.1 SECTION INCLUDES

- A. Cabinetry.
- B. Cabinet Hardware.
- C. Countertops for cabinetwork.
- D. Wall hung counters.
- E. Delegated design of wall hung counter supports.

### 1.2 RELATED REQUIREMENTS

- A. 01 35 15 LEED Certification Procedures: For additional procedures required for LEED certification.
- B. 01 43 39 Mockups: For additional requirements related to the mockups in this section.
- C. 01 60 00 Product Requirements: For substitution and additional product requirements.
- D. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E. 06 10 00 Rough Carpentry: For hidden shelf supports.
- F. 06 20 00 Finish Carpentry: For additional wood-based products.
- G. 08 80 00 Glazing: Glass for casework.
- H. 09 22 19 Non-Structural Metal Framing: Support framing, grounds, and concealed blocking for metal stud construction.
- I. 09 90 00 Painting and Coating: Site finishing of cabinet interior.
- J. 12 36 00 Countertops: for countertops installed with casework.

# 1.3 ADMINISTRATIVE REQUIREMENTS

# 1.4 SUBMITTALS

- A. Qualification Data: For fabricator and installer.
- B. Product Data: Provide data for hardware, accessories, and finishes.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.

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- Provide the information required by AWI/AWMAC/WI (AWS) Architectural Woodwork Standards.
- 3. Provide schedule of drawer locations where soft-close drawer slide features are not available; Architect to review and revise style as required.
- D. Sample: Submit sample of cabinet panel construction, minimum 12 inches square, illustrating proposed cabinet substrate and finish.
- E. Hardware Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.
- F. LEED Submittals: For components of this section submit the following in compliance with Section 01 35 15 LEED Certification Procedures.
  - 1. Low-Emitting Materials Submittals:
    - a. LEED Low Emitting Materials (LEM) Submittal Form: Section 01 35 15.01 LEED Low-Emitting Materials Submittal Coversheet.
    - b. EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.

      Documentation certifying products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 and 2017.
    - c. EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied products: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 01 35 15 - LEED Certification Procedures.
- G. Manufacturer's Installation Instructions: For finishes and hardware. Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- H. Maintenance Data: For user operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

### 1.5 MAINTENANCE MATERIAL

- A. Furnish extra materials described below, before installation begins, that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
  - 1. Cabinet and Drawers: Provide (4) sets of keys to Owner.

### 1.6 QUALITY ASSURANCE

A. Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

**Architectural Wood Casework** 

B. Installer Qualifications: Company specializing in performing the work of this section with minimum of 5 years of experience.

### 1.7 MOCKUP

A. Construct mockup of single base cabinet; minimum 9 inches wide, to include door representing laminate, wood grain direction, and matching of material, cabinet interior, fit, finish, matching edgebanding and selected hardware. B. Mockup may not remain as part of the Work.

### 1.8 DELIVERY, STORAGE, AND HANDLING

A. As required by the quality standard and fabricator for a warrantable installation of the installed products to meet the Performance and Design Criteria.

# PART 2 PRODUCTS

### 2.1 DESCRIPTION

A. Custom designed and fabricated casework and associated accessories and hardware.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Provide materials that meet guidelines in Section 01 35 15 LEED Certification Procedures.
  - 1. EQ Credit Low Emitting Materials, Option 1: Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 and 2017.
  - EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
    - a. Applies only to interior paints and coatings applied onsite.

### 2.3 SELECTED INDUSTRY GRADES

- Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI (AWS) Architectural Woodwork Standards.
  - 1. Pattern matching for wood grain veneers based on selected grade and as indicated below:
    - a. Premium Grade:
      - 1) Doors, drawer fronts and false fronts and laminate pattern to run and match vertically within each cabinet unit.
      - Soft close hinges, soft close doors.
      - 3) Public Areas Casework:
        - a) Finish: Wilsonart Traceless laminate, selections per finish schedule

- b) Self-edge.
- c) Thru-color.
- b. Custom Grade:
  - 1) Soft close hinges, soft close doors
  - 2) Staff Kitchen and Common Kitchen:
    - d) Finish: Wilsonart Standard laminate, selections per finish schedule
    - e) Self-edge.

# 2.4 MATERIALS

- A. Cores:
  - 1. Per AWS Standards
- B. Countertop Edge Materials:
  - 1. Self Edged; no PVC or Vinyl trims permitted
- C. Plastic Laminate Materials:
  - 1. Basis of Design: Wilsonart Traceless.
    - a. Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 Product Requirements.
  - High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
    - a. Horizontal Surfaces: HGS, 0.048 inch nominal thickness.
    - b. Vertical Surfaces: VGS, 0.028 inch nominal thickness.
    - c. Non-exposed substrate per casework manufacturer.
    - d. Color: Architect to select from full range of manufacturer's colors.
    - e. Flame Retardant Surfaces: HGF, 0.048 inch nominal thickness.
    - f. Cabinet Liner: CLS, 0.020 inch nominal thickness.
    - g. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

# 2.5 CABINET HARDWARE

A. Drawer Slides:

- 1. Basis of Design: Accuride International, Inc.
- 2. Performance Criteria:
  - a. Rated medium duty grade for drawer size indicated.
    - 1) Drawer slides rated for 100 lbs. minimum; soft-close feature available.
  - b. Rated extra heavy duty grade for drawer size indicated.
    - 1) Drawer slides rated for 250 lbs. minimum; soft-close feature not available.
- 3. Features:
  - a. Full extension.
  - b. Soft-close, stay-closed feature where indicated above. B.

Door and Drawer pulls:

- 2. Public Area Basis of Design: Hafele; Versa Collection.
  - a. Item #: 133.53.407.
- 3. Performance Criteria:
  - a. ADA Standards Compliant.
- 4. Features:
  - a. Style: Bar pulls.
  - b. Finish: Matt black.
  - c. Handles: Zinc.
  - d. CTC: 160 mm.
  - e. Locks: CAM locks; matte black; keyed.
- C. Hinges: European-style, concealed, opening to 135 degrees; soft-closing.

### 2.6 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.
- C. Particleboard for Countertop Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

- 1. Made with binder containing no urea formaldehyde.
- Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- E. Joint Sealant: Mildew-resistant silicone sealant per Section 079005 Joint Sealers.
- F. Freestanding countertop supports: Standard front mount Countertop L Bracket, sized and spaced to support counter's weight as determined by manufacturer. Vertical leg to be hidden behind finishes as described in architectural details. No diagonal brace support permitted.
  - 1. Basis of Design from IronSupports.com.

# PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.
- B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 35 15 - LEED Certification Procedures.

# 3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with Quality Standards.

# 3.3 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Assemble cabinets and complete fabrication.
- C. Anchor cabinets to structure. Secure with countersunk, concealed fasteners
  - 1. For shop finished items, use color matched wood filler.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
  - Scribe and cut cabinets to fit adjoining work and repair damaged finish at cuts.
  - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned.
  - 3. Maintain veneer sequence matching of cabinets with transparent finish.
- E. Shop Finishes: Touch up finishing after installation of architectural cabinets. Fill nail holes with matching filler.

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- 1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.
- F. All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.

### 3.4 ADJUSTING

A. Adjust and lubricate hardware for proper operation. Adjust hardware to center doors and drawers in openings and to provide smooth operation. Complete installation of hardware and accessory items as indicated.

### 3.5 CLEANING

- A. Dispose of all waste material in accordance with project's Waste Management Plan.
  - 1. See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

### 3.6 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

**END OF SECTION** 

### **PART 1 - GENERAL**

#### 1.1 SECTION INCLUDES

- A. Fiber Board Insulation.
- B. Acoustic Batt Insulation.
- C. Foam Detailing Insulation.

#### 1.2 RELATED REQUIREMENTS

- A . 013515 LEED Certification Procedures: For additional procedures required for LEED Certification.
- B. 014339 Mockups: For additional requirements related to the mockups in this section.
- C . 016000 Product Requirements: For substitution and additional product requirements.
- D. 017419 Construction Waste Management and Disposal: Limitations on disposal of removed material; requirements for recycling.
- E . 092116 Gypsum Board Assemblies: For acoustic insulation installed as a component of assemblies

### 1.3 SUBMITTALS

- A. Qualification Data: For installer, manufacturer, and design engineer.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations and product schedule indicating where each material will be used.
- C . Test Report: Submit report of full-size mockup test for NFPA 285 fire performance, with project cladding assemblies highlighted, for foam insulation on exterior.
- D. Shop Drawings: Indicate required flashings, control joints, and expansion joints, and sealing details at openings, projections, penetrations, and sleeves to maintain continuous thermal barrier.
- E . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - 1. LEED Submital Coversheet.
  - 2. Low-Emitting Materials Submittals:
    - EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
       Documentation certifying all paints and coatings, ceilings, flooring and insulation, products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later.
    - b. EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings products applied onsite products: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 – LEED Certification Procedures..
  - 3. Materials and Resources Submittals:

- MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessments or EPDs in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
- MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with 013515 – LEED Certification Procedures (LEEDv4).
- F . Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
  - 1. Include recommended fastening components and spacing to control sag.
  - Include manufacturer's recommended product for thermal barrier over foam insulation exposed to interior in accordance with IBC 2012.2603.4.
    - a. "...tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275."

### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualification:
- B. Designer Qualifications:
- C . Installer Qualifications: company specializing in performing the work of this section with minimum 2 years of experience.

### 1.5 MOCKUP

- A. Construct mockup of 100 sq ft of horizontal insulation exposed in unconditioned space, representing finished work including internal and external corners.
  - 1. Locate where convenient.
  - 2. Mockup may remain as part of the Work.

# 1.6 DELIVERY, STORAGE, AND HANDLING

- A . As required by the Quality Certification Program for installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

### **PART 2 - PRODUCTS**

#### 2.1 DESCRIPTION

A. Foam board, fiber board, batt, and low expansion detailing foam thermal insulation

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Provide materials that meet the guidelines in Section 013515 LEED Certification Procedures.
  - 1. EQ Credit Low Emitting Materials: Meet emissions testing and requirements of CDPH Standard Test Method v1.1, 2010 or later.

- EQ Credit Low Emitting Materials: Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 or later and meet the applicable VOC content limits of the California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011, Section 013515 - LEED Certification Procedures (LEEDv4)..
  - Applies only to interior paints, coatings, wet-applied on site within the weather barrier

### 2.3 MATERIALS

- A. Foam Board Insulation: AQ
  - Polyisocyanurate Board Insulation:
    - Rigid cellular foam, complying with ASTM C1289.
    - b. Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.
    - c. Performance Criteria:
      - 1) Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
      - Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
      - Complies with fire-resistance requirements as part of an exterior nonloadbearing exterior wall assembly when tested in accordance with NFPA 285 in cladding systems matching project.
      - Water Absorption: <1 percent by volume, maximum, when tested In accordance with ASTM C209.
      - 5) Water Vapor Transmission: <0.3 perms when tested in accordance with ASTM E96/E96M based on 1 inch thickness.
      - 6) Board Density: 2 lb/cu ft.
      - 7) Compressive Resistance: 25 psi.
      - 8) Thermal Resistance (R Value) at 40 degrees F/inch of thickness: 6.5.Lumber Materials:

#### B. Fiber Board Insulation:

- 1. Rigid Mineral Wool Board:
  - a. Exterior Continuous Insulation; ASTM C578.
  - b. Performance Criteria:
    - Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
    - Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
    - Rated Non-combustible per NFPA standard 220 in accordance with ASTM E136.
    - 4) Water Absorption: 0.03 percent by volume, maximum, when tested In accordance with ASTM C1104.

- 5) Water Vapor Transmission: 50 perms when tested in accordance with ASTM E96/E96M based on 1 inch thickness.
- 6) Board Density: 4.5 lb/cu ft.
- 7) Compressive Resistance: 25 psi.
- 8) Thermal Resistance (R Value) at 40 degrees F/inch of thickness: 4.2.

#### c. Features:

- 1) Board Thickness: 2.5 inches.
- 2) Installation: Glue or friction fit between z-clips; no stick pin through fastening.
- 3) Designed for use in rainscreen drainage cavities.

#### C. Fiber Batt Insulation:

- Mineral Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
  - Substitutions for products by manufacturers other than those listed above: See Section 016000 - Product Requirements.
  - b. Performance Criteria:
    - Combustibility: Non-combustible, when tested in accordance with ASTM E136.
    - 2) Manufactured with binder containing no added urea formaldehyde.
    - 3) Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
    - 4) Smoke Developed Index: 450 or less, when tested in accordance with ASTM F84
    - 5) Thermal Resistance (R Value) at 40 degrees F/inch of thickness: 3.1.
  - c. Features:
    - 1) Formaldehyde Free.

# 2.4 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.
- C. Protection Membrane: White, Polypropylene fiberglass scrim.
  - 1. Basis of Design Product: WMP-10 by LAMTEC Corporation.
  - 2. Performance:
    - a. Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
    - b. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
    - c. Light Reflectance: 85% minimum when tested in accordance with ASTM C423.
    - Tensile Strength: 40 lbs/inch width (MD) when tested in accordance with ASTM C1136.

- e. Dimensional Stability: 0.030% maximum when tested in accordance with ASTM D1204.
- D. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.
- B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 015721 Indoor Air Quality Controls.

#### 3.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

#### 3.3 INSTALLATION

- A . General: Install all materials in accordance with quality standard specified based on conditions present.
- B . All paints and coatings, including accessories, applied on site required to comply with EW credit: Low Emitting Materials in accordance with Section 013515 LEED Certification Procedures.

### 3.4 CLEANING

A. Dispose of all waste material in accordance with Section 017419 – Construction Waste Management and Disposal and project's Waste Management Plan.

### 3.5 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

### 3.6 SCHEDULE

- A . Fiberglass Batt Insulation
  - 1. Manufacturer: Owens Corning or approved equal.
  - 2. Application: Unfaced batts for loose-laid installation above ceilings. Friction fit batts in interior walls for STC ratings
- B. Exterior Rigid Mineral Wool Board:
  - 1. Manufacturer: Roxul, Knauf, or approved equal.
  - 2. Application: Exterior Continuous Insulation.

- C . Foam Detailing Insulation
  - 1. Application: as required by envelope details

**END OF SECTION** 

### **PART 1 GENERAL**

#### 1.1 SECTION INCLUDES

- Cellulose insulation applied to inside wall and roof assemblies as required by envelope details.
- B. Surface sealer.

#### 1.2 RELATED REQUIREMENTS

- A. 01 35 15 LEED Certification Procedures: For additional requirements related to LEED Certification,
- B. 01 43 39 Mockups: For additional requirements related to the mockups in this section.
- C. 01 60 00 Product Requirements: For substitution and additional product requirements.
- D. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 30 00 Administrative Requirements.
  - Review preparation and installation procedures and coordinating and scheduling required with related work.

### 1.4 SUBMITTALS

- A. Product Data: Provide data on materials, describing insulation properties.
- B. LEED Submittals: For components of this section submit the following in compliance with Section 01 35 15 LEED Certification Procedures.
  - 1. Low-Emitting Materials Submittals:
    - LEED Low Emitting Materials (LEM) Submittal Form: Section 01 35 15.01 LEED Low-Emitting Materials Submittal Coversheet.
    - b. EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation. Documentation certifying products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 and 2017.
    - c. EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied products: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 01 35 15 - LEED Certification Procedures.
  - 2. Materials and Resources Submittals:

- a. MR Credit BPDO Environmental Product Declarations (EPD), Option 1: disclosed in a 3rd-party verified EPD that conforms to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
- b. Test Report: ICC-ES report for spray foam insulation. A copy of this report shall be available onsite for the field inspector.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 2 years of experience.
- C. Products Specified by Flammability or Combustibility Criteria: Listed and classified by Underwriters Laboratories Inc.

### 1.6 MOCKUP

- A. Construct mockup of 100 sq ft, 10 feet long by 10 feet wide, illustrating ceiling construction.
- B. Locate where directed.
- C. Mockup may remain as part of the Work.

### 1.7 FIELD CONDITIONS

A. Maintain acceptable ambient and substrate surface temperatures prior to, during, and after installation of primer and insulation materials and overcoat.

### **PART 2 PRODUCTS**

### 2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Provide materials the meet the guidelines in Section 01 35 15 LEED Certification Procedures.
  - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: LCA or EPD reports or compliant summary for each product in this section with a compliant evaluation.
  - 2. EQ Credit Low Emitting Materials, Option 1: Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 and 2017.
  - 3. EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
    - a. Applies only to interior paints and coatings applied onsite.

### 2.2 MANUFACTURERS

### A. Cellulose Fiber:

- 1. Basis of Design: Heatlok HFO Pro by Huntsman Building Solutions.
- 2. Location: As shown in Drawings.
- Substitutions: See Section 01 60 00 Product Requirements.

# 2.3 MATERIALS

- A. Cellulose Fiber Insulation: ASTM C739; treated cellulose fiber, white color, conforming to the following test requirements:
  - 1. Bond strength shall be greater than 100 psf per ASTM E736/E736M.
  - 2. Product shall be Class 1 Class A per ASTM E84/ UL 723.
  - 3. Non-corrosive per ASTM C739.
  - 4. Bond Deflection per ASTM E759/E759M: 6" Deflection in 10' Span No Spalling or Delamination.
  - 5. R-Value to be 3.75 per inch per ASTM C518.
  - 6. Comply with IBC 803.3/SBC 2018 803.10 stability requirements for interior finishes.
  - 7. Meet ASTM C 1149.
  - 8. Manufacturer's written certification that product contains no asbestos, fiberglass or other man-made mineral fibers.
  - 9. Contains no added Urea-Formaldehyde Resins.

# 2.4 ACCESSORIES

- A. Primer: As required by insulation manufacturer.
- B. Insulation Surface Sealer: Clear, latex base.

### **PART 3 EXECUTION**

# 3.1 EXAMINATION

- A. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 35 15 - LEED Certification Procedures.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit adhesion.
- C. Verify that ceiling hangers and supporting clips are installed correctly.

D. Verify other work on and within spaces to be insulated is complete prior to application.

### 3.2 PREPARATION

- A. Mask and protect adjacent surfaces from overspray or damage.
- B. Apply primer in accordance with manufacturer's instructions.
- C. Install insulation stops between rafters at wall/sloped roof construction to prevent insulation from covering soffit vents or from limiting air circulation from soffit to attic space.

#### 3.3 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Install insulation to a uniform monolithic density without voids.
- C. Install to a minimum cured thickness indicated.
- D. Install to achieve a thermal resistance R-value of \_\_\_\_\_.

# 3.4 FIELD QUALITY CONTROL

A. Inspection will include verification of insulation and sealer thickness and density.

### 3.5 CLEANING

- A. Dispose of all waste material in accordance with project's Waste Management Plan.
  - 1. See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

### 3.6 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

# **END OF SECTION**

### **PART 1 GENERAL**

#### 1.1 SECTION INCLUDES

- A. Liquid Applied Weather Barrier Coating.
- B. Flexible Flashings.

# 1.2 RELATED REQUIREMENTS

- A. 01 35 15 LEED Certification Procedures: For additional requirements related to LEED Certification.
- B. 01 43 39 Mockups: For additional requirements related to the mockups in this section.
- C. 01 60 00 Product Requirements: For substitution and additional product requirements.
- D. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E. 07 21 00 Thermal Insulation: Vapor retarder and air barrier components installed in conjunction with insulation.
- F. 07 62 00 Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

# 1.3 DEFINITIONS

- Weather Barrier: Assemblies that form water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
- C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
- D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture-resistant, to the degree specified, intended to be installed to shed water without sealed seams.

### 1.4 ADMINISTRATIVE REQUIREMENTS

### 1.5 SUBMITTALS

- A. Qualification Data: For manufacturer and installer.
- B. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.

- C. Shop Drawings: Indicate extents, special joint or termination conditions, and conditions of interface with other materials. Indicate line of continuous air barrier at building exterior.
- D. LEED Submittals: For components of this section submit the following in compliance with Section 01 35 15 LEED Certification Procedures
  - 1. Materials and Resources Submittals:
    - a. MR Credit BPDO Environmental Product Declarations (EPD), Option 1: disclosed in a 3rd-party verified EPD that conforms to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
- E. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of air barrier system installation.
- F. Test Report: Submit report of full-size mockup test for NFPA 285 fire performance.
- G. Field test results.
- H. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, perimeter conditions requiring special attention, and storage and handling criteria.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner 's name and registered with manufacturer.

### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualification: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience with local product representation available to review product installation.
- B. Installer Qualifications: Company specializing in performing the work of this section, using specified materials with minimum 5 years of experience on projects of similar size and complexity.
- 1.7 DELIVERY, STORAGE, AND HANDLING
  - A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

### 1.8 WARRANTY

- A. Manufacturer's warranty for air barrier for a period of ten (10) years from date of Purchase.
  - 1. Preinstallation meeting and jobsite observations by air barrier manufacturer may be required for specified warranty.

### PART 2 PRODUCTS

### 2.1 DESCRIPTION

Tacoma Public Library – Main Branch Renovation SECTION 07 25 00 Weather Barriers

A. Components of liquid-applied weather barrier system and all associated liquid applied flashings.

### 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Air Permeability:
  - 1. The system: Air permeability not to exceed 0.04 cfm/ft2 under a pressure differential listed, when tested per ASTM E2357
- B. Air Infiltration: 0.004 cfm/sq ft maximum per ASTM E283.
- C. Fire Performance: Tested in accordance with, and complying with the acceptance criteria of, NFPA 285; testing must be performed specifically for this project.
- D. Fire Performance: Combustible exterior wall coverings shall be tested in accordance with NFPA 268.
  - Code Reference: SBC 2018.1405.1.1.
- E. Provide materials the meet the guidelines in Section 01 35 15 LEED Certification Procedures.
  - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: LCA or EPD reports or compliant summary for each product in this section with a compliant evaluation.

### 2.3 MATERIALS

- A. Liquid Applied Weather Barrier Coating:
  - 1. Basis of Design: Cat-5 Rainscreen by Prosoco
  - 2. Performance Criteria:
    - a. Air Permeance: Pass: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
    - b. Water Vapor Permeance: 15 perms, minimum, when tested in accordance with ASTM E96/E96M.

### 3. Features:

- a. Material Thickness: 12-15 mils as recommended by manufacturer to attain the performance criteria specified over the substrates present.
- b. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for ultraviolet and weather exposure.
- c. Color: To be selected by Architect from manufacturer's full range.
- 4. Location: Rainscreen wall assemblies.

# B. Flexible Flashings.

- 1. Liquid Flashing Membrane: Product recommended by weather barrier manufacturer to maintain performance criteria while transitioning to rough openings.
- 2. Basis of Design: R-Guard Fast Flash by Prosoco.
- 3. Location: Concealed flashing.
- 4. Self-Adhering Flexible Flashing: SBS-modified bituminous sheet membrane, 30 mil minimum thickness, laminated to a cross-laminated polyethylene film, in factory cut widths.
  - a. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) Flashing product recommended by weather barrier manufacturer.
    - 2) Transition and termination where sheet membrane is challenging or 8-inch upturn height cannot be achieved: Siplast parapro 123.
    - 3) Henry; Blueskin SA.
    - 4) Tremco, Inc.; ExoAir 110/110LT.
- 5. High Temperature Self-Adhering Membrane Flashing: Meeting AAMA 711 specification for heat exposure range Level 3 Service temperature over 176 degrees: Butyl based bituminous sheet membrane, 30-40 mil thickness, laminated to a cross-laminated polyethylene film, in factory cut widths. One of the following:
  - a. Basis of Design: Grace Ultra by GCP.
- 6. Primers, Cleaners, Insulation Adhesive, Joint Compound, and Sealant Materials: As recommended by air barrier manufacturer, appropriate to application, and compatible with adjacent materials.

### 2.4 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria. B. Liquid Flashing Membrane:
  - 1. At locations recommended by air and water-resistant membrane manufacturer. C.

### Primer:

- 1. Liquid waterborne or solvent-borne primer recommended for substrate by air and water barrier material manufacturer. D. Joint Reinforcing Strip:
  - 1. Manufacturer's joint reinforcing tape. E.

Substrate-Patching Membrane:

- 1. Manufacturer's standard trowel-grade substrate filler.
- F. Adhesive and Tape:
  - 1. Manufacturer's standard adhesive and pressure-sensitive adhesive tape. G.

# Metal Flashings:

1. Per 07 62 00 - Sheet Metal Flashing and Trim. H.

#### Joint Sealant:

1. Per 07 90 05 - Joint Sealers.

# PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Verify existing conditions meet the manufacturer's requirements before starting work.
- 3.2 PREPARATION
  - A. Prepare surfaces to receive work in accordance with manufacturer's instructions.
- 3.3 INSTALLATION
  - A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
  - B. Follow specific requirements for lapping and integration with flashings described in the details to form an air and weather tight installation.
  - C. Where primer is required, primer substrates at a rate required by air and water barrier manufacturer and allow it to dry. Limit priming to areas that will be covered by material on same day. Re-prime areas exposed for more than 24 hours.
    - 1. Where required, prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
  - D. Connect and seal exterior wall air and water barrier material continuously to the following areas where applicable, using accessory materials as indicated in the Drawings:
    - Roofing-membrane, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings.
  - E. Install air and water barrier as recommended by the manufacturer around window and door rough openings and at penetrations after sheathing is installed and penetrations have been secured. Provide minimum overlaps as require.

- F. Coordinate installations with Section 07 62 00 Sheet Metal Flashing and Trim to provide air tight transitions within the air and weather barrier membrane including but not limited to rough opening and penetration heads, ledger angles, and cross cavity through wall flashings. Install tapes and sealant continuously as required to provide an air tight installation.
- G. Secure and/or adhere the air and weather barrier system as required by manufacturer.
- H. Ensure that air and weather barrier is air tight, free from holes, gouges, and punctures.
- Cover air and weather barrier system within manufacturer's recommended exposure timeframe.

### 3.4 FIELD QUALITY CONTROL

- A. The owner is to engage a qualified testing agency to perform quantitative field testing of the air barrier assemblies/system during the course of construction. The following testing protocols are to be followed:
  - 1. Whole Building Air Leakage Test per the local governing energy code: Testing of the Addition only is acceptable.
    - a. After all air barrier materials and assemblies are installed including, but not limited to, sealed exterior sheathing, windows, flashings, interior air seal, wall air and weather barrier membranes, penetration flashings, roof membrane, etc. on the entire building:
      - For the Addition Only, determine extraneous air leakage per the test protocol described in the local governing energy code by way of pressurizing and depressurizing the Addition Only using a blower door and report the measured leakage in cfm/sq. ft.
      - 2) Document, by means of thermographic scans, any locations of observed air leakage.
      - Repair accessible locations of the building air barrier system per manufacturer guidelines.
      - 4) Document corrective actions take to seal identified air leaks. Submit report to Owner, Architect, and Authority Having Jurisdiction in accordance with local energy codes.

### 3.5 CLEANING

- A. Clean dust, dirt, and debris from the surface of air and water-resistant barriers prior to installation of furring and/or cladding materials.
- B. Dispose of all waste material in accordance with project's Waste Management Plan.
  - 1. See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

### 3.6 PROTECTION

- A. Protect air and water barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
  - Protect air and weather barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for longer than manufacturer's recommended timeframe, remove and replace fluid-applied air and
    - weather barrier or install additional, full-thickness, fluid-applied air and weather barrier application after repairing and preparing the overexposed membrane according to fluidapplied air and weather barrier manufacturer's written instructions.
  - 2. Protect fluid-applied air and weather barrier from contact with incompatible materials and sealants not approved by fluid-applied air and weather barrier manufacturer. B. Repair damage before proceeding with subsequent construction.
- C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- D. Remove masking materials after installation.

**END OF SECTION** 

## **PART 1 - GENERAL**

- 1.1 SECTION INCLUDES
  - A. Painted Board Siding
- 1.2 RELATED REQUIREMENTS
  - A . 013515 LEED Certification Procedures: For additional procedures required for LEED Certification.
  - B. 016000 Product Requirements: For substitution and additional product requirements.
  - C . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed material; requirements for recycling.
  - D. 072100 Thermal Insulation: Rigid insulation board used as protection board.
  - E. 099000 Painting and Coating: For finish on wood siding.

#### 1.3 ADMINISTRATIVE REQUIREMENTS

A . Preinstallation Meeting: Convene one month before starting work of this section in accordance with Section 013000 - Administrative Requirements.

### 1.4 SUBMITTALS

- A. Qualification Data: For manufacturer and installer.
- B. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.
- C . Shop Drawings: Indicate required flashings, sealing at openings and special joint conditions.
- D. Sample: Submit two samples 12 x 12 inch in size illustrating surface texture, and final finish of each type of siding indicated.
- E . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submital Coversheet.
  - Low-Emitting Materials Submittals:
    - a. EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation. Documentation certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later.
    - b. EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings products applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 – LEED Certification Procedures.
- F. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.

- 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
- 3. Recommendations on maintenance schedule.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualification: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

### 1.6 DELIVERY, STORAGE, AND HANDLING

A . Store in ventilated areas with constant minimum temperature of 60 degrees F and maximum relative humidity of 55 percent..

#### 1.7 WARRANTY

A . Manufacturer's Finish Warranty: Correct defective work within a 20 year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

## **PART 2 - PRODUCTS**

### 2.1 DESCRIPTION

A. Board and panel wood siding with trim, flashings, accessories, and fastenings.

### 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Grad lumber in accordance with the following:
  - 1. Western Red Cedar: Smooth finish finger jointed paint grade

#### 2.3 BOARD SIDING

A . Basis of Design Product: Western red cedar, Ship Lap, and open joint; NLGA, WCLIB, or WWPA.

### B. Features:

- 1. Profile: 1 x 6 finger jointed drop siding as exterior cladding material.
- 2. Finish: Shop primed, field painted.
- 3. Miter cut and matched at all exterior corners.

## 2.4 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

#### B. Nails:

1. Corrosion resistant type; non-staining, of size and strength to securely and rigidly retain the work; prefinished to match siding finish.

## **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify that substrates are ready to receive work.
- B. Verify that water-resistive barrier has been installed over substrate completely and correctly.
- C . Do not begin until unacceptable conditions have been corrected.
- D . If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

### 3.3 INSTALLATION

- A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Fasten siding in place, level and plumb.
- C . Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 5721 Indoor Air Quality Controls.
- D. Install corner strips.
- E . Install metal flashings at internal and external corners.
- F. Touch-up prefinished paint surfaces that are disfigured. Unsightly touch-up will require removal and replacement of affected siding.
- G. Prepare for site finishing specified in Section 099000.

### 3.4 TOLERANCES

- A. Maximum Variation From Plumb and Level: 1/4 inch per 10 feet.
- B. Maximum Offset From Joint Alignment: 1/16 inch.

## 3.5 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

### 3.6 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

### **PART 1 - GENERAL**

### 1.1 SECTION INCLUDES

A. Fabricated sheet metal items.

#### 1.2 RELATED REQUIREMENTS

- A . 013000 Administrative Requirements: For additional requirements of preinstallation meeting.
- B . 13515 LEED Certification Procedures: For additional procedures required for LEED Certification.
- C. 016000 Product Requirements: For substitution and additional product requirements.
- D. 017419 Construction Waste Management and Disposal: Limitations on disposal of removed material; requirements for recycling.
- E. 050513 Shop-Applied Coatings for Metal: For finish on sheet metal flashing.
- F. 072500 Weather Barriers: Moisture protection and underlayments under sheet metal flashings.
- G. 079005 Joint Sealers: Sealants installed with sheet metal flashing and trim.

# 1.3 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one month before starting work of this section in accordance with Section 013000 Administrative Requirements.
  - Review preparation and installation procedures and coordinating and scheduling required with related work.

## 1.4 SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Shop Drawings: Indicate material profile, jointing locations, jointing details, fastening methods, flashings, terminations, and installation details. Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop and field assembled work. Include the following:
  - Identify material, thickness, weight, and finish for each item and location in Project.
  - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  - 3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim,
- C . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures (LEEDv4).
  - 1. LEED Submital Coversheet.
  - 2. Materials and Resources Submittals:

- MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessments or EPDs in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
- MR Credit BPDO Sourcing of Raw Materials: Manufacturer's documentation demonstrating product claims of extended producer responsibility program, recycled-content, or FSC certified wood, in accordance with Section 013515 -LEED Certification Procedures (LEEDv4).
  - Include manufacturer documentation confirming city/state/country of material extraction, manufacturer and purchase and air distance from these locations to project site for products extracted and manufactured within 100 miles of the project site.

### D. Samples:

- 1. Finish Sample: Submit two samples illustrating each metal finish color.
- 2. Fabrication Sample: Submit sample of coping lap joint as it will occur every 10 feet.
- E. Warranty: Submit manufacturer finish warranty and ensure forms have been completed in

### 1.5 QUALITY ASSURANCE

A . Fabricators Qualification: Company specializing in the manufacture of work of this section with minimum 5 years of experience on projects of similar size and complexity.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

### 1.7 WARRANTY

- A. Manufacturer's Finish Warranty: Correct defective work within a 20 year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
  - 1. Panel Finish Criteria are listed AAMA 2605.

#### **PART 2 - PRODUCTS**

# 2.1 DESCRIPTION

A . Sheet metal including steel, stainless steel, and aluminum fabricated into items such as flashings, counterflashings, gutters, downspouts, and other items indicated and scheduled.

### 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . General: Install sheet metal flashing and coping to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B . Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.

1. Temperature Change (Range): 120 deg, ambient; material surfaces.

#### 2.3 MATERIALS

- A . Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
- B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal, shop pre-coated with PVDF coating.
- C . Pre-Finished Aluminum: ASTM B209; 0.032 inch thick; plain finish shop pre-coated with fluoropolymer coating.
- D . Stainless Steel: for masonry use: ASTM A666 Type 304, soft temper, 0.018 inch thick; smooth mill finish.
- E . Stainless Steel: For all other uses: ASTM A666 Type 304, rollable temper, 0.018 inch thick; smooth No. 4 finish.

### 2.4 FABRICATION

- A . Conform to referenced SMACNA manual, Manufacturer's recommendations if premanufactured and as detailed. Conform to following general requirements:
- B. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- C . Form pieces in longest possible lengths.
- D . Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- E. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- F. Hem exposed edges 1/2 inch on unexposed side, miter and seam corners, unless noted otherwise.
- G . Cleats: Fabricate continuous cleats and starter strips from one gauge heavier material than sheet metal material, in widths required by SMACNA, interlockable with sheet.
- H . Fully soldered/welded stainless steel saddle and transition flashings at 3-D transitions such as roof to wall intersections, roof to elevator overrun, and the like.
- I . Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- J . Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection, and as required by SMACNA. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- K . Shingle laps in flashings: 6-inch minimum, sealed with two distinct beads of bib-skinning butyl sealant at each lap.

L . End Dams: For full soldered, welded, or seamless end dams at all flashing ends, 1-inch minimum.

#### 2.5 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Joints: Butt jointed with backing plate lapping and rivets not permitted.
- C. Fasteners: AISI Type 304 or 316, stainless steel, with soft neoprene washers.
- D. Flexible Flashing:
  - 1. For use under metal copings and flashings:
  - 2. Basis of Design: Grace Ultra by GCP Applied Technologies.
- E. Slip Sheet:
  - 1. Rosin sized building paper.
- F. Protective Backing Paint: See Section 099000 Painting and Coating.
- G . Sealant: As specified in Section 079005 Joint Sealers.

### **PART 3 - EXECUTION**

### 3.1 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

# 3.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

### 3.3 INSTALLATION

A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.

### 3.4 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

### 3.5 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

#### 3.6 SCHEDULE

A. Head/Sill Flashings; Trims where Stucco is Cut:

- 1. Profile: Custom per Architectural details.
- 2. Finish: Color to be selected from manufacturer's standards.
- 3. Location: Per architectural details.

## B. Sill Pan:

- 1. Application: SST A240/A240M Mill finish. Welded end dams.
- 2. Finish: Brushed.
- 3. Location: At all windows and exterior storefronts.

# C . Brake Shapes at Storefronts

- 1. Application: Trims and finishes adjacent to interior and exterior storefronts
- 2. Finish: Color to match adjacent storefront
- 3. Location: Per architectural details

**END OF SECTION** 

## **PART 1 GENERAL**

## 1.1 SECTION INCLUDES

A. Walk Pads at Roof

### 1.2 RELATED REQUIREMENTS

- A. 01 60 00 Product Requirements: For substitution and additional product requirements.
- B. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

### 1.3 SUBMITTALS

- A. Qualification Data: For manufacturer and installer.
- B. Product Data: Provide product criteria, characteristics, accessories, jointing and flashing methods.
- C. Shop Drawings: Indicate location and proximity to new equipment
- D. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- F. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's operation and materials.
  - 2. Recommendations on maintenance schedule.

## 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum of 5 years of experience.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

### 1.6 WARRANTY

A. Installation Warranty: Contractor shall correct defective Work within a 2 year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

# PART 2 PRODUCTS

## 2.1 DESCRIPTION

A. Premanufactured roof traffic pads

### 2.2 MATERIALS

## A. Walk Pads:

- 1. Basis of Design: WR Meadows Whitewalk or approved equal.
  - a. Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 Product Requirements.
- Contractor to confirm existing roof material and compatibility of product and installation method.
- 3. Finish: White mineral granules

## 2.3 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

## **PART 3 EXECUTION**

# 3.1 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

### 3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

### 3.3 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- A. Dispose of all waste material in accordance with project's Waste Management Plan.
  - 1. See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

### 3.6 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

**END OF SECTION** 

### **PART 1 - GENERAL**

### 1.1 SECTION INCLUDES

- A. Penetration firestopping
- B . Fire resistive joint systems.

### 1.2 RELATED REQUIREMENTS

- A . 013000 Administrative Requirements: For additional requirements of preinstallation meeting.
- B . 013515 LEED Certification Procedures: For additional procedures required for LEED Certification.
- C. 014339 Mockups: For additional requirements related to the mockups in this section.
- D. 016000 Product Requirements: For substitution and additional product requirements.
- E . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed material; requirements for recycling.
- F. 092116 Gypsum Board Assemblies: For fire rated assemblies requiring firestopping.
- G. Divisions 21-28: For items typically penetrating fire rated assemblies requiring firestopping

## 1.3 ADMINISTRATIVE REQUIREMENTS

A . Preinstallation Meeting: Convene one month before starting work of this section in accordance with Section 013000 - Administrative Requirements.

#### 1.4 SUBMITTALS

- A. Qualification Data: For manufacturer and fabricator.
- B. Product Data: Provide product criteria, characteristics, accessories, and jointing methods, and termination conditions.
- C . Shop Drawings: Indicate system design listing by UL, FM Research, Intertek Testing Services, Omega Point Laboratories (OPL).
  - Where system design listing is not available for a particular configuration provide an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) for submittal
- D . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - 1. LEED Submittal Coversheet.
    - MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 013515 - LEED Certification Procedures (LEEDv4).
- E. Contractor Installation log.

- F. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- G. Maintenance Data: For user's operation and maintenance of system including:
  - Methods for maintaining system's materials.

### 1.5 QUALITY ASSURANCE

- A. Manufacturer of firestop products shall have been successfully producing and supplying these products for a period of not less than 3 years, and be able to show evidence of at least 10 projects where similar products have been installed and accepted.
- B. Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

### 1.6 MOCKUP

- A . Prior to installing firestopping, erect mockups for each different firestop system indicated to verify selections made and to demonstrate qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final installations.
  - 1. Locate mockups on site in locations indicated or, if not indicated, as directed by Owner.
  - 2. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging completed unit of Work. Accepted mockups in an undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

### 1.7 WARRANTY

- A . Installation Warranty: Contractor shall correct defective Work within a five year period after Date of Substantial Completion.
- B. Manufacturer Warranty: Provide five year warranty for firestopping systems.

### **PART 2 - PRODUCTS**

## 2.1 DESCRIPTION

A . Interior Firestopping: Provide firestopping of all joints head of walls and penetrations in fireresistance rated and smoke-resistant assemblies. Single source installer.

#### 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Penetrations: Provide firestopping systems that resist the spread of fire, and the passage of smoke and other gases according to requirements indicated:
  - 1. Firestop all penetrations passing through fire resistance rated wall and floor assemblies and other locations as indicated on the drawings.
  - 2. Provide complete penetration firestopping systems that have been tested and approved by third party testing agency.
  - F Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E814, but not less than one hour or the fire-resistance rating of the construction being penetrated.

- 4. T Rated Through-Penetration Firestop Systems: Provide firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated by Code.
- 5. Provide T-Rating Collar Devices tested in accordance with ASTM E814 or ANSI/UL 1479 for metallic pipe penetrations requiring T-Ratings per the applicable building code.
- L Rated Through-Penetration Firestop Systems: Provide firestop systems with L ratings, in addition to F and T ratings, as determined per UL 1479, where indicated by Code.
- 7. W Rated Through-Penetration Firestop Systems: Provide firestop systems with W Water Resistance ratings, in addition to F, T and L ratings, as determined per UL 1479, where indicated.
- B. Perimeter Fire Containment Systems: Provide interior perimeter joint systems with fireresistance ratings indicated, as determined per ASTM E2307, but not less than the fireresistance rating of the floor construction.
- C . Fire-Resistive Joints: Provide joint systems with fire-resistance ratings indicated, as determined per UL 2079, but not less than the fire-resistance rating of the construction in which the joint occurs.
- D . For firestopping exposed to view, traffic, moisture, and physical damage, provide appropriate firestop systems for these conditions.
  - 1. Exposed to view firestopping must be paintable.
- E . Firestop material must be able to be installed per manufacturers written instructions in temperatures ranging from 35 degrees F to 120 degrees F, and have the ability to be frozen, thawed and still comply with its UL designation and testing results.
- F. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.

#### G. Movement:

- 1. Provide firestop sealants and fire resistive joint sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.
- Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in Standards, ASTM E-1399, ASTM E1966, or ANSI/ UL 2079.
- H . Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.
- I. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.
- J . When mechanical cable pathways are not practical, openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.

- K . Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words "Chase Wall Optional".
- L . Provide penetration firestop systems, fire-resistive joint systems, or perimeter fire barrier systems subjected to an air leakage test conducted in accordance with Standard, ANSI/ UL 1479 for penetrations and ANSI/UL 2079 for joint systems with published L-Ratings for ambient and elevated temperatures as evidence of the ability of firestop system to restrict the movement of smoke.

#### 2.3 MANUFACTURERS

- A. Specification is based on products listed in assemblies shown on Drawings.
  - Comparable products by one of the following are also acceptable. See Section 016000
     Product Requirements for submittal requirements.
    - a. 3M Fire Protection Products.
    - b. HILTI, Inc.
    - c. Hydroflame.
    - d. Specified Technologies, Inc.
  - 2. Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.

### 2.4 ACCESSORIES

A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

### **PART 3 - EXECUTION**

## 3.1 EXAMINATION

A . Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping.

### 3.2 PREPARATION

- A . Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond. Do not allow spillage and migration onto exposed surfaces.
- B. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed. Remove tape as soon as it is possible to do so without disturbing the firestopping seal with substrates.
- C. Verify that system components are clean, dry, and ready for installation.
- D . Verify that field dimensions are as shown on the Drawings and as recommended by the manufacturer.

### 3.3 PENETRATION FIRESTOP INSTALLATION

- A. Ensure that all pipes, conduit, cable, and other items, which penetrate fire rated construction, have been permanently installed prior to installation of firestop assemblies.
- B. Ensure that partitions and all other construction that conceal penetrations are not erected prior to the installation of firestop and smoke seals.
- C . Install forming/damming materials and other accessories in accordance with manufacturers written instructions.
- D . Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
  - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
  - 2. Install materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed finish to produce smooth, uniform surfaces.

### 3.4 FIRESTOP JOINT SYSTEMS INSTALLATION

- A . Install joint fillers to provide support of firestop materials during application.
- B. Provide at the position to produce the cross-sectional shapes and depths of installed firestop material relative to joint widths for optimum sealant movement capability and required fireresistance.
- C . Install systems that result in firestop materials:
  - 1. Directly contacting and fully wetting joint substrates.
  - 2. Completely filling recesses provided for each joint configuration.
  - 3. Providing uniform, cross-sectional shapes and depths relative to joint width that optimize movement capability.
- D . Tool non-sag firestop materials immediately after application and prior to skinning begins. Form smooth, uniform beads of configuration indicated or required to:
  - Produce fire-resistance rating.
  - 2. Eliminate air pockets.
  - 3. Ensure contact and adhesion with sides of joint.

### 3.5 INSTALLATION LOG

- A . Include the following items for all firestop and fire resistive joint installations:
  - 1. Contractor's name, address, and phone number.
  - 2. Through-penetration firestop systems designation of applicable testing and inspecting agency.
  - 3. Date of installation.
  - Firestop systems manufacturer's name.

B . Provide as a pdf file with bi-directional links to floor plans and elevations to clearly illustrate location of material.

#### 3.6 IDENTIFICATION

A . Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems.

### 3.7 CLEANING

- A . Clean off excess fill materials and sealants adjacent to openings and joints as work progresses. Use methods and cleaning materials approved by manufacturers of firestopping products and or assemblies in which openings and joints occur.
- B . Protect firestopping during and after curing period from contact with contaminating substances.
- C . Dispose of all waste material in accordance with Section 017419 Construction Waste Management and Disposal and project's Waste Management Plan.

#### 3.8 SCHEDULE

- A. Firestopping:
  - 1. Location: As required at shaft walls and penetrations..

**END OF SECTION** 

## **PART 1 - GENERAL**

# 1.1 SECTION INCLUDES

- A. Sealants for exterior surfaces
- B. Sealants for interior surfaces.

### 1.2 RELATED REQUIREMENTS

- A . 013515 LEED Certification Procedures: For additional procedures required for LEED Certification.
- B. 014339 Mockups: For additional requirements related to the mockups in this section.
- C. 016000 Product Requirements: For substitution and additional product requirements.
- D. 017419 Construction Waste Management and Disposal: Limitations on disposal of removed material; requirements for recycling.

#### 1.3 SUBMITTALS

- A. Qualification Data: For manufacturer, installer, testing agency.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C . Preliminary Selection Sample: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D . Field Samples for Confirmation: Provide sealant samples in the color selected based on Manufacturer's charts for sealants other than the ones included in the Visual and Performance Mockup. Field samples shall be minimum 12 inches long and installed at joints intended for each particular sealant use. Mockup and field samples will be used to confirm sealant color selection.
- E . Sanded sealant samples: Include in the Visual and Performance mockup, as part of the brick portion of the mockup.
- F . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. Materials and Resources Submittals:
    - MR Credit BPDO Sourcing of Raw Materials: Manufacturer's documentation demonstrating product claims of extended producer responsibility program, recycled content, or FSC certified wood, in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
      - Include manufacturer documentation confirming city/state/country of material extraction, manufacturer and purchase and air distance from these locations to project site for products extracted and manufactured within 100 miles of the project site.

- MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 013515 - LEED Certification Procedures (LEEDv4).
- G . SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- H. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- I. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- J . Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
  - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- K. Field Test Report Log: For each elastomeric sealant application.
- L . Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- M . Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- N. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  - 3. Recommendations on maintenance schedule.

### 1.4 QUALITY ASSURANCE

- A . Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project. Minimum 5 years of documented experience in facilities of this size and scope.
  - 1. Prequalification of single source installers for exterior sealants is encouraged.
- C . Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

# 1.5 MOCKUP

A. Construct mockup of 8 lineal feet of sealant at narrowest joint width and widest joint width, representing finished work including internal and external corners and control joints.

- B. Locate where directed.
- C. Mockup may remain as part of the Work.

### 1.6 DELIVERY, STORAGE, AND HANDLING

A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

#### 1.7 WARRANTY

- A . Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

### 2.1 DESCRIPTION

A. Joint sealers for properly designed joints in interior and exterior materials; selected for durability, movement capacity, adhesion to substrates and non-staining characteristics.

## 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- C . Elastomeric Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- D. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

### 2.3 MATERIALS

- A . Sealants for exterior surfaces:
  - Silicone Sealant: ASTM C920, Grade NS, Class 50, Uses NT, A, G, M, O; single component, general purpose, medium modulus, neutral curing, non-sagging, nonstaining, non-bleeding.
    - a. Movement Capability: +/- 50 percent.
    - b. Color: Standard colors matching finished surfaces.
    - c. Designed for weather-proofing typical exterior materials including unprimed adhesion to anodized and fluoropolymer coated aluminum.

- Surface Modified Silicone Sealant: ASTM C920, Grade NS, Class 50, Uses NT, A, G, M, O; single component, general purpose, medium modulus, neutral curing, nonsagging, non-staining, non-bleeding.
  - a. Movement Capability: +/- 50 percent.
  - b. Color: Standard colors matching finished surfaces.
  - Designed for weather-proofing sensitive porous stone and light colored metal panel substrates.
- 3. Preformed Compressible Foam Sealers.
  - a. Movement +25%, -25% (50% total) permanently elastic.
  - b. Color: Color as selected to match concrete.

#### B. Sealants for interior surfaces:

- 1. General Purpose Interior Sealant: polyurethane; single, or multi- component, paintable.
  - a. Color: Standard colors matching finished surfaces.
  - Designed for interior movement and non-moving joints adjacent to painted surfaces.
- 2. Acoustical Sealant: Latex sealant; ASTM C834.
  - a. Non-hardening type.
  - Tested as part of acoustical assemblies.
- 3. Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single or multi-component.
  - a. Approved by manufacturer for wide joints up to 1-1/2 inches.
  - b. Color: Standard colors matching finished surfaces.
  - c. Product: Vulkem 45 SSL by Tremco Inc.
  - d. Designed for exposed, trafficked joints with pourable self-leveling installation.

### 2.4 ACCESSORIES

# A. Joint sealant backing:

- General:
  - a. Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- 2. Cylindrical Sealant Backings:
  - a. ASTM C1330, Type C (closed-cell material with a surface skin). B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- 3. Bond-Breaker Tape:

a. Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint

surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

#### B. Miscellaneous Materials:

- Primer:
  - Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction jointsealant- substrate tests and field tests.
- 2. Cleaners for Nonporous Surfaces:
  - a. Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- 3. Masking Tape:
  - a. Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
- 4. Natural Sand:
  - a. Washed natural sand containing no contaminants that would affect the sealant. Color as approved by the architect for sanded joints as indicated or scheduled.
- C . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

#### 3.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

### 3.3 INSTALLATION

- A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Joint Sanding: Sand sealant joints at brick and sidewalks.
  - 1. Immediately after tooling and prior to skinning over of sealant, broadcast sand onto surface of sealant.
  - 2. Retool by rolling a dowel over the joint to achieve sufficient embedment.
  - 3. Maintain uniform appearance.

## 3.4 FIELD QUALITY CONTROL

A . Field quality control to include field adhesion testing, field stain testing, test methods and evaluation of field test results.

B. Perform all corrections necessary for issuance of warranty.

### 3.5 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

### 3.6 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

## 3.7 SCHEDULE

#### A. Silicone:

- 1. Manufacturer: Dow, GE, May, Pecora, Sika, Tremco.
- Application: One- or two-part silicone sealant ASTM 920 Grade NS, Class 50/100, Use
- 3. Finish: Color to be selected from manufacturer's standards.

#### B. Silicone:

- 1. Manufacturer: Dowsil 790.
- 2. Application: Masonry.

#### C. Silicone:

- 1. Manufacturer: Dowsil 795.
- Application: Non-porous substrate.

## D. Polyurethane

- Manufacturer: Sika, Tremco
- 2. Application: One- or two-part polyurethane sealant ASTM C920 Grade NS, Class 100/50, Use NT.
- 3. Finish: Color to be selected from manufacturer's standards.
- 4. Location: Exterior and interior movement joints not subject to traffic.

### E. Polyurethane:

- 1. Manufacturer: BASF, Pecora, PSI, Sika, Tremco
- 2. Application: Polyurethane sealant, ASTM C920 Grade NS, Class 25, Use T.
- 3. Finish: Color to be selected from manufacturer's standards.
- 4. Location: Exterior and interior stationary joints subject to foot traffic.

#### F. Latex:

- 1. Manufacturer: BASF, Pecora, PSI, Tremco
- 2. Application: Acrylic latex or siliconized acrylic latex sealant, ASTM C834 Grade NF.

3. Finish: Color to be selected from manufacturer's standards.

4. Location: Interior stationary joints not subject to traffic.

## G. Acoustic:

- 1. Manufacturer: Pecora AIS-919, USG Sheetrock acoustical sealant.
- 2. Application: Non-sag, non-staining ASTM C834, and acoustic tested per ASTM E90.
- 3. Finish: Color to be selected from manufacturer's standards.
- 4. Location: Acoustic sealant at STC rated assemblies.

**END OF SECTION** 

### **PART 1 - GENERAL**

### 1.1 SECTION INCLUDES

A . Fully welded hollow metal door frames.

### 1.2 RELATED REQUIREMENTS

- A. 087100 Door Hardware: For hardware installed in hollow metal doors.
- B. 088000 Glazing: For glass in doors and borrowed lites.
- C. 099000 Painting and Coating: For field painting.

#### 1.3 SUBMITTALS

- A . Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes. Include U-value data for thermally broken doors and frames.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- C . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. LEED Low Emitting Materials Submittals:
    - a. EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation. Documentation certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later.
    - EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings products applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 - LEED Certification Procedures.
  - 3. Materials and Resources Submittals:
    - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessment or EPDs in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
    - MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 01 3515 - LEED Certification Procedures (LEEDv4).
- D . Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- E . Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- F. Maintenance Data: For user's operation and maintenance of system including:

- 1. Methods for maintaining system's materials and finishes
- 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

#### 1.4 QUALITY ASSURANCE

A . Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

## **PART 2 - PRODUCTS**

### 2.1 DESCRIPTION

A. Interior hollow metal frames for solid core wood doors.

## 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Accessibility Requirements: For doors required to be accessible, comply with applicable provisions in the Accessible and Usable Building Facilities ICC A117.1 and 2010 ADA Standards for Accessible Design Department of Justice.
- B . VOC Content: Provide adhesive and sealant products with VOC content equal to or less than 50 grams/Liter.
- C . Comply with ANSI A250.8 in general and for grade and style specified. NAAMM HMMA doors of equivalent or better construction are allowed.
- D . Provide hardware preparation in accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard. Coordinate with Section 087100 Door Hardware.
- E. Provide materials that meet guidelines in Section 013515 LEED Certification Procedures.
  - EQ Credit Low Emitting Materials: Meet emissions testing and requirements of CDPH Standard Test Method v1.1 or later.
  - Meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
    - Applies only to interior paints, coatings, wet-applied onsite within the weather barrier.

### 2.3 MANUFACTURERS

A. Specification is based on Doors and Frames by one of the following:

- Comparable products by one of the following are also acceptable. See Section 016000
   Product Requirements for submittal requirements.
  - a. Assa Abloy.
  - b. Ceco.
  - c. Curries.
  - d. Fleming.
  - e. Steelcraft.
- 2. Substitutions for products by manufacturers other than those listed above: 016000 Product Requirements.

### 2.4 MATERIALS

- A. Interior hollow metal door frames
  - 1. Performance Criteria:
    - a. Comply with the requirements of grade specified for corresponding door.
    - Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 2.
    - Frames for Glass: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage.
  - 2. Features:
    - a. Assembly: Fully welded.
    - b. Finish: Factory primed, for field finishing.

### 2.5 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Glazing: As specified in Section 088000 Glazing, factory installed.
- C . Mineral Fiber Insulation: For filling frame cavities.
- D. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

### 2.6 FINISHING

- A . Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.
- C. Field Finish: In accordance with Section 099000 Painting and Coating.

## **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

A . Verify existing conditions meet the manufacturer's requirements before starting work.

### 3.2 PREPARATION

- A. Prepare surfaces to receive work in accordance with manufacturer's instructions.
- B. Coat inside of frames to be installed in masonry, with bituminous coating, prior to installation.
- C. Coat inside of other frames with bituminous coating to a thickness of 1/16 inch.

### 3.3 INSTALLATION

- A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B . Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- C. Install fire rated units in accordance with NFPA 80.
- D . Seal seam at top closures after finish is applied to create a smooth surface without groove or pits.
  - 1. Seal with sealant Per Section 079005 Joint Sealers.
- E. Pack all frames with insulation.
- F. Coordinate installation of hardware.
- G. Coordinate installation of electrical connections to electrical hardware items.
- H. Touch up damaged factory finishes.
- I. All paints and coatings, including accessories, applied on site must comply with the VOC limits, emissions testing and Submittal requirements for IEQ Credit Low-Emitting Materials as specified in Section 013515 LEED Certification Procedures.

### 3.4 TOLERANCES

- A. Clearances Between Door and Frame: As specified in ANSI A250.8.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

### 3.5 ADJUSTING

- A. Adjust and lubricate hardware for proper operation.
- B. Adjust for smooth and balanced door movement in accordance with manufacturer's instructions.

# 3.6 CLEANING

A . Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

## 3.7 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

# 3.8 SCHEDULE

1. See door and frame schedule in drawings.

**END OF SECTION** 

## **PART 1 - GENERAL**

### 1.1 SECTION INCLUDES

A. Fire rated wood doors.

### 1.2 RELATED REQUIREMENTS

- A . 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 016000 Product Requirements: For substitution and additional product requirements.
- C . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- D. 081113 Hollow Metal Doors and Frames: For frames.
- E. 087100 Door Hardware: For hardware installed in wood doors.
- F. 088000 Glazing: For glass in doors and borrowed lites.
- G. 099000 Painting and Coating: For field painting.

#### 1.3 SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles.
- D . Sample: Submit two samples face material, manufacturer's standard size showing factory finishes, colors, and surface texture.
- E . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. Low-Emitting Materials Submittals:
    - EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
       Documentation certifying paints and coatings, ceilings, flooring and insulation, products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later.
    - EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings products applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 - LEED Certification Procedures.
  - 3. Materials and Resources Submittals:

- a. MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessment or EPDs in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
- MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 01 3515 - LEED Certification Procedures (LEEDv4).
- F. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- G . Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
  - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

# 1.6 WARRANTY

- A . Interior Doors: Provide manufacturer's warranty for the life of the installation.
  - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

#### **PART 2 - PRODUCTS**

#### 2.1 DESCRIPTION

A. Wood doors for Hollow Metal Frames with Lites as described

### 2.2 PERFORMANCE AND DESIGN CRITERIA

A . Accessibility Requirements: For doors required to be accessible, comply with applicable provisions in the Accessible and Usable Building Facilities ICC A117.1 and 2010 ADA Standards for Accessible Design – Department of Justice.

- B. Quality Level: Custom Grade, Extra Heavy Duty performance, in accordance with WDMA I.S. 1A for all doors with the following exceptions.
- C. Construction: Flush.
- D. Vertical Edges: Same species as face veneer.
- E. Edge type (AWI "E" type) edge set in between door face veneers.
- F. Door Edge Profile: Beveled on both edges.
- G . Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- H . Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- Source Limitations: For doors and frames, obtain products from single source from single manufacturer.
- J . Provide hardware preparation in accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard. Coordinate with Section 087100 Door Hardware.
- K. Provide materials that meet guidelines in Section 013515 LEED Certification Procedures.
  - 1. EQ Credit Low Emitting Materials, Option 1: Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010.
  - EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
    - Applies only to interior paints and coatings wet-applied onsite within the weather barrier.

### 2.3 MANUFACTURERS

- A. Specification is based on doors and frames by one of the following:
  - 1. Graham Wood Doors: www.grahamdoors.com
  - 2. Lynden Doors: www.lyndendoor.com
  - VT Industries, Inc: <u>www.vtindustries.com</u>
- B. Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.

### 2.4 MATERIALS

- A. Finish:
  - 1. Paint grade shop primed wood or manufactured wood veneer.
    - a. Size: 1 3/4" 5-ply.
    - b. HD hardboard crossbands.

- c. WDMA I.S. 1-A, Heavy Duty.
- d. Core: LD2 particleboard
- e. Finish: Factory prime for field painting; smooth.
- f. Location: Per door schedule.

### B. Cores:

- Cores Constructed with stiles and rails:
  - a. Provide solid blocks for hardware reinforcement.
  - b. Provide solid blocking for other throughbolted hardware.

### 2.5 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

#### **PART 3 - EXECUTION**

- 3.1 EXAMINATION
  - A. Verify existing conditions meet the manufacturer's requirements before starting work.
- 3.2 PREPARATION
- 3.3 INSTALLATION
  - A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
  - B. Field-Finished Doors: Trimming to fit is acceptable.
    - 1. Adjust width of non-rated doors by cutting equally on both jamb edges.
    - 2. Trim maximum of 3/4 inch off bottom edges.
  - C. Coordinate installation of hardware.
  - D. Touch up damaged finishes.
  - E . All paints and coatings, including accessories, applied on site must comply with the VOC limits, emissions testing and Submittal requirements for IEQ Credit Low-Emitting Materials as specified in Section 013515 LEED Certification Procedures (LEEDv4).

### 3.4 TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.

# 3.5 ADJUSTING

- A. Adjust and lubricate hardware for proper operation.
- B . Adjust for smooth and balanced door movement in accordance with manufacturer's instructions.

## 3.6 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

# 3.7 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

**END OF SECTION** 

### **PART 1 GENERAL**

### 1.1 SUMMARY

A. Section Includes: Manual overhead insulated rolling doors

#### B. Related Sections:

- 1. 05 50 00 Metal Fabrications. Door opening jamb and head members.
- 2. 06 10 00 Rough Carpentry. Door opening jamb and head members.
- 3. 09 91 00 Painting. Field painting.

### 1.2 SYSTEM DESCRIPTION

### A. **Design Requirements:**

- 1. Wind Loading:
  - a. Supply doors to withstand up to 30 psf design wind load
- 2. Cycle Life:
  - Design doors of standard construction for normal use of up to 20 cycles per day maximum, and an overall maximum of 50,000 operating cycles for the life of the door

### 3. Seismic Performance:

a. Provide manufacturer's seismic calculations confirming ASCE7-10

### 4. Insulated Door Slat Material Requirements:

- a. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84
- b. Minimum R-value of 8.0 (U-value of 0.125) as calculated using the ASHRAE Handbook of Fundamentals
- c. Insulation to be CFC Free with an Ozone Depletion Potential (ODP) rating of zero

### 5. **Safety:**

a. Chain operated doors shall be designed so that the door immediately stops upward or downward travel and is maintained in a stationary position when the hand chain is released by user.

#### 1.3 SUBMITTALS

- A. Reference Section 01 33 00 Submittal Procedures; submit the following items:
  - 1. **Product Data**
  - 2. **Shop Drawings:** Include special conditions not detailed in Product Data. Show interface with adjacent work.

# 3. Quality Assurance/Control Submittals:

- a. Provide manufacturer ISO 9001:2015 registration
- b. Provide manufacturer and installer qualifications see below
- c. Provide manufacturer's installation instructions

### 4. Closeout Submittals:

- a. Operation and Maintenance Manual
- b. Certificate stating that installed materials comply with this specification

# 1.4 QUALITY ASSURANCE

# A. Qualifications:

- 1. **Manufacturer Qualifications:** ISO 9001:2015 registered and a minimum of five years experience in producing doors of the type specified
- 2. Installer Qualifications: Manufacturer's approval
- 1.5 DELIVERY STORAGE AND HANDLING
  - A. Follow manufacturer's instructions
- 1.6 WARRANTY
  - A. Standard Warranty: Two years from date of shipment against defects in material and workmanship
  - B. Maintenance: Submit for owner's consideration and acceptance of a maintenance service agreement for installed products

# PART 2 PRODUCTS

# 2.1 MANUFACTURER

# A. Manufacturer:

- 1. Basis of Design: Cookson Model ESD20
- 2. Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.
- 2.2 PRODUCT INFORMATION
  - A. **Model:** ESD20
- 2.3 MATERIALS
  - A. Curtain:
    - 1. Fabrication:
      - a. Slat Material:
        - 1) **Steel:** Minimum 22 gauge AISI type 304 #4 finish stainless steel/24gauge, Grade 40, ASTM A 653 galvanized steel zinc coating
      - b. **Insulation:** 7/8 inch (22 mm) foamed-in-place, closed cell urethane
      - c. Total Slat Thickness: 15/16 inch (24 mm)
      - d. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84
      - e. **R-value:** 8.0
    - 2. Slat Finish (Interior and Exterior):
      - a. SpectraShield® Coating System (Color Selected by Architect):
        - 1) **SpectraShield** color as selected by Architect from manufacturer's color range, more than 180 colors

- B. **Endlocks:** Fabricate interlocking sections with high strength nylon endlocks on alternate slats each secured with two ¼" (6.35 mm) rivets. Provide windlocks as required to meet specified wind load.
  - 1. **Nylon:** Required up to 21'-5" width (DBG Distance Between Guides)

# C. Bottom Bar

# 1. Configuration:

a. **Insulated Bottom Bar:** Reinforced extruded aluminum interior face with full depth insulation and exterior skin slat to match curtain material and gauge. Minimum 4" tall x 1-1/16" thickness.

### 2. Finish:

a. Exterior: Match slatsa. Interior: Match slats

# D. Guides:

# 1. Fabrication:

- a. Minimum 3/16 inch (4.76 mm) structural steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.
- b. Top 16 ½" (419.10 mm) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service.

# 2. Finish:

a. **Powder Coat (Stock Colors):** Zirconium treatment followed by a grey baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness

# E. Counterbalance Shaft Assembly:

- 1. **Barrel:** Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width
- 2. **Spring Balance**: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.

# F. Brackets:

Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures

# 1. Finish:

a. **Powder Coat (Stock Colors):** Zirconium treatment followed by a gray baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness

# G. Hood:

Minimum 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.

#### 1. Finish:

# a. GalvaNex™ Coating System (Stock Colors):

1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding baked-on base coat and gray baked-on polyester enamel finish coat

# H. Weatherstripping:

- 1. Bottom Bar:
  - a. **Manually Operated Doors:** Replaceable, bulb-style, compressible EDPM gasket extending into guides
- 2. **Guides:** Replaceable vinyl strip on guides sealing against both sides of curtain
- 3. **Hood:** Neoprene/rayon baffle to impede air flow above coil
- 4. **Lintel Seal:** Nylon brush seal fitted at door header to impede air flow

#### 2.4 OPERATION

A. **Manual ControlGard Chain Hoist:** Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide. Chain hoist to include integral brake mechanism that will immediately stop upward or downward travel and maintain the door in a stationary position when the hand chain is released by the user.

# 2.5 ACCESSORIES

- A. Locking:
  - Padlockable chain keeper on guide. (Manual Chain operated.)
- B. **Vision Panels:** 10 x 1-1/2 x 3/4 inch thick (254 x 38 x 19 mm) oval acrylic panes set with double-sided foam glazing tape and fully contained within slat assembly. 16 panes per door. Smaller vision panels are not acceptable.
- C. **Strip Door Bracket**: Assembly integral to coiling door to hang strip door on interior of building. Contact factory for sizes greater than 12'-0" x 12-0". Powder coated finish to match coiling door.

### **PART 3 EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates
- C. Commencement of work by installer is acceptance of substrate

# 3.2 INSTALLATION

- A. General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports
- B. Follow manufacturer's installation instructions

# 3.3 ADJUSTING

A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion

# 3.4 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer
- B. Remove surplus materials and debris from the site

# 3.5 DEMONSTRATION

- A. Demonstrate proper operation to Owner's Representative
- B. Instruct Owner's Representative in maintenance procedures

**END OF SECTION** 

# PART 1 GENERAL

# 1.1 SECTION INCLUDES

- A. Delegated design of storefront and entrances.
- B. Exterior storefronts and entrances
- C. Interior storefront and entrances.
- D. Interior sliding glass storefront system

# 1.2 RELATED REQUIREMENTS

- A. 01 35 15 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 01 43 39 Mockups: For additional requirements related to the mockups in this section.
- C. 01 60 00 Product Requirements: For substitution and additional product requirements.
- D. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling. E. 08 80 00 - Glazing: For glass infill.

# 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 30 00 Administrative Requirements.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

# 1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Provide glazed storefronts that comply with test performance requirements indicated, as evidenced by reports based on Project-specific preconstruction testing or of tests performed on manufacturer's standard assemblies by a qualified testing agency.
- B. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility with and adhesion of each material that will come in contact with sealants and each condition.
  - 1. Test a minimum five production-run samples each of metal, glazing, and other material.
  - 2. Prepare samples using techniques and primers required for installed assemblies.

- Perform tests under environmental conditions that duplicate those under which assemblies will be installed.
- 4. For materials that fail tests, determine corrective measures necessary to prepare each material to ensure compatibility with and adhesion of sealants including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

# 1.5 SUBMITTALS

- A. Product Data: Provide product criteria, characteristics, accessories, material descriptions, dimensions of individual components and profiles, and finishes.
  - 1. Include sealants tested and approved as part of entrance and storefront system.
  - Indicate glazed storefronts comply with performance requirements indicated, as
    evidenced by tests performed on manufacturer's standard assemblies by a qualified
    testing agency
- B. Qualification Data: For manufacturer, installer, and design engineer.
- C. Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Include plans, elevations, sections, full-size details, and attachments to other work. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior. Relationship to the work of others shall be clearly indicated when necessary to coordinate the work with other building trades.
- Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include full-size isometric details of each vertical-to-horizontal intersection of glazed Storefronts, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage templates and details.
    - c. Interface with adjoining building construction.
    - d. Referenced to detail numbers indicated on the Contract Drawings.
    - e. Expansion and seismic provisions.
    - f. Glazing.
    - g. Entrance Systems.
- E. Coordination Drawings: Show tie-back and intermittent stabilization anchors.

 Include required slab edge configuration, post tensioning locations, embedded or surface attachment anchors and channels, structural supports such as steel posts and girts, and door locations.

# F. Product Test Reports:

- 1. Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed storefronts, indicating compliance with performance requirements.
- G. Sample: For each type of exposed finish required, in manufacturer's standard sizes.
- H. LEED Submittals: For components of this section submit the following in compliance with Section 01 35 15 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. LEED Low Emitting Materials Submittals:
    - a. EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation. Documentation certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later.
    - EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings products applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 - LEED Certification Procedures.
  - 3. Materials and Resources Submittals:
    - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessment or EPDs in accordance with Section 013515 – LEED Certification Procedures (LEEDv4).
    - MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 01 3515 - LEED Certification Procedures (LEEDv4).
- I. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner 's name and registered with manufacturer.
- K. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  - 3. Recommendations on maintenance schedule.

4. Include ASTM C1401 recommendations for postinstallation-phase quality-control program.

# 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

# 1.7 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 01 35 15 LEED Certification Procedures.

# 1.8 WARRANTY

- A. Manufacturer's Finish Warranty: Correct defective work within a 10 year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
  - 1. Finish Criteria are listed AAMA 2605.

# **PART 2 PRODUCTS**

# 2.1 DESCRIPTION

A. Factory fabricated and finished aluminum framing system with infill, and related anchorage and attachment devices.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

A. The storefront system begins at the primary structural members of the building frame and the edges of concrete slabs, include all support embeds, plates, angles and ancillary framing members required for structural integrity and support of the Storefront from the building structure.

# B. The Drawings:

- 1. Indicate the design intent for profile, joints and configuration required together with relationship to structural frame and interior building elements.
  - a. Drawings do not purport to identify or solve completely the problems of fixingsand anchorage or flatness and stability of facing.

# C. General Performance:

- 1. Glazed storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
- 2. Failure includes the following:
  - a. Deflection exceeding specified limits.
  - b. Framing members transferring stresses, including those caused by structural movements to glazing.
  - c. Glazing-to-glazing contact.
  - d. Sealant failure.
  - e. Glass breakage.
  - f. Loosening or weakening of fasteners, attachments, and other components.
  - g. Failure of operating units.

# D. Structural Performance:

- 1. Deflection of Framing Members:
  - a. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
    - 1) For spans over 13 feet 6 inches limit deflection to L/240 + 1/4 inch.
- b. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.
- c. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175. E. Accessibility:
- 1. Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds maximum.
  - a. ANSI/ICC A117.1 309.4 Operation.

# 2.3 MANUFACTURERS

A. Specification is based on products listed below.

08 43 13 - 5

1. Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 - Product Requirements.

# 2.4 EXTERIOR ENTRANCE SYSTEMS

- A. Basis of Design: Kawneer Trifab VersaGlaze 451T storefront with 350T Insulpour Doors
  - 1. Storefront Features: 2" sightline; 4-1/2" depth
  - 2. High Thermal Performance with integral thermal break
  - 3. Color to match existing exterior windows

# 2.5 INTERIOR ENTRANCE SYSTEMS

- A. Basis of Design: Kawneer Trifab VersaGlaze 450 storefront with 350 Non-Thermal Doors
  - 1. Storefront Features: 1-3/4" sightline; 4-1/2" depth
  - 2. Color to be selected from manufacturer's standard colors of 70% fluoropolymer-based coating.

# 2.6 INTERIOR SLIDING GLASS STOREFRONT

- A. Basis of Design: Kawneer 1010 locking mall storefront
  - 1. Features: one fixed/two sliding panel operation per door with locking jamb hardware.
  - 2. Floor supported, overhead braced operation
  - 3. Include ADA compliant floor track and door hardware at all locations.
- 4. Color to be selected from manufacturer's standard colors of 70% fluoropolymer-based coating.

# 2.5 GLAZING:

- A. Comply with Section 08 80 00 Glazing.
- B. Glazing Gaskets, Spacers, Setting Blocks, Sealant Backings, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types compatible with sealants and suitable for joint movement and assembly performance requirements.

# 2.6 FINISHES:

- A. Basis of Design: Kawneer Permafluor Architectural Finishes 70% fluoropolymer-based coating.
  - 1. Color(s) to be selected from Manufacturer's standards.
  - 2. Color of storefront will vary based on location.

# 2.7 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria. B. Framing Sealants:
- 1. Manufacturer's standard sealants with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), and 100 percent silicone. C. Manufacturer's recommended compensation head channels.
- D. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.

# **PART 3 EXECUTION**

# 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.
- B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 35 15 LEED Certification Procedures.

# 3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

# 3.3 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.

# 3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed Storefronts to comply with the following nonaccumulating maximum tolerances:
  - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  - 3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.

- b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
- c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
- 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.
- 5. Allowances for cumulative effect of all tolerances (fabrication, assembly, thermal, seismic, building, and erection) and including the work of other sections, shall be made to ensure compliance with the above requirements.

# 3.5 ADJUSTING

- A. Adjust operating windows, ventilators, hardware, and accessories for smooth function and tight fit at contact points and weather stripping for smooth operation. Lubricate hardware and moving parts.
  - For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge. The force required to activate operable parts shall be 5 pounds maximum.

# 3.6 CLEANING

- A. Dispose of all waste material in accordance with project's Waste Management Plan.
  - 1. See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

# 3.7 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division1 Specification Sections, apply to this Section.

# 1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Sliding doors.
  - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - Mechanical door hardware.
  - 2. Electromechanical door hardware.
  - 3. Cylinders specified for doors in other sections.

# C. Related Sections:

- Division 08 Section "Hollow Metal Doors and Frames".
- Division 08 Section "Flush Wood Doors".
- 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- 4. Division 28 Section "Access Control Hardware Devices".
- D . Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 Accessible and Usable Buildings and Facilities.
  - ICC/IBC International Building Code.
  - 3. NFPA 70 National Electrical Code.
  - NFPA 80 Fire Doors and Windows.
  - 5. NFPA 101 Life Safety Code.
  - 6. NFPA 105 Installation of Smoke Door Assemblies.
  - State Building Codes, Local Amendments.
- E . Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
  - 1. ANSI/BHMA Certified Product Standards A156 Series.
  - 2. UL10C Positive Pressure Fire Tests of Door Assemblies.
  - 3. ANSI/UL 294 Access Control System Units.

- 4. UL 305 Panic Hardware.
- 5. ANSI/UL 437- Key Locks.

#### 1.3 SUBMITTALS

- A . Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C . Shop Drawings: Details of electrified access control hardware indicating the following:
  - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    - Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    - b. Complete (risers, point-to-point) access control system block wiring diagrams.
    - c. Wiring instructions for each electronic component scheduled herein.

- 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

#### E. Informational Submittals:

- Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- G. LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. LEED Low Emitting Materials Submittals:
    - a. EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.

      Documentation certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later.
    - EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings products applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 - LEED Certification Procedures.
  - 3. Materials and Resources Submittals:
    - a. MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessment or EPDs in accordance with Section 013515 LEED Certification Procedures (LEEDv4).
    - b. MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 01 3515 LEED Certification Procedures (LEEDv4).

# 1.4 QUALITY ASSURANCE

- A . Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C . Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service

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performance.

- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E . Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
  - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
  - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

- G . Keying Conference: Conduct conference to comply with requirements in Division01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- H . Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - Prior to installation of door hardware, conduct a project specific training meeting to
    instruct the installing contractors' personnel on the proper installation and adjustment of
    their respective products. Product training to be attended by installers of door hardware
    (including electromechanical hardware) for aluminum, hollow metal and wood doors.
    Training will include the use of installation manuals, hardware schedules, templates and
    physical product samples as required.
  - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  - 3. Review sequence of operation narratives for each unique access controlled opening.
  - 4. Review and finalize construction schedule and verify availability of materials.
  - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

# 1.5 DELIVERY, STORAGE, AND HANDLING

- A . Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C . Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

### 1.6 COORDINATION

A . Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C . Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

#### 1.7 WARRANTY

- A . General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C . Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
  - 1. Ten years for mortise locks and latches.
  - 2. Five years for manual overhead door closer bodies.
  - 3. Ten years for manual overhead door closer bodies.
  - 4. Five years for motorized electric latch retraction exit devices.
  - 5. Two years for electromechanical door hardware.

#### 1.8 MAINTENANCE SERVICE

A . Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

### **PART 2 - PRODUCTS**

### 2.1 SCHEDULED DOOR HARDWARE

A . General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part3. Products are identified by using door hardware designations, as follows:
  - Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements.
     Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C . Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

# 2.2 HANGING DEVICES

- A . Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
  - 1. Quantity: Provide the following hinge quantity:
    - a. Two Hinges: For doors with heights up to 60 inches.
    - b. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four Hinges: For doors with heights 91 to 120 inches.
    - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
  - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
  - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
  - 4. Hinge Options: Comply with the following:
    - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all outswinging lockable doors.
  - 5. Manufacturers:
    - a. Hager Companies (HA).
    - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
    - c. Stanley Hardware (ST).
- B . Pivots: ANSI/BHMA A156.4, Grade 1, certified. Space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.

- 1. Manufacturers:
  - a. Architectural Builders Hardware (AH).
  - b. Rixson Door Controls (RF).
- C . Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should comply with ANSI/BHMAA156.14.
  - 1. Sliding Bi-Passing Pocket Door Hardware: Provide complete sets consisting of track, hangers, stops, bumpers, floor channel, guides, and accessories indicated.
  - 2. Cascading: Provide a bi-parting or single direction telescoping system as required with a minimum 200 lb. per door capacity.
  - 3. Bi-folding Door Hardware: Rated for door panels weighing up to 125 lb.
  - 4. Pocket Sliding Door Hardware: Rated for doors weighing up to 200 lb.
  - 5. Manufacturers:
    - a. By door manufacturer
    - b. Hager Companies (HA).
    - c. Johnson Hardware (JO).
    - d. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

#### 2.3 POWER TRANSFER DEVICES

- A . Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
  - 1. Manufacturers:
    - a. Hager Companies (HA) ETW-QC (# wires) Option.
    - McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) QC (# wires) Option.
    - c. Stanley Hardware (ST) C Option.
- B . Electrified Quick Connect Intermediate Transfer Pivots: Provide electrified offset intermediate transfer pivot hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
  - 1. Manufacturers:
    - a. Architectural Builders Hardware (AH) EL019-EZ (# wires).
    - b. Rixson Door Controls (RF) E-M19-QC (# wires).

- C . Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
  - 1. Provide one each of the following tools as part of the base bid contract:
    - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) Electrical Connecting Kit: QC-R001.
    - McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) -Connector Hand Tool: QC-R003.
  - 2. Manufacturers:
    - a. Hager Companies (HA) Quick Connect.
    - McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) QC-C Series.
    - c. Stanley Hardware (ST) WH Series.

#### 2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
  - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
  - 2. Furnish dust proof strikes for bottom bolts.
  - 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
  - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
  - 5. Manufacturers:
    - a. Door Controls International (DC).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Trimco (TC).
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
  - 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
  - 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
  - 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
  - 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

# 5. Manufacturers:

- a. Hiawatha, Inc. (HI).
- B. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- c. Trimco (TC).

#### 2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B . Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C . Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
  - 1. Threaded mortise cylinders with rings and cams to suit hardware application.
  - 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
  - 4. Tubular deadlocks and other auxiliary locks.
  - 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  - 6. Keyway: Manufacturer's Standard.
- D. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- E . High Security Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders certified to UL437, including pick and drill resistance. Pick resistance to incorporate two or more independent locking mechanisms including a pin tumbler device with six top pin chambers, mushroom-shaped driver pins, and coded sidebar locking mechanism operated independently from the six top pin tumbler device. Drill resistance to incorporate cylinder housing with fixed case-hardened inserts protecting the pin tumbler shear line, cylinder plugs with case-hardened inserts protecting both the pin tumbler shear line and the side bar, mushroom-shaped stainless steel driver pins, and stainless steel side pins. Cylinders to be factory keyed.
  - New high security key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.

# Manufacturers:

- a. ASSA (AA) Maximum+.
- b. Corbin Russwin (RU) Access 3 AHS.
- c. Corbin Russwin (RU) Pyramid PHS.
- d. Medeco (MC) Medeco 3.
- e. Sargent (SA) Degree DG3.
- f. Sargent (SA) KESO UL.

- g. No Substitution.
- F. Keying System: Each type of lock and cylinders to be factory keyed.
  - Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
  - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  - 3. New System: Key locks to a new key system as directed by the Owner.
- G. Key Quantity: Provide the following minimum number of keys:
  - 1. Change Keys per Cylinder: Two (2)
  - 2. Master Keys (per Master Key Level/Group): Five (5).
  - 3. Construction Keys (where required): Ten (10).
- H. Construction Keying: Provide construction master keyed cylinders.
- I. Key Registration List (Bitting List):
  - Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
  - 2. Provide transcript list in writing or electronic file as directed by the Owner.

# 2.6 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
  - 1. Manufacturers:
    - a. Lund Equipment (LU).
    - b. MMF Industries (MM).
    - c. Telkee (TK).

#### 2.7 MECHANICAL LOCKS AND LATCHING DEVICES

- A . Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
  - 1. Manufacturers:
    - a. Corbin Russwin Hardware (RU) ML2000 Series.
    - b. Sargent Manufacturing (SA) 8200 Series.
    - c. Yale Commercial(YA) 8800FL Series.

# 2.8 ELECTROMECHANICAL LOCKING DEVICES

- A . Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below and in the hardware sets.
  - Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified
    options including: outside door lock/unlock trim control, latchbolt and lock/unlock status
    monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line
    resistors contained within the lock case. Unless otherwise indicated, provide electrified
    locksets standard as fail secure.
  - Manufacturers:
    - a. Yale Commercial(YA) 8800FL Series.

# 2.9 LOCK AND LATCH STRIKES

- A . Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
  - Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
  - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B . Standards: Comply with the following:
  - Strikes for Mortise Locks and Latches: BHMAA156.13.
  - 2. Strikes for Bored Locks and Latches: BHMAA156.2.
  - 3. Strikes for Auxiliary Deadlocks: BHMAA156.36.
  - 4. Dustproof Strikes: BHMAA156.16.

### 2.10 CONVENTIONAL EXIT DEVICES

- A . General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
  - At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
  - 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
  - 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

- 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
- Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
  - Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
  - Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
- 6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
- 7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
- 8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
- 9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
- 10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Commercial Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Fabricate latchbolts from cast stainless steel, Pullman type, incorporating a deadlocking feature.
  - 1. Manufacturers:
    - Yale Commercial(YA) 6000 Series.
- C . Electromechanical Push Rail Exit Devices (Commercial Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.
  - 1. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
  - 2. Manufacturers:
    - a. Yale (YA) 6000 Series.

# 2.11 DOOR CLOSERS

- A . All door closers specified herein shall meet or exceed the following criteria:
  - 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
  - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  - 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

- 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
- 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
- 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.
  - Manufacturers:
    - a. Corbin Russwin Hardware (RU) DC6000 Series.
    - b. Norton Door Controls (NO) 8500 Series.
    - c. Sargent Manufacturing (SA) 1431 Series.
    - d. Yale Commercial(YA) 3500 Series.
    - e. Yale Commercial (YA) 5800 Series.
- C . Door Closers, Surface Mounted (Standard Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.
  - Manufacturers:
    - a. Corbin Russwin Hardware (RU) DC3000 Series.
    - b. Sargent Manufacturing (SA) 1331 Series.
    - c. Yale Commercial(YA) 2700 Series.
    - d. Norton Door Controls (NO) 210 Series
- D. Door Closers, Overhead Concealed (Narrow Profile): ANSI/BHMA 156.4 Grade 1 Certified Products Directory (CPD) listed door closers designed for narrow profile frames and doors. Closers to have fully concealed body in the frame head for offset hung applications, with separate and independent valves for closing speed and backcheck adjustments and a decorative cover plate.
  - Manufacturers:
    - a. Rixson Door Controls (RF) 91DCP Series.

### 2.12 ARCHITECTURAL TRIM

- A. Door Protective Trim
  - General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

- 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
- 3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
- 4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
  - a. Stainless Steel: 300 grade, 050-inch thick.
- 5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
- Manufacturers:
  - a. Hiawatha, Inc. (HI).
  - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
  - c. Trimco (TC).

# 2.13 DOOR STOPS AND HOLDERS

- A . General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  - 1. Manufacturers:
    - a. Hiawatha, Inc. (HI).
    - B. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Trimco (TC).
- C . Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
  - 1. Manufacturers:
    - a. Rixson Door Controls (RF).
    - b. Rockwood Products: ASSA ABLOY Architectural Door Accessories (RO).
    - c. Sargent Manufacturing (SA).

# 2.14 ARCHITECTURAL SEALS

- A . General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL1784.
  - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C . Fire Labeled Gasketing: Assemblies complying with NFPA80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  - Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D . Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E . Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
  - National Guard Products (NG).
  - 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
  - 3. Reese Enterprises, Inc. (RE).

# 2.15 ELECTRONIC ACCESSORIES

- A . Exit Delay Locking Systems: Exit delay locking systems are fully integrated units consisting of a minimum 1200 pound holding force magnetic lock, movement initiating device, reset bypass switch, and exit delay timer module. Unit to include an adjustable initiation gap allowing door travel of up to 1 inch before going into alarm condition. Operates on either 12VDC or 24VDC.
  - Manufacturers:
    - a. Security Door Controls (SD) 101 Exit Check Series.
    - b. Securitron (SU) iMXD Series.
- B . Linear Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw plus 50% for the specified electrified hardware and access control equipment.
  - 1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

# 2. Manufacturers:

- a. Alarm Controls (AK) APS Series.
- b. Securitron (SU) BPS Series.
- C . Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.
  - 1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
  - 2. Manufacturers:
    - Securitron (SU) AQD Series.
- D. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multivoltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.
  - 1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
  - 2. Manufacturers:
    - a. Securitron (SU) AQL Series.

#### 2.16 FABRICATION

A . Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

# 2.17 FINISHES

- A . Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C . Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

# **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A . Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

# 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHIA115 series.
- B. Wood Doors: Comply with ANSI/DHIA115-W series.

# 3.3 INSTALLATION

- A . Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C . Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D . Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division7 Section "Joint Sealants."
- E . Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

# 3.4 FIELD QUALITY CONTROL

- A . Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures" and "Cash Allowances". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
  - Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
  - 2. Submit documentation of incomplete items in the following formats:
    - a. PDF electronic file.
    - b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

# 3.5 ADJUSTING

A . Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

#### 3.6 CLEANING AND PROTECTION

- A . Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C . Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

# 3.7 DEMONSTRATION

A . Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

#### 3.8 DOOR HARDWARE SETS

- A . The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
  - 1. Quantities listed are for each pair of doors, or for each single door.
  - 2. The supplier is responsible for handing and sizing all products.
  - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

- 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
  - 1. MK McKinney
  - 2. PE Pemko
  - 3. RF Rixson
  - 4. AD Adams Rite
  - 5. RO Rockwood
  - 6. YA Yale
  - 7. MC Medeco
  - 8. SU Securitron

END OF SECTION 087100

# **PART 1 - GENERAL**

#### 1.1 SECTION INCLUDES

- A. Delegated design of exterior and interior, monolithic glazing and insulated glazing units.
- B. Glass glazing.
- C. Exterior Insulated glazing.
- D. Interior Acoustic glazing
- E. Glazing coatings and frits.

# 1.2 RELATED REQUIREMENTS

- A . 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 016000 Product Requirements: For substitution and additional product requirements.
- C . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- D. 081113 Hollow Metal Doors and Frames: For assembly requiring components from this section.
- E. 084313 Aluminum Framed Entrances and Storefronts

# 1.3 SUBMITTALS

- A. Qualification Data: For installer, fabricator and design engineer.
- B. Early Performance Criteria Design Submittal: Submit design package identifying the following criteria, used to design aluminum framed entrances and storefront systems:
  - 1. Load criteria, including seismic load criteria, wind load criteria.
  - 2. Design Loads, including wind loads at typical locations and corners, corner zone width, glass dead load, and glazing makeup.
  - 3. Anticipated movements, including the following:
    - a. Horizontal Joint Movement:
      - 1) Live load deflection.
      - 2) Thermal expansion.
      - 3) Long-term DL creep.
      - 4) Column shortening.
      - 5) Total Movement.
    - b. Elastic Story Drift.
    - c. Lateral Drift.

- d. Parallel-to-Wall Deflection.
- e. Cantilever Deflection of Framing Members
- C . Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Include the following:
  - Provide specific shadowbox calculations to determine if ventilation of the cavity is required
- D. Energy Performance Certificates: Certificates are required for this project including project specific frame types, spacer types and glass types. Project specific reports substantiate Uvalue, visual light transmission, and solar heat gain values required by the Energy Code for the project.
  - 1. For projects following the Energy Code Prescriptive Path: Submit NFRC Report with gateway sizes indicating compliance with requirements.
  - For projects following the Energy Code Performance Path: Submit CMAST bid reports
    at time of product submittal. Prior to glazed assembly installation, submit NFRCCMAST label certificates for the designed assemblies (not gateway sizes). Provide
    finite element computer thermal modeling and calculations per NFRC 100 and NFRC
    200, using DOE/LBNL THERM 5.2 and WINDOWS 5.2 software.

#### E. Product Data:

- 1. Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- Glazing Compounds & Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements and identify available colors.
- F. Shop Drawings: For any glazing installed with components from this section alone.
  - 1. Submit shop drawings for glazing installed within other systems in accordance with the system submittal requirements.
- G . Sample: Submit two samples in manufacturer's standard size of glass type units, showing coloration and design.
- H . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet
  - 2. Materials and Resources Submittals:
    - a. MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessments or EPDs in accordance with Section 013515 - LEED Certification Procedures (LEEDv4).
- I. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- J . Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- K. Maintenance Data: For user's operation and maintenance of system including:

- 1. Methods for maintaining system's materials and finishes.
- 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

# 1.4 QUALITY ASSURANCE

- A . Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.
- B. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
- C . Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

# 1.5 DELIVERY, STORAGE, AND HANDLING

- A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

#### 1.6 WARRANTY

- A . Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.
- B. Laminated Glass: Provide a ten (10) year warranty to include coverage for delamination, including replacement of failed units.

# **PART 2 - PRODUCTS**

# 2.1 DESCRIPTION

A . Glazing and accessories installed as monolithic glazing or insulating glazing units within framing systems and support structures specified elsewhere.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Thermal Performance: Requirements Listed on window and door schedule.
  - 1. U-Value:
    - a. Prescriptive Energy Code Limits: Based on NFRC 100 gateway size.
      - 1) Fixed Glazing, including frame: U-value 0.45 maximum.
    - b. New exterior elements of the project must meet the standards of the Washington State Energy Code prescriptive requirements for glazing and openings.
      - U-Value, Maximum: For glass and frames, fixed and operable based on project specific opening sizes, configurations, frame types, spacer types and glass types. Advertised U-values substantiated by NFRC Bid Reports at time of bid.
      - U-Value Maximums are subject to change as the energy model is updated.
  - 2. Solar Heat Gain Coefficient (SHGC), Maximum: For the overall glazed assembly vision

- area and adjacent framing.
- 3. Visible Light Transmission (VLT), Minimum: For the overall glazed assembly vision area and adjacent framing.
- B. By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C . Roll Wave Maximum Distortion Tolerance: 0.003 inch target with 0.005 inch maximum peak to valley measurement.
- D. Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C1048.
- E. Thickness: As required for loads indicated.
- F. Deflection no greater than 1/175 of the longest dimension or 1/2 inch whichever is less.

# 2.3 GLASS GLAZING

### A. Float Glass:

- 1. Performance Criteria:
  - a. By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
  - b. Roll Wave Maximum Distortion Tolerance: 0.003 inch target with 0.005 inch maximum peak to valley measurement.
  - c. Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C1048.
  - d. Tinted Types: Performance and features to match basis of design product.
- Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
- 3. Heat-Strengthened in accordance with ASTM C1048.
- 4. Fully Tempered in accordance with ASTM C1048.
  - a. Safety Glazing: Comply with 16 CFR 1201 test requirements for Category II..

#### B. INSULATED GLAZING UNITS

# A . Fabricator:

- 5. Any of the manufacturers specified for float glass.
- 6. Any fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified performance, features and warranty.

# B . Sealed Insulating Glass Units:

- 1. Performance:
  - a. Durability: Certified by an independent testing agency to comply with ASTM E2190.
  - b. IGU Performance: IGUs without spandrel glass to comply with ASTM E2188.
  - c. Resistance to Fogging: IGUs without spandrel glass to comply with ASTM E2189.
  - d. Edge Spacers: Material as required to meet performance criteria listed for

## assemblies.

- 1) Color: Black.
- e. Edge Seal: Glass to elastomer with supplementary silicone sealant.
  - 1) Color: Black.
- f. Air Space: As scheduled below.

## 2.4 LAMINATED GLAZING

- A. Laminated glazing for use in STC rated assemblies
  - Performance Criteria:
    - Type, thickness, and configuration as required to achieve STC rating of assembly
    - b. Provide products not requiring surface applied films to maintain their performance criteria. Surface applied films can be easily damaged and performance criteria compromised.
    - c. 1/2" overall maximum thickness; ¼" overall thickness assumed to achieve STC rating with .045" PVB interlayer.
  - 2. Features:
    - a. Surface Finish: Ground and polished on both sides.
- 2.5 GLAZING COATINGS AND FRITS
  - A. Low-E Coated Vision Glass:
    - 1. Features:
      - a. Color: Neutral.
      - b. Location: #2 surface of exterior units.

# 2.6 ACCESSORIES

- A . Glazing Channels: Specification is based on CRL Wet Glaze U Channels by CRLaurence Co. Inc.
  - Comparable and substituted products will be judged based on the following performance criteria, features, warranty, and qualifications. See Section 016000 -Product Requirements for submittal requirements.
  - 2. Features:
    - a. 1 inch deep base channel.
    - b. 2 inch deep top channel.
    - c. Finish: Satin Anodized.
- B. Vertical Glazing Gasket: Specification is based on CRL EZ Glaze Soundstrip by CRLaurence Co. Inc.
  - Comparable and substituted products will be judged based on the following performance criteria, features, warranty, and qualifications. See Section 016000 -Product Requirements for submittal requirements.
  - Features:
    - a. Color: Clear

b. Depth: Selected to match glass panels.

# **PART 3 - EXECUTION**

## 3.1 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

## 3.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

# 3.3 INSTALLATION

A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.

### 3.4 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

## 3.5 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

### 3.6 SCHEDULE

- A. Interior Storefront, Doors and Relites:
  - 1. Manufacturer: Basis of Design: PPG
  - 2. Application: Glass for field-assembled storefront systems and for doors and relites. Safety glazing (tempered and/or laminated) where required.
  - 3. Location: Per plans.
- B. Interior Laminated Acoustic Units:
  - 1. Manufacturer: Basis of Design: Viracon
  - 2. Application: 1/4" overall: 1/8" glass, .045" PVB, 1/8" glass for STC rating of 35
  - 3. Location: Per window schedule in all STC rated walls.

# C . Exterior Insulated Units:

- 1. Manufacturer: Solarban 70 is basis of design
- 2. Application: Double glazed, low-E units with Argon fill.
- 3. Location: Per window schedule.
- Additional Requirements: Glazing materials for field-assembled fenestration shall comply with NFRC rating and labeling criteria and with fenestrations manufacturer's NFRC simulation report. An NFRC label certificate is required for the installed assembly.

# **PART 1 - GENERAL**

### 1.1 SECTION INCLUDES

A. Glass mirrors.

## 1.2 RELATED REQUIREMENTS

- A . 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 016000 Product Requirements: For substitution and additional product requirements.
- C . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- D. 102800 Toilet Accessories

### 1.3 SUBMITTALS

- A. Product Data on Mirror Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- B. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- C. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- D . Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

# 1.4 QUALITY ASSURANCE

- A . Perform Work in accordance with GANA (GM) Glazing Manual for glazing installation methods.
- B . Fabricate, store, transport, receive, install, and clean mirrors in accordance with recommendations of GANA (TIPS), "Mirrors Handle with Extreme Care: Tips For the Professional on the Care and Handling of Mirrors."

# 1.5 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

# 1.6 DELIVERY, STORAGE, AND HANDLING

A . As required by SMACNA Guideline Chapter 3 and Section 013515 - LEED Certification Procedures.

## 1.7 WARRANTY

A . Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

# **PART 2 - PRODUCTS**

- 2.1 DESCRIPTION
  - A . Frameless glass mirrors wall mounted with clips and adhesive.
- 2.2 PERFORMANCE AND DESIGN CRITERIA
- 2.3 MANUFACTURERS
  - A. Mirrors:
    - 1. Trulite Glass and Aluminum Solutions: www.trulite.com.
    - 2. Binswanger Mirror/ACI Distribution: www.binswangerglass.com.
    - 3. Lenoir Mirror Co: www.lenoirmirror.com.
    - 4. Substitutions: See Section 016000 Product Requirements.
- 2.4 MATERIALS
  - A. Mirror Glass; General:
    - 1. Select materials and/or provide supports as required to limit mirrored glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.
  - B. Mirror Glass; Type:
    - 1. ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q1 (mirror select); silvering, protective coating and physical characteristics complying with ASTM C1503; 6 mm minimum thick.
- 2.5 GLAZING ACCESSORIES
  - A. Setting Blocks:
    - 1. Neoprene, 80 to 90 Shore A durometer hardness.
  - B. Spacer Shims:
    - 1. Neoprene, 50 to 60 Shore A durometer hardness.
  - C . Glazing Edges: Pencil Edges

- E. Mirror Attachment Accessories:
  - 1. Stainless steel J-profile channels at top and bottom.
- F. Mirror Adhesive:
  - 1. Chemically compatible with mirror coating and wall substrate.

### 2.6 ACCESSORIES

A . All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 - LEED Certification Procedures.

# **PART 3 - EXECUTION**

# 3.1 EXAMINATION

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive mirrors.

## 3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.
- C . Perform installation in accordance with ASTM C1193 for solvent release sealants. Install sealant in accordance with manufacturer's instructions.

# 3.3 INSTALLATION - GENERAL

- A . Install mirrors in accordance with GANA recommendations.
- B . Set mirrors plumb and level, free of optical distortion.
- C . Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D . Frameless Mirrors: Set mirrors with J-channel and adhesive, applied in accordance with adhesive manufacturer's instructions.
  - Using a full bed of adhesive mount mirror to preservative pressure treated plywood backing.
  - 2. Support mirror until adhesive has set.
- E . All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

# 3.4 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Remove labels after work is complete.
- C . Clean mirrors and adjacent surfaces.
- D . Dispose of all waste material in accordance with Section 017419 Construction Waste Management and Disposal and project's Waste Management Plan.

# 3.5 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

# 3.6 SCHEDULE

- A. Wall Hung Mirrors:
  - 1. Application: Frameless glass mirrors with pencil edges, J channel at top and bottom.
  - 2. Finish: Pencil polish edge.
  - 3. Location: Toilet rooms

**END OF SECTION** 

# **PART 1 - GENERAL**

### 1.1 SECTION INCLUDES

- A. Gypsum Sheathing.
- B. Exterior Soffit Board.
- C. Gypsum Board.
- D. Tile Backer Board.
- E. Shaftwall.
- F. Acoustic Insulation.

## 1.2 RELATED REQUIREMENTS

- A. 016000 Product Requirements: For substitution and additional product requirements.
- B. 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- C. 061000 Rough Carpentry: Building framing and sheathing.
- D. 078400 Firestopping: Top-of-wall assemblies at fire rated walls.
- E. 079005 Joint Sealers: Acoustic sealant.
- F. 092219 Non-Structural Metal Framing: Blocking product and execution requirements.

### 1.3 SUBMITTALS

- A. Qualification Data: For Installer and design engineer.
- B . Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, joint finishing system, and cement board.
- C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- D . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - 1. LEED Submittal Coversheet.
  - Low-Emitting Materials Submittals:
    - EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
       Documentation certifying paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later

- 3. Materials and Resources Submittals:
  - a. MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessment or EPDs in accordance with Section 013515 - LEED Certification Procedures (LEEDv4).
- E . Test Reports: For all stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

## 1.4 QUALITY ASSURANCE

- A. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

# 1.5 DELIVERY, STORAGE, AND HANDLING

- A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

# **PART 2 - PRODUCTS**

### 2.1 DESCRIPTION

A . Includes Gypsum wallboard finishing, metal trim and accessories, and acoustical sealants and insulation.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Provide completed gypsum board assemblies complying with ASTM C840 and GA-216.
- B. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
  - 1. Air Pressure Within Shaft: Sustained loads of 7.5 lbf/sq ft with maximum mid-span deflection of L/240.
  - Acoustic Attenuation: STC ratings as specified in drawings, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

- C . Shaft Walls at Elevator and Stair Shafts: Provide completed assemblies with the following characteristics:
  - Air Pressure Within Shaft: Intermittent loads of 7.5 lbf/sq ft with maximum mid-span deflection of L/240.
  - 2. Acoustic Attenuation: STC ratings as specified in drawings, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
  - Soft Body Impact: Meet or exceed Soft Body Impact Classification Level 2 measured in accordance with ASTM C1629/C1629M.
- D . Fire Rated Assemblies: Provide completed assemblies complying with UL listed assemblies indicated and ratings indicated on life safety drawings.
  - Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
  - 2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory.
- E . Interior Partitions Indicated as Acoustic: Provide completed assemblies with the following characteristics:
  - Acoustic Attenuation: STC ratings as specified in drawings, calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- F. Provide materials that meet guidelines in Section 013515 LEED Certification Procedures.
  - 1. EQ Credit Low Emitting Materials, Option 1: Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 or later.

# 2.3 MATERIALS

- A. Gypsum Sheathing:
  - 1. Sizes to minimize joints in place; ends square cut.
    - a. Application: Exterior sheathing, unless otherwise indicated.
    - b. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - Glass-Mat-Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
  - 2. Core Type: Type X.
  - 3. Thickness: 5/8 inch.
  - 4. Glass-Mat-Faced Products: Georgia-Pacific Gypsum; DensGlass Sheathing; CertainTeed Gypsum, Inc.
- B . Impact-Resistant Gypsum Board:
  - 1. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1629/C1629, sizes to minimize joints in place; ends square cut.
    - a. Application: Use as indicated.
    - b. Type X: Thickness 5/8 inch.
    - c. Edges: Tapered.

## d. Products:

- Georgia-Pacific Gypsum; ToughRock FireGuard X Abuse Resistant Gypsum Wallboard.
- 2) CertainTeed Extreme Impact Resistant Gypsum Panels.
- National Gypsum; Hi-Impact XP Gypsum Wallboard.

# C. Exterior Soffit Board:

- 1. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  - Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
  - b. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X.
  - c. Type X Thickness: 5/8 inch.
  - d. Edges: Tapered.

# D. Gypsum Board:

- Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  - a. Application: Use for vertical surfaces, unless otherwise indicated.
  - b. Type X: Thickness 5/8 inch.
    - 1) Edges: Tapered.
    - 2) Products:
      - a) Georgia-Pacific Gypsum; ToughRock, and ToughRock Fireguard.
      - b) CertainTeed Gypsum, Inc.; GlasRoc.
  - c. Type C: Thickness: As indicated.
    - Edges: Tapered.
    - 2) Products:
      - a) ToughRock FireGuard C Gypsum Wallboard.
      - b) CertainTeed Gypsum, Inc.; Type C Fire-Resistant Drywall.

# E. Tile Backer Board:

- Glass-Mat-Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
  - a. Standard Type: Thickness 1/2 inch.
  - b. Fire-Resistant Type: Type X core, thickness 5/8 inch.
  - c. Products:
    - Georgia-Pacific Gypsum; DensShield Tile Backer.

## F. Shaftwall and Coreboard:

 Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.

- a. Application: Elevator shafts, stair cores and other assemblies that span floors.
- b. Type X Thickness: 1 inch.
- c. Edges: Beveled long edges and square cut ends.
- d. Products:
  - 1) Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant).

## G. Acoustic Insulation:

1. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3.5 inches, unless noted otherwise.

# 2.4 ACCESSORIES

A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

### B. Acoustic Sealant:

1. As specified in Section 079005 - Joint Sealers.

# C . Finishing Accessories:

- 1. ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
  - a. Types: As detailed or required for finished appearance.
  - Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.

# D. Joint Materials:

- ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
  - a. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
  - b. Typical: Ready-mixed vinyl-based joint compound.
  - Exterior Soffits: Chemical hardening type compound.

## E. High Build Drywall Surfacer:

1. Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

## F. Anchorage to Substrate:

- 1. Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- G. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 - LEED Certification Procedures.

# **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.
- B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 013515 LEED Certification Procedures.

## 3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

## 3.3 INSTALLATION

- A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Comply with ASTM C840 and GA-216. Install to minimize butt end joints, especially in highly visible locations.
- C . Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
- E . Exterior Soffit Board: Install perpendicular to framing, with staggered end joints over framing members or other solid backing.
- F. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- G . All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

# 3.4 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
  - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
  - 2. At exterior soffits, not more than 30 feet apart in both directions.
  - 3. Review all proposed control joint locations with architect prior to installing.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C . Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

# 3.5 JOINT TREATMENT

A . Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.

- B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C . Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 5: As noted
  - 2. Level 4: Walls and Ceilings, typical
  - 3. Level 3: In utility areas, behind cabinetry, and on backing board to receive tile finish.
  - 4. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
  - 5. Level 0: Temporary partitions and surfaces indicated to be finished in later stage of project.
- D . Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- F . Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

## 3.6 FIELD OBSERVATION AT "PUNCH"

- A. Finish will be judged from a viewing difference of 4 feet.
- B. Ceilings will be viewed from a standing position.
- C . Finished lighting system or temporary lighting similar to proposed finished lighting should be used for judging the wall.
- D . Eye catching discrepancies and or blemishes, including "fuzzy" wall board surfaces, will be rejected.

### 3.7 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

## 3.8 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

### 3.9 SCHEDULE

- A. Gypsum Board Assemblies:
  - 1. Manufacturer: USG, National Gypsum Co, Georgia Pacific, CertainTeed Corp, American Gypsum.

- Application: Non-load-bearing, steel-framed gypsum board assemblies designed to provide fire-rated enclosures capable of installation where only one side is accessible during construction.
- 3. Location: To be used at new mechanical shafts if required by construction limitations.

### B. Shaftliner:

- 1. Manufacturer: CertainTeed ProRoc or manufacturer with similar recycled content.
- Application: Gypsum shaftliner board, type X; ASTM C1396/C1396M.
- 3. Location: Per wall tags and typical assembly details.

# C. Gypsum Board Typical:

- 1. Manufacturer: CertainTeed or manufacturer with similar recycled content.
- Application: Gypsum board, installation and finishing: As specified in section 092900 "Gypsum Board."
- 3. Location: Per wall tags and typical assembly details.

## D. Fire-Resistance Rated Assemblies:

- 1. Manufacturer: CertainTeed or manufacturer with similar recycled content.
- Application: Fire-resistance-rated assemblies: Materials and construction identical to those tested according to ASTM E119.
- 3. Location: Per fire safety plan and wall/floor assemblies.

# E . STC Rated Assemblies:

- 1. Manufacturer: CertainTeed or manufacturer with similar recycled content.
- 2. Application: STC-rated assemblies: Materials and construction identical to those tested according to ASTM E90 and classified according to ASTM E413.
- 3. Location: Per plans

## F. Finish:

- 1. Application: Smooth finish (no spray texture). Finish level as follows: (GA-214):
  - a. Level 1 (fire tape): Concealed locations above ceilings
  - b. Level 4: All visible locations.

# **END OF SECTION**

# PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Delegated design of non-structural metal framing.
- B. Metal partition, ceiling, and soffit and shaftwall framing.
- C. Blocking and backing panels.

## 1.2 RELATED REQUIREMENTS

- A. 01 35 15 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 01 60 00 Product Requirements: For substitution and additional product requirements.
- C. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- D. 05 40 00 Cold-Formed Metal Framing: For structural load bearing metal stud framing.
- E. 09 21 16 Gypsum Board Assemblies: Execution requirements for anchors for attaching work of this section.

# 1.3 SUBMITTALS

- A. Qualification Data: For installer and design engineer.
- B. Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- D. Shop Drawings: Indicate extents, special joint or termination conditions, and conditions of interface with other materials.
  - 1. Indicate acoustic details.
  - 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
- E. LEED Submittals: For components of this section submit the following in compliance with Section 01 35 15 LEED Certification Procedures.
  - 1. Materials and Resources Submittals:

- a. MR Credit BPDO Environmental Product Declarations (EPD), Option 1: disclosed in a 3rd-party verified EPD that conforms to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
- F. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.

## 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

## 1.5 MOCKUP

- A. Mockup Size: Full height, minimum 12 feet long, including corner.
- B. Mockup may remain as part of the Work.
- C. The work of this section may be part of several different mockups. Coordinate with the mockups of other sections.

# 1.6 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 01 35 15 LEED Certification Procedures.

# PART 2 PRODUCTS

## 2.1 DESCRIPTION

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Perform Work in accordance with ASTM C754.
- B. Coordinate the placement of components to be installed within stud framing system.
- C. Suspended Assemblies: Coordinate with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

- D. Design and install framing and furring to limit deflection to the following under point loads of 100 lbs and uniform loads as noted below except where required to withstand greater load (pressurized shafts and stairwells for example).
  - Maximum Deflection of Vertical Assemblies:
    - a. Assemblies spanning single floor: Sustained loads of 5 lbf/sq ft with a maximum mid span deflection of 1:240.
    - Assemblies spanning multiple floors: Sustained loads of 7.5 lbf/sq ft with a maximum mid span deflection of 1:240.
  - 2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads and wind uplift.
  - 3. Maximum Deflection for assemblies under applied plaster finishes (Portland Cement or Gypsum) and ceramic tile is 1:360.
  - 4. Use The SSMA Product Technical Information Book to look up the appropriate stud size, spacing and thickness. E. Ceiling and Soffit Framing:
  - 1. Seismic Requirements:
    - a. Classification: Conform to ASTM C635/C635M, Heavy Duty Classification.
    - b. Code Compliance: FBC, American Society of Civil Engineers ASCE 7 Section 13 and CISCA (AC) Guidelines.
- F. Acoustic Attenuation for Interior Partitions: STC's are calculated in accordance with ASTM E413 and based on published tests conducted in accordance with ASTM E90.
  - 1. Provide materials and construction identical to those tested in assembly indicated according to ASTM E90. See Section 09 21 16 for STC requirement.
- G. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- H. Provide materials that meet the guidelines in Section 01 35 15 LEED Certification Procedures.
  - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: disclosed in a 3rd-party verified EPD that conforms to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

# 2.3 MATERIALS

- A. Metal partition, ceiling, and soffit and shaftwall framing.
  - 1. Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and "SSMA Product Technical Information" book for the spacing indicated<>.

- a. Minimum Framing Component thickness is 20 Gage.
- b. Studs: C shaped.
- c. Runners: U shaped, sized to match studs.
- d. Ceiling Channels: C shaped or T shaped.
- e. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- f. Steel Stud Framing Connectors:
  - 1) Products:
    - a) Simpson Strong Tie, Bridging Connectors; DBC Bridging Connector: www.strongtie.com.
    - b) Substitutions: See Section 01 60 00 Product Requirements.
- g. Single leg Resilient channels.
- h. "Z's": Used for several different members.
- i. Shaftwall framing CH and other sections as required for complete framing system.
- 2. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
  - a. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
  - b. Material:
    - 1) Typical: ASTM A653/A653M steel sheet, SS Grade 50, with G40/Z120 hot dipped galvanized coating.
    - Areas Subject to Moisture: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating. Areas include exterior or nonconditioned space, shower rooms, locker rooms or other locations subject to regular wetting or high humidity.
  - c. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems.
- 4. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.

- 5. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.
- 6. Fasteners: ASTM C1002 self-piercing tapping screws.
- 7. Anchorage Devices: Power actuated.
  - a. Also acceptable "Danback" flexible wood blocking system from Deitrich.
  - b. See backing schedule on architectural drawings.
- 8. Anchorage Devices: Power actuated or Drilled expansion bolts.
- 9. Acoustic Insulation: As specified in Section 09 21 16 Gypsum Board Assemblies.
- 10. Acoustic Sealant: As specified in Section 07 90 05.
- Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I Inorganic. B.
   Blocking and backing panels.
- 1. Sheet Metal Backing (Blocking): 0.036 inch thick, galvanized. 4 inch minimum width
  - a. See backing schedule on architectural drawings.
- In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- 3. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- 4. Specifically, provide the following non-structural framing and blocking:
  - a. Cabinets and shelf supports.
  - b. Wall brackets.
  - c. Handrails.
  - d. Grab bars.
  - e. Towel and bath accessories.
  - f. Wall-mounted door stops.
  - g. Chalkboards and marker boards.
  - h. Wall paneling and trim.
  - i. Joints of rigid wall coverings that occur between studs.

### 2.4 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 - LEED Certification Procedures.

# PART 3 EXECUTION

# 3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.
- C. Verify existing conditions meet the manufacturer's requirements before starting work.
- D. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 35 15 LEED Certification Procedures.

# 3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

## 3.3 INSTALLATION OF STUD FRAMING

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Comply with requirements of ASTM C754.
- C. Extend partition framing to structure where indicated and to ceiling in other locations.
- D. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- E. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track. F. At partitions indicated with an acoustic rating:
  - 1. Provide components and install as required to produce STC ratings as indicated.
  - 2. Place two beads of acoustic sealant (one on either side) between runners and substrate, studs, and adjacent construction.
  - 3. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.
  - 4. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

- G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- H. Backing and Blocking: Use steel channels or flat sheets secured to studs minimum 4" wide. Provide blocking for support of all wall hung items and equipment.
  - 1. Use sheet metal backing for reinforcement of 16 gauge minimum.
- Install supplementary framing and bracing at openings and terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer.
- J. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement:
  - 1. Where edges of suspended ceilings abut building structure at ceiling perimeters and at penetrations of structural elements.
  - 2. Where partition and wall framing abuts overhead structure.
  - 3. Where studs are installed directly against exterior walls of masonry or concrete, install asphalt felt strips between studs and wall.
- K. All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.

# 3.4 CEILING AND SOFFIT FRAMING

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.
- I. Laterally brace suspension system.

1. Sway-brace suspension systems with hangers used for support.

# 3.5 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.
- C. Level ceiling to a tolerance of 1/1200. For tilted ceilings maintain this tolerance as a "flatness" tolerance.

## 3.6 CLEANING

- A. Dispose of all waste material in accordance with project's Waste Management Plan.
  - See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

# 3.7 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

## 3.8 SCHEDULE

- A. Interior Assemblies: Finish: G40, Sizes: Profiles indicated, Metal Thickness: As required to meet performance criteria.
- B. Exterior Assemblies: Finish: G90, Sizes: Profiles indicated, Metal Thickness: As required to meet performance criteria.

**END OF SECTION** 

# PART 1 - GENERAL

### 1.1 SECTION INCLUDES

- A. Tile.
- B. Installation materials.
- C. Installation methods.

### 1.2 RELATED REQUIREMENTS

- A . 013000 Administrative Requirements: For additional requirements of preinstallation meeting.
- B. 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- C. 014339 Mockups: For additional requirements related to the mockups in this section.
- D. 016000 Product Requirements: For substitution and additional product requirements.
- E . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- F . 035400 Cast Underlayment: For leveling if substrate does not meet tiling installation requirements.
- G. 079005 Joint Sealers: For sealants installed with tiling.
- H. 092116 Gypsum Board Assemblies: For tile backer board installation for tile substrate.
- I. 092219 Non-Structural Metal Framing: For installation requirements of metal framing to meet tiling requirements.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 013000 Administrative Requirements.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

## 1.4 SUBMITTALS

- A. Qualification Data: For installer.
- B . Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C . Shop Drawings: Indicate membrane and tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details and related dimensioning as well as plumbing (drains) mechanical and electrical fixtures and lines installed.

- D. Sample: Mount tile and apply grout on two plywood panels, minimum 18 x 18 inches in size illustrating pattern, color variations, and grout joint size variations.
- E . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. Low-Emitting Materials Submittals:
    - EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
       Documentation certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later.
    - EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings products applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 - LEED Certification Procedures.
  - 3. Materials and Resources Submittals:
    - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessment or EPDs in accordance with Section 013515 - LEED Certification Procedures (LEEDv4).
    - b. MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 013515 LEED Certification Procedures (LEEDv4).
- F. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- G . Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

### 1.5 MAINTENANCE MATERIAL

A. Extra Tile: 10 square feet of each size, color, and surface finish combination.

## 1.6 QUALITY ASSURANCE

A . Installer Qualifications: Company specializing in performing the work of this section with minimum of 5 years of experience.

## 1.7 MOCKUP

- A. Visual and Constructability Mockup:
  - 1. Construct and participate as specified in Section 014339 Mockups.
- B. Construct tile mockup where indicated on the drawings, incorporating all components specified for the location.
  - 1. Approved mockup may remain as part of the Work.

# 1.8 DELIVERY, STORAGE, AND HANDLING

- A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

## 1.9 WARRANTY

- A . Installation Warranty: Contractor shall correct defective Work withing a 2 year period after Date of Substantial Completion.
- B . Manufacturer Warranty: Provide five year warranty for tile setting materials failing to resist penetration of water.
  - Exception: Where such failures are the result of structural failures of building. Hairline
    cracking of concrete due to temperature change or shrinkage is not considered a
    structural failure.

## **PART 2 - PRODUCTS**

# 2.1 DESCRIPTION

A . Tile assemblies and accessories installed in accordance with Tile Council of North America guidelines on walls, floors, and in showers.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Blending: For tiles with color variations, factory blend and package tile so each package has the same range of colors and quantities of each variation. If factory blending is not available, field blend prior to beginning installation.
- B. Wet Dynamic Coefficient of Friction (DCOF): Not less than 0.42 as tested in accordance with ANSI/NFSI B101.3 Wet DCOF of Common Hard-Surface Floor Materials.
- C. Provide materials that meet guidelines in Section 013515 LEED Certification Procedures.
  - Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 or later and meet the applicable VOC content limits of the California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings, or the

South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011, Section 013515 - LEED Certification Procedures (LEEDv4).

 Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 or later, in accordance with Section 013515 - LEED Certification Procedures (LEEDv4). Flooring with FloorScore certification meets the requirement.

## 2.3 INSTALLATION MATERIALS

### A. Non-Ceramic Trim:

- 1. Satin natural anodized extruded aluminum, or stainless steel as scheduled, style and dimensions to suit application, for setting using tile mortar or adhesive.
  - a. Manufacturer: Schluter.
  - b. Applications: Use in the following locations:
    - 1) Open edges of wall tile.
    - 2) Open edges of floor tile.
    - 3) Wall corners, outside and inside.
    - 4) Transition between floor finishes of different heights.
    - 5) Thresholds at door openings.
    - 6) Expansion and control joints, floor and wall.
    - 7) Floor to wall joints: Profiles ProCove base. Finish as selected by Architect from manufacturer's full range.
    - Transition between floor finishes of different materials.

# B. Bond Coat:

- Latex-Portland Cement Mortar Bond Coat: ANSI A118.15H.
  - a. Specification is based on:
    - 1) ProLite Fortified Mortar by Custom Building Products.
    - 2) S28 Microtec (interior) or FB9L Pourable shearflex (interior) or X90 Outdoor (exterior) by Ardex.
    - 3) by Mapei.
    - 4) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.
  - b. Performance:
    - 1) Dry-Set Cement Mortar for Large and Heavy Tile.
    - Non-Sag Characteristics for Wall Tile Installations.
- 2. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
  - Specification is based on:
    - 1) EBM-Lite Epoxy Bonding Mortar by Custom Building Products.
    - 2) WA Epoxy Adhesives by ARDEX Engineered Cements.
    - 3) Kerapoxy 410 by Mapei.
    - 4) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.

## b. Performance:

- 1) Water Cleanable Setting Epoxy.
- 2) Non-Sag Characteristics for Wall Tile Installations.

### C. Grout:

- Grout Colors based as listed in Finish Legend on Drawings.
- 2. Standard Grout: ANSI A118.6 standard cement grout.
  - a. Specification is based on:
    - 1) Prism SureColor Grout by Custom Building Products.
    - 2) FL Rapid set sanded grout or FG-C microtec unsanded grout by Ardex
    - 3)\_\_by Mapei
    - 4) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements .
- 3. Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
  - a. Specification is based on:
    - 1) Prism SureColor Grout by Custom Building Products.
    - FL Rapid set sanded grout by Ardex. If an unsanded grout is desired choose Ardex FG-C microtec unsanded floor and wall grout.
    - 3) by Mapei.
    - 4) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.
  - b. Performance:
    - 1) For Use in Grout Joints 1/16 inch to 1/2 inch width.
    - 2) Rated for Scratch/Abrasion Sensitive Tile/Stone Surfaces.
- 4. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
  - a. Specification is based on:
    - CEG-IG Industrial Grade Commercial Epoxy Grout by Custom Building Products.
    - 2) WA Epoxy Grout by ARDEX Engineered Cements.
    - 3) Opticolor by Mapei.
    - 4) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.
  - b. Performance:
    - 1) For Use in Grout Joints 1/16 in to 1/2 inch in width.
    - Resistant to Oleic Acids and No-Rinse Cleaning Agents Normally Associated with Commercial Kitchen Conditions.
    - 3) Rated for use in both floor and wall applications, maintaining non-sag characteristics for vertical grout joints.
    - 4) Water Cleanable 100% Solids Grouting Epoxy.

c. Features:

Color: As indicated in Finish Legend.

### D. Grout Sealer:

- Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
  - a. Specification is based on:
    - 1) AquaMix Sealers' Choice Gold by Custom Building Products. Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements .
    - 2) Penetrating Sealer No Sheen Formula.
    - 3) w VOC Content, below 100 g/L.

# E. Waterproof Membrane:

- Specifically designed for bonding to cementitious substrate and thinset tile over a sloped mortar bed or pre-fabricated shower pan; complying with ANSI A118.10.and ANSI A108.13.
  - a. Specification is based on:
    - RedGard Waterproofing & Crack Prevention Membrane by Custom Building Products.
    - 2) 8+9 rapid waterproofing by ARDEX Engineered Cements.
    - 3) Mapelastic 400 by Mapei.
    - 4) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.

### b. Performance:

- 1) Thickness: 25 mils, minimum, dry film thickness.
- 2) Thin-Load Bearing Membrane Designed to Suppress Horizontal In-Plane Cracks in Concrete Up to 1/8 inch in width.

## F. Crack Isolation Membrane:

- 1. Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated.
  - a. Specification is based on:
    - RedGard Waterproofing & Crack Prevention Membrane by Custom Building Products.
    - 2) 8+9 Waterproof Membrane by Ardex.
    - 3) Mapelastic AquaDefense by Mapei.
    - 4) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements .

### b. Performance:

1) Thin-Load Bearing Membrane Designed to Suppress Horizontal In-Plane Cracks in Concrete Up to 1/8 inch in width.

# G. Sound Reduction Underlayment:

- 1. Comply with ANSI A118.13, bonded membrane.
  - a. Specification is based on:

- EasyMat 5mm Sound Reduction Mat Underlayment by Custom Building Products.
- 2) DS 70 acoustic mat 5mm by Ardex.
- 3) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements .

## b. Performance:

- 1) Mat Underlayment to Maintain Delta of 20 or Greater.
- Mat Underlayment to be Compatible with Setting Mortar and Grouting Materials.

### H. Joint Sealant:

- 1. For treatment of movement, expansion, and change of plane joints in tile work, complying with ASTM C920, and requirements of TCNA (HB) section EJ-171.
  - a. Specification is based on:
    - 1) 100% Silicone Commercial Sealant by Custom Building Products.
    - 2) SX 100% silicone sealant by ARDEX Engineered Cements.
    - 3) Mapesil by Mapei.
    - 4) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.

### b. Performance:

- Sealant Material Must Maintain Shore A Hardness of 20 or Greater for conditions exposed to foot traffic.
- Sealant Material Must be Color Matched to Selected Grout Color.

## I. Tile Backer Board:

- 1. Coated glass mat type complying with ASTM C1178/C1178M; inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.
  - a. Specification is based on:
    - 1) DensShield Tile Backer by Georgia-Pacific Gypsum.
    - 2) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements .
  - b. Performance:
    - 1) Core: Type X.
    - Thickness: 5/8 inch.

## 2.4 INSTALLATION METHODS

- A . Wall Installation over Gypsum: In accordance with The Tile Council of North America Handbook TCNA (HB) Method W244.
  - 1. Using waterproof membrane at toilet room walls containing plumbing.
- B . Floor Installation over Concrete: In accordance with The Tile Council of North America Handbook Method F113.

# 2.5 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

# **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.
- B. Verify Deflection of floor using note "Maximum Allowable Deflection..." under the headline Notes / Definitions in the TCA manual. This limit 1/360 with a 300 lb concentrated load shall be doubled to 1/720 for stone tiles.
- C . Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- D. Large format tiles require very flat floors. Do no install if floors are not the equivalent of a floor flatness of Ff 50 (35 local) and Fl 50 (35 local).
- E . Verify that concrete subfloor surfaces are ready for tile installation in accordance with Section 090510 Flooring Moisture Measurement and Mitigation for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
  - 1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours, tested according to ASTM F1869.
  - 2. Alkalinity: pH range of 5 to 9, tested according to ASTM F710.
- F. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 013515 LEED Certification Procedures.

# 3.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

# 3.3 INSTALLATION

- A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B . Extend tile work into recesses and under or behind fixtures and cabinets to form a complete covering without interruptions. Terminate work neatly at obstructions, edges, and corners.
- C. Ground Tile: When partial tiles must be used on exposed edges:
  - 1. Grind the edges of cut unglazed thru-body tile to mimic the factory edge and place the cut edge in.
  - 2. If a cut edge must face out, grind with fine enough grit to match the finish texture of the tile as close as possible.

3. Submit samples for approval prior to commencing work.

- D. Lay tile to pattern indicated.
  - Do not interrupt tile pattern through openings.
  - 2. Align floor, base, wall, and trim joints where sizes permit.
  - 3. Lay out tilework and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.
- E . Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
  - 1. Glazed Wall and Floor Tile: 1/8 inch.
- F. Sound tile after setting. Replace hollow sounding units.
- G. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- I. Grout tile joints.
- J. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
- K . All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

### 3.4 ERECTION TOLERANCES

# A. Lippage:

Material	Size	Joint Width	Allowable Lippage 1/32"
Glazed Wall/Mosaics	1" x1" to 6" x 6"	1/8" or less	
Paver/Stone	All	1/8" to 1/4"	1/32"
Paver/Stone	All	1/4" or greater	1/16"

- 1. The ANSI A137.1 standard defined allowed warpage according to the type of tile.
- 5.3.1.2.6 Warpage: For example paver tiles, when measured as described in ASTM C 485, the warpage of each tile in the sample shall not exceed 1.0 percent along any edge nor 0.75 percent on either diagonal. From this formula the allowable warpage can be determined.
- 3. The amount of allowable tile warpage is not used in the calculation of allowable lippage. Rather, allowable lippage is the total of the inherent (i.e. actual) tile warpage and the allowable lippage from the table above. Of course, the actual warpage should not exceed the allowable warpage as calculated above.
- 4. Running Bond / Brick Joint Tile Patterns: For Running Bond/Brick Joint Patterns utilizing tiles (square or rectangular) where the side being offset is greater than 18" (nominal dimension), the running bond offset will be a maximum of 33% unless otherwise specified by the tile manufacturer. If an offset greater than 33% is specified, specifier and owner must approve mockup and lippage.
- 5. Floor/Substrate Flatness Requirements: Maximum allowable plane variation: 1/4 inch

in 10.0 feet for installation of small format tiles (all edges of tile units less than 15 inches in length). Maximum allowable plane variation: 1/8 inch in 10.0 feet for installation of large format tiles (tile units maintaining any edge 15 inches in length or greater).

# 3.5 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

# 3.6 PROTECTION

- A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.
- B. Apply heavy kraft paper as a minimum to prevent surface damage during construction, and remove before final inspection.

# 3.7 SCHEDULE

### A. Wall Tiles:

- 1. Manufacturer: DalTile Color Wheel Linear.
- 2. Application: 2 x 8 ceramic tiles at walls.
- 3. Finish: Color to be selected from standards.
- 4. Location: Toilet rooms, backsplash at kitchenettes.

### B. Floor Tiles:

- Manufacturer: DalTile Flat.
- 2. Application: 2 x 8 ceramic tiles at walls.
- 3. Finish: Color to be selected from standards.
- 4. Location: Per Finish Schedule

**END OF SECTION** 

# **PART 1 - GENERAL**

### 1.1 SECTION INCLUDES

- A. Resilient sheet flooring.
- B. Resilient base.
- D. Resilient installation accessories.

### 1.2 RELATED REQUIREMENTS

- A . 013000 Administrative Requirements: For additional requirements of preinstallation meeting.
- B. 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- C. 014339 Mockups: For additional requirements related to the mockups in this section.
- D. 016000 Product Requirements: For substitution and additional product requirements.
- E . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- F. 035400 Cast Underlayment.
- G . 090510 Flooring Moisture Measurement and Mitigation: Concrete moisture testing and mitigation systems.

## 1.3 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 013000 Administrative Requirements.
  - Review preparation and installation procedures and coordinating and scheduling required with related work.

# 1.4 SUBMITTALS

- A. Qualification Data: For installer.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plan.
- D . Flooring Sample: Submit two samples, 6 x 6 inch in size illustrating color and pattern for each resilient flooring product specified; heat weld rod samples for selection.
- E . Base and Accessory Samples: Submit manufacturer's complete set of color samples for initial selection.

- F . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. Low-Emitting Materials Submittals:
    - EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
       Documentation certifying certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 (LEEDv4)..
    - EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied paints, coatings products applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 - LEED Certification Procedures.
  - Materials and Resources Submittals:
    - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: Life Cycle Assessment or EPDs in accordance with Section 013515 - LEED Certification Procedures (LEEDv4).
    - MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 01 3515 – LEED Certification Procedures (LEEDv4).
- G. Certificate: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- H. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- J. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  - 3. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

# 1.5 MAINTENANCE MATERIAL

- A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Flooring Material: 10 square feet of each type and color.
  - 2. Extra Wall Base: 20 linear feet of each type and color.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

## 1.7 MOCKUP

- A. Visual and Constructability Mockup:
  - Construct and participate as specified in Section 014339 Mockups.
- B. Construct mockup of one room of each type of flooring, representing finished work including internal and external corners, seaming and interruptions.
- C . Locate where directed.
- D. Mockup may remain as part of the Work.

# 1.8 DELIVERY, STORAGE, AND HANDLING

- A . As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.
- B. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

### 1.9 WARRANTY

A . Provide minimum Manufacturers Limited 5 year commercial warranty for manufacturing defects.

# **PART 2 - PRODUCTS**

# 2.1 DESCRIPTION

A . Resilient sheet and tile flooring, resilient stair accessories, resilient base and installation accessories for transition to other flooring types.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
- B. Provide materials that meet guidelines in Section 013515 LEED Certification Procedures.
  - Meet emissions testing and requirements of CDPH Standard Test Method v1.1. Flooring with FloorScore certification meets the requirement.

 Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 or later and meet the applicable VOC content limits of the California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011, Section 013515 - LEED Certification Procedures (LEEDv4).

## 2.3 RESILIENT SHEET FLOORING

- A . (RF-2) Vinyl Sheet Flooring: 100 percent virgin composition, color and pattern through total thickness.
  - 1. Basis of Design: Medintech Plus by Armstrong Flooring.
  - 2. Performance Requirements:
    - a. Homogenous sheet good.
    - b. Minimum Requirements: Comply with ASTM F1913, without backing and .
    - c. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
  - 3. Features:
    - a. Total Thickness: 0.079 inch minimum.
    - b. Sheet Width: 72 inch minimum.
    - c. Profile: Flat.
    - d. Pattern: To be selected from manufacturer's standards.
  - 4. Integral Cove Base:
    - a. 4 inch minimum height with 3/8 inch minimum radius.
  - 5. Seamless Installation: Chemically bonded

## 2.4 RESILIENT BASE

- A. (WB-2) Resilient Base: ASTM F1861, top set Style A straight, and as follows:
  - 1. Basis of Design product, height and profile: Pinnacle Series by Roppe; 4 inches high.
  - 2. Type: Thermoset Rubber Base.
  - 3. Thickness: 0.125 inch thick.
  - 4. Material: TS Thermoset Vulcanized Rubber
  - 5. Finish: Satin.
  - 6. Color: To be selected by Architect from manufacturer's standards.
  - 7. Styles: B Cove
  - 8. Length: Roll (4 foot sections are not acceptable except as maintenance stock).
- C . Comparable products by one of the following are also acceptable. See Section 016000 Product Requirements for submittal requirements.
  - Burke Flooring: www.burkemercer.com.
  - 2. Johnsonite, a Tarkett Company: www.johnsonite.com.
  - 3. Roppe Corp: www.roppe.com.

4. Substitutions for products by manufacturers other than those listed above: See Section 016000 - Product Requirements.

# 2.5 RESILIENT INSTALLATION ACCESSORIES

- A. (RA#) Cap for cove carpet, cap for cove resilient flooring, carpet bar for tackless installations, carpet edge for glue-down applications, nosing for carpet, nosing for resilient flooring, reducer strip for resilient flooring, joiner for tile and carpet, transition strips.
  - 1. Basis of Design Product: Products by manufacturer of resilient flooring or base. Comparable and substituted products will be judged based on color match and available profiles.
    - a. Comparable products by one of the following are also acceptable. See Section 016000 Product Requirements for submittal requirements.
      - 1) Burke Flooring: www.burkemercer.com.
      - 2) Johnsonite, a Tarkett Company: www.johnsonite.com.
      - 3) Roppe Corp: www.roppe.com.
      - 4) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.
  - 2. Profile and Dimensions: As indicated or required for conditions present.
  - 3. Colors and Patterns: As selected from full range of industry colors.
  - 4. Locations: Provide rubber molding accessories in areas indicated and as recommended by flooring manufacturer for complete installation.

# 2.6 ACCESSORIES

A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

- B. Electrostatic Dissipative Adhesive:
  - 1. Provide Manufacturer's recommended Static Dissipative Tile Adhesive and copper ground-connection strips for under the tile.
- C. Copper Conductors:
  - 1. As required for installation
- D. Subfloor Filler:
  - 1. White premix latex; type recommended by adhesive material manufacturer.
- E. Primers, Adhesives, and Seaming Materials:
  - 1. Waterproof; types recommended by flooring manufacturer.
- F. Moldings, Transition and Edge Strips:
  - 1. Same material as flooring.
- G . Filler for Coved Base:
  - Plastic.
- H. Sealer and Wax:
  - 1. Types recommended by flooring manufacturer.
  - 2. Heat Weld Rod
    - Color to closely match resilient flooring, as selected by Architect from manufacturer's standard colors.
- I. All paints and coatings, including accessories, applied on site must comply with the VOC limits, emissions testing and Submittal requirements for IEQ Credit Low-Emitting Materials as specified in Section 013515 LEED Certification Procedures (LEEDv4).

#### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.
- B. Verify existing conditions meet the manufacturer's requirements before starting work, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- C . Verify that wall surfaces are smooth and flat within the tolerances specified, are dust-free, and are ready to receive resilient base.
- D. Cementitious Subfloor Surfaces: Verify that substrates meet moisture, internal relative humidity and alkalinity requirements of flooring and adhesive manufacturers in accordance with Section 090510 Flooring Moisture Measurement and Mitigation.
  - Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

F. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 013515 - LEED Certification Procedures.

#### 3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

### 3.3 INSTALLATION

### A. General:

- 1. Install all materials in accordance with manufacturer's instructions based on conditions present.
- 2. Starting installation constitutes acceptance of subfloor conditions.
- 3. Fit joints tightly.
- 4. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- 5. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
  - Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.
  - b. Resilient Strips: Attach to substrate using adhesive.
- 6. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- 7. Install flooring in recessed floor access covers, maintaining floor pattern.
- 8. At movable partitions, install flooring under partitions without interrupting floor pattern.
- 9. Turn sheet flooring up 4 inches to create integral cove base. Heat weld corner seams.
- 10. Seamless Installation:
  - a. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
- B . All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

# 3.4 CLEANING

- A. Dispose of all waste material in accordance with Section 017419 Construction Waste Management and Disposal and project's Waste Management Plan.
- B. Remove excess adhesive from floor, base, and wall surfaces without damage.
- C. Initial cleaning and finishing is the responsibility of the contractor.
  - 1. Follow manufacturer's recommendations for initial cleaning and finishing procedures.
  - Not all types of flooring require finishing.

# 3.5 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

# 3.6 SCHEDULE

- B. Rubber Flooring with Integrated Cove Base:
  - 1. Manufacturer: Mohawk Mendella.
  - 2. Application: Rubber sheet flooring.
  - 3. Finish: Color to be selected from standards.
  - 4. Location: Per finish schedule.
- C. Roppe Pinnacle Rubber Floor Base:
  - 1. Manufacturer: Roppe.
  - 2. Application: 4" cove base.
  - 3. Finish: Color to be selected from standards.
  - 4. Location: per finish schedule (public spaces to have wood base per 062023).

# PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Custom Pattern Carpet Tile.
- B. Walk-off mat tile.
- C. Broadloom Carpet

### 1.2 RELATED REQUIREMENTS

- A. 01 35 15 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 01 60 00 Product Requirements: For substitution and additional product requirements.
- C. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

### 1.3 SUBMITTALS

- A. Qualification Data: For installer.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate layout of joints and transitions between patterns.
- D. Flooring Sample: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Accessory Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- F. LEED Submittals: For components of this section submit the following in compliance with Section 01 35 15 LEED Certification Procedures.
  - 1. Low-Emitting Materials Submittals:
    - a. LEED Low Emitting Materials (LEM) Submittal Form: Section 01 35 15.01 LEED Low-Emitting Materials Submittal Coversheet.
    - EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation.
       Documentation certifying products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 and 2017.
    - c. EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied products: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 01 35 15 LEED Certification Procedures.

- 2. Materials and Resources Submittals:
  - a. MR Credit BPDO Environmental Product Declarations (EPD), Option 1: disclosed in a 3rd-party verified EPD that conforms to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
  - MR Credit BPDO Material Ingredients, Option 1: Disclosed in a manufacturer inventory following USGBC guidelines, or in accordance with a USGBC approved program.
- G. Certificate: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- H. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- J. Maintenance Data: For user's operation and maintenance of materials including:
  - 1. Methods for maintaining materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  - 3. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

#### 1.4 MAINTENANCE MATERIAL

- A. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Flooring Material: 3 percent of each type and color (minimum of 10 yards) each type and color.

### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience.

# 1.6 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 01 35 15 LEED Certification Procedures.

## 1.7 WARRANTY

A. Provide minimum Manufacturers Limited 5 year commercial warranty for manufacturing defects.

# **PART 2 PRODUCTS**

### 2.1 DESCRIPTION

A. Carpet tile flooring installed fully adhered and walk-off mat tile.

### 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
- B. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
- C. Provide materials that meet guidelines in Section 01 35 15 LEED Certification Procedures.
  - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: LCA or EPD reports or compliant summary for each product in this section with a compliant evaluation.
  - All products must meet emissions testing and requirements of CDPH Standard Test Method v1.1. Carpet and Padding with Green Label Plus certification meets this requirement.
  - 3. EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
    - a. Applies only to interior paints and coatings applied onsite.

### 2.3 CARPET TILE

- A. Carpet Tile: Manufactured in single dye lot, conforming to the following criteria:
  - 1. Basis of Design: Milliken.
    - a. Product: Illume Collection
    - b. Color: (4) Custom Colors/Patterns
    - c. Size: 1m square
    - d. Location: Four Distinct Patterns as described in drawings
- B. Walk-Off Mat Tile:
  - 1. Basis of Design: Obex CutX Entrance Flooring by Milliken.
  - 2. Material Options: CutX.
  - 3. Size: 24" square
  - 4. Application: High-traffic areas.

Location: As indicated on Drawings.

# C. Broadloom Carpet:

1. Basis of Design: Philadelphia Commercial by Shaw

2. Pattern: Engrain

3. Application: Stair Installation

4. Location: As indicated on Drawings

#### 2.4 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Subfloor Filler: Type recommended by adhesive material manufacturer.
- C. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
- D. Transitions at flooring edges: Schluter transitions as described in drawings at each product termination
- E. Rubber base (where occurs): 09 65 00 Resilient Flooring.
- F. Wood base (where occurs) 06 20 00 Finish Carpentry
- G. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.
- H. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

### PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Cementitious Subfloor Surfaces: Verify that substrates meet moisture, internal relative humidity and alkalinity requirements of flooring and adhesive manufacturers in accordance with Section 09 05 10 - Flooring Moisture Measurement and Mitigation.
  - Obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.
- C. Verify that required floor-mounted utilities are in correct location.

D. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 35 15 - LEED Certification Procedures.

#### 3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

# 3.3 INSTALLATION

## A. General:

- 1. Install all materials in accordance with manufacturer's instructions based on conditions present and CRI Carpet Installation Standard.
- 2. Blend carpet from different cartons to ensure minimal variation in color match.
- 3. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- 4. Lay carpet tile in pattern scheduled in Finish Legend on Drawings, with pile direction parallel to next unit, set aligned as indicated on shop drawings.
- 5. Starting installation constitutes acceptance of subfloor conditions.
- 6. Fit joints tightly.
- 7. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- 8. Adhere carpet tile to substrate along centerline of rooms, at perimeter of rooms, where tiles are cut, and at 15 foot intervals throughout rooms. Lay remainder of tile dry over substrate.
- 9. Trim carpet tile neatly at walls and around interruptions.
- 10. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
  - Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.
  - Resilient Strips: Attach to substrate using adhesive.
- B. All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.

## 3.4 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean and vacuum carpet tile surfaces in accordance with manufacturer's instructions.
- C. Dispose of all waste material in accordance with project's Waste Management Plan.

Tile Carpeting ent and Disposal for additional

1. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

# 3.5 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

## **PART 1 GENERAL**

## 1.1 SECTION INCLUDES

- A. Acoustical ceiling panel and baffle systems.
- B. Accessories as required for complete installation.

# 1.2 RELATED REQUIREMENTS

- A. 01 35 15 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 01 60 00 Product Requirements: For substitution and additional product requirements.
- C. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

### 1.3 SUBMITTALS

- A. Qualification Data: For manufacturer and installer.
- B. LEED Submittals: For components of this section submit the following in compliance with Section 01 35 15 LEED Certification Procedures.
  - 1. Low-Emitting Materials Submittals:
    - LEED Low Emitting Materials (LEM) Submittal Form: Section 01 35 15.01 LEED Low-Emitting Materials Submittal Coversheet.
    - b. EQ Credit Low Emitting Materials, Option 1: General Emissions Evaluation. Documentation certifying products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 and 2017.
    - EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied products: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 01 35 15 - LEED Certification Procedures.
- C. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
  - 4. Specimen warranty.

D. Test Reports: Certified test data from an independent test agency verifying that wall systems meet specified requirements for acoustical and fire performance.

- E. Shop Drawings: Elevations and reflected ceiling plans indicating layouts of panels, locations of seams, and details indicating typical transitions to other finish surfaces. Include details of inside and outside corners and backing at fixtures mounted within panels.
- F. Verification Samples:
  - 1. For each textile specified, minimum size 8 inches square, representing actual product in color, texture, and pattern.
  - Accessory package.
- G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Supply an additional 10 percent of accessories installed for Owner's use in maintenance of project.
  - 2. Supply an additional 5 percent of fabric installed for Owner's use in maintenance of project.

## 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide all components of acoustical wall systems by a single manufacturer, including recommended primers, adhesives, and sealants.
- B. Installer Qualifications: Firm specializing in site-fabricated wall systems, with not less than 2 years of documented experience in installing wall systems of the type specified, and approved by the manufacturer.
- 1.5 DELIVERY, STORAGE, AND HANDLING
  - A. As required by SMACNA Guideline Chapter 3 and Section 01 35 15 LEED Certification Procedures.

## PART 2 PRODUCTS

- 2.1 DESCRIPTION
  - A. Acoustical ceiling components including prefabricated and site built units.
- 2.2 PERFORMANCE AND DESIGN CRITERIA
  - A. Provide materials that meet guidelines in Section 01 35 15 LEED Certification Procedures.

**Acoustical Components** 

- MR Credit BPDO Environmental Product Declarations (EPD), Option 1: LCA or EPD reports or compliant summary for each product in this section with a compliant evaluation.
- 2. EQ Credit Low Emitting Materials, Option 1: Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 and 2017.
- 3. EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
  - a. Applies only to interior paints and coatings applied onsite.

# 2.3 MATERIALS

## A. Architectural Felt Acoustic Panels:

- 1. Description: 1" thick, 100% polyester thru-color suspended ceiling panels.
- 2. Manufacturer: Basis of design: Acoufelt.
- 3. NRC Rating: .60 minimum
- 4. Dimensions: 48 x 108 panels maximum size; installed size per drawings.
- 5. Finish: Integral color and full range of manufacturer's selections. See finish schedule for quantity of colors to be used in project.
- 6. Installation: Cable suspension with manufacturer's supplied hardware to underside of existing concrete deck.
- 7. Location: Per reflected ceiling plans

#### B. Architectural Felt Acoustic Baffles:

- 1. Description: 1" thick, 100% polyester thru-color suspended ceiling panels.
- 2. Manufacturer: Basis of design: Acoufelt.
- 3. NRC Rating: .60 minimum
- 4. Dimensions: 12" high x 180" baffles maximum size; installed size per drawings.
- 5. Finish: Integral color and full range of manufacturer's selections. See finish schedule for quantity of colors to be used in project.
- 6. Installation: Cable suspension with manufacturer's supplied hardware to underside of existing concrete deck.
- 7. Location: Per reflected ceiling plans

**Acoustical Components** 

- C. 2x2 Acoustic Ceiling Tile in 7/8" T-Bar Grid
  - a Existing to be reused and salvaged.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that all mechanical and electrical items and other finished items abutting acoustical ceiling systems have been installed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 35 15 - LEED Certification Procedures.

# 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove ceiling plates and other obstacles, and prepare substrates to receive new anchors in accordance with manufacturer's instructions.

# 3.3 INSTALLATION

- A. Suspension using manufacturer's supplied fasteners and fittings.
  - 1. Spacing and style of fasteners per manufacturer
  - 2. Furring mechanically attached to ceiling.
- B. All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.

## 3.4 CLEANING

- A. Dispose of all waste material in accordance with project's Waste Management Plan.
  - 1. See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

# **PART 1 - GENERAL**

#### 1.1 SECTION INCLUDES

- A. Interior paint systems.
- B. Exterior paint systems.

### 1.2 RELATED REQUIREMENTS

- A . 013000 Administrative Requirements: For additional requirements of preinstallation meeting.
- B. 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- C. 014339 Mockups: For additional requirements related to the mockups in this section.
- D. 016000 Product Requirements: For substitution and additional product requirements.
- E . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- F. 050513 Shop-Applied Coatings for Metal: For factory applied finishes.

## 1.3 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 013000 Administrative Requirements.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

## 1.4 SUBMITTALS

- A . Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.
- B . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. Low-Emitting Materials Submittals:
    - EQ Credit Low Emitting Materials: General Emissions Evaluation. Documentation certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later
    - EQ Credit Low Emitting Materials: Additional VOC content requirements for wetapplied paints, coatings products applied onsite: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 - LEED Certification Procedures.
  - 3. Materials and Resources Submittals:

- MR Credit BPDO Material Ingredients, Option 1: Disclosed in a manufacturer inventory in accordance with Section 013515 - LEED Certification Procedures (LEEDv4).
- C . Sample: Submit three paper chip samples, 8.5 x 11 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- D. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- E. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  - 3. Recommendations on maintenance schedule.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of paint and coating products used in the work of this section with minimum ten years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B . As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

#### **PART 2 - PRODUCTS**

#### 2.1 DESCRIPTION

A. Surface preparation and field application of paints, stains, varnishes, and other coatings.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Provide materials that meet guidelines in Section 013515 LEED Certification Procedures.
  - EQ Credit Low Emitting Materials, Option 1: Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 or later
  - EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
    - a. Applies only to interior paints, coatings wet-applied on site within the weather barrier.

## 2.3 MANUFACTURERS

- A . Provide all paint and coating products used in any individual system from the same manufacturer; unless noted otherwise below.
- B. Paints:
  - 1. B-M: Benjamin Moore & Co: www.benjaminmoore.com.
  - 2. Tnemec: www.tnemec.com.
- C . Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.

#### 2.4 MATERIALS

- A. Interior paint systems:
  - 1. Paint interior surfaces in accordance with the following MPI Painting Manual designations.
  - All painting and coating must mee LEED VOC content and emissions requirements.
  - Acrylic-Enamel.
    - a. Substrate: Concrete, Concrete Masonry Units, Gypsum Board..
    - b. Benjamin Moore & Company:
      - 1) Primer: 046 Fresh Start 100% Acrylic Superior Primer.
      - 2) Top coat: 526 Aura Waterborne Satin (2 coats min.).
    - c. Sherwin Williams:
      - Primer: PrepRite ProBlock Interior/Exterior Latex Primer, B51-600 Series (4.0 mils wet, 1.4 mils dry).
      - 2) Top Coat: Duration Home Interior Latex Satin, A97-1200 Series (4 mils wet, 1.6 mils dry per coat).
      - 3) Alternate Top Coat: S-W ProMar 200 HP Zero VOC Latex Eg-Shel, B20-1900 Series (4 mils wet, 1.7 mils dry per coat)

#### 4. Epoxy.

- a. Substrate: Concrete, Concrete Masonry Units, Gypsum Board.
- b. Benjamin Moore & Company:
  - Primer: 253 Super Spec Latex Primer Sealer & Enamel Undercoat, 1.1 mils.
  - 2) Top coat: P43-86 Super Spec HP Acrylic Epoxy Semi-Gloss 1.0-2.0 mils.
- c. Sherwin Williams:
  - Primer: Quick Dry Interior/Exterior Latex Stain Blocking Primer, B51W8670 (4 mils wet, 1.1 mils dry per coat).
  - 2) Top Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss B73-300 Series (5.0 mils wet, 2.0 mils dry per coat).
  - 3) Alternate Top Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46 Series (4.0 mils wet, 1.4 mils dry per coat).
- 5. Urethane Finish.
  - a. Substrate: Ferrous, Non-Ferrous, and Zinc-Coated Metals:

- 1) Benjamin Moore & Company:
  - a) Primer: HP04 Ultra Spec HP Acrylic Metal Primer.
  - b) Top coat: M735 Super Spec HP Waterborne Urethane Semi-Gloss.
- 2) Sherwin Williams:
  - a) Primer: S-W Pro Industrial Pro-Cryl Universal Primer B66-1310 Series (5.0 mils wet, 1.9 mils dry).
  - b) Top Coat: S-W Pro Industrial Waterbased Acrolon 100, B65-720 Series (4.0 mils wet, 1.8 mils dry per coat).
- 6. Acrylic.
  - Substrate: Interior Ferrous Metal.
  - b. Sheen: Satin.
  - c. Sherwin Williams:
    - 1) Shop Primer: S-W Kem Kromik Universal Metal Primer B50 Series (6.0-8.0 mils wet, 3.3-4.4 mils dry per coat).
    - Primer: S-W Pro Industrial Pro-Cryl Universal Primer B66-1310 Series (5.0 mils wet, 1.9 mils dry).
    - 3) Top Coat: S-W Pro Industrial Eg-Shel Acrylic, B66-660 Series (6.0 mils wet, 2.2 mils dry per coat).
- B. Exterior paint systems:
  - 1. Zinc Rich Epoxy Urethane.
    - a. Substrate: Ferrous Metal; typical steel; AESS.
    - b. Tnemec:
      - 1) Primer: Tnemec 94 H2O.
      - 2) Intermediate: Tnemec 1075.
      - 3) Finish Coat: Corotech V540 Waterborne Urethane, 2-2.5 mils dft.

### 2.5 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.

# **PART 3 - EXECUTION**

- 1.1 EXAMINATION
  - A. Verify existing conditions meet the manufacturer's requirements before starting work.
  - B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 013515 LEED Certification Procedures.
- 1.2 PREPARATION

A . Prepare surfaces to receive work in accordance with manufacturer's instructions.

#### 1.3 INSTALLATION

- A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. All paints and coatings, including accessories, applied on site must comply with the VOC limits, emissions testing and Submittal requirements for IEQ Credit Low-Emitting Materials as specified in Section 013515 LEED Certification Procedures (LEEDv4)..

#### 1.4 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

### 1.5 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

### 1.6 SCHEDULE

#### A. Coats:

1. Application: Primer + 2 coats.

# B. Interior Systems:

- 1. Manufacturer: Benjamin Moore Aura or similar.
- Application: Interior paints, latex or high performance architectural latex. Zero VOC.
- 3. Finish: Sheen TBD from flat to semi-gloss dependent on location/substrate.
- 4. Location: Per finish schedule.

## C. Exterior Systems:

- 1. Product: Zinc-Rich Urethane/Inorganic Water-Based Epoxy/ Polyurethane.
- 2. Manufacturers: Tnemec Tneme-Zinc w/ Unibond DF or approved equal.
- 3. Sheen: Eggshell
- 4. Coats: Shop Primer + 2 coats.
- 5. Location: Exterior steel; exterior fence and gates, steel at openings, canopies, railings and others as indicated on drawings.

# D. Wood Finish on Stair Treads:

- Manufacturer: Bona
- 2. Product Line: Traffic HD Anti-Slip
- 3. Finish: Clear.
- 4. Sheen: Satin.
- 5. Locations: New Feature Stair treads.

# **PART 1 - GENERAL**

#### 1.1 SECTION INCLUDES

- A. Delegated design of signage and supports.
- D. Panel Signs for room identification and code requirement.
- F. Applied Decal Signs.

#### 1.2 RELATED REQUIREMENTS

- A . 013000 Administrative Requirements: For additional requirements of preinstallation meeting.
- B. 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- C. 014339 Mockups: For additional requirements related to the mockups in this section.
- D. 016000 Product Requirements: For substitution and additional product requirements.
- E . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

## 1.3 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 013000 Administrative Requirements.
  - Review preparation and installation procedures and coordinating and scheduling required with related work.

## 1.4 SUBMITTALS

- A. Qualification Data: For fabricator and design engineer.
- B . Delegated-Design Submittal: For assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C . Product Data: Provide product criteria, characteristics, accessories, jointing and attachment methods.

# D. Shop Drawings:

- 1. Show sign mounting heights, locations of supplementary supports, and accessories.
- 2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
- E . Sample: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
  - 1. Panel Signs: Not less than 12 inches square for each type.

- 2. Accessories: One of each, for each type.
- F. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- G . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - LEED Submittal Coversheet.
  - 2. Low-Emitting Materials Submittals:
    - a. EQ Credit Low Emitting Materials: General Emissions Evaluation. Documentation certifying certifying all paints and coatings, ceilings, flooring and insulation products comply with current California Department Public Health Standard (CDPH) Method v1.1-2010 or later and meet additional VOC content requirements for wet-applied paints, coatings products applied onsite: Documentation of certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 LEED Certification Procedures (LEEDv4).
    - EQ Credit Low Emitting Materials: Additional VOC content requirements for wetapplied paints, coatings products applied onsite: Documentation of certification from the manufacturer that the product meets the applicable VOC limits listed in Section 013515 - LEED Certification Procedures (LEEDv4).
- H. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  - 3. Include manufacturers' brochures and parts lists describing the actual materials installed.
- I. Closeout Submittals:
- 1.5 MAINTENANCE MATERIAL
  - A. Spare parts, extra stock, tools.
- 1.6 QUALITY ASSURANCE
  - A. Manufacturer Qualification: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
  - B. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
  - C . Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.
  - D. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience on projects of similar size and complexity.
- 1.7 MOCKUP
  - A. Locate where directed.
  - B. Mockup may remain as part of the Work.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B . As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

## **PART 2 - PRODUCTS**

#### 2.1 DESCRIPTION

A . Signage as required by code and to facilitate wayfinding.

### 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Tactile and Braille Characters: Text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Produce precisely formed characters with square-cut edges free from burrs and cut marks. Text shall be accompanied by Grade 2 Braille. Braille dots with domed or rounded shape produced using Raster Method.
  - 1. Raised-Copy Thickness: Not less than 0.7 mm and not more than 3 mm.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C . Provide materials that meet the guidelines in Section 013515 LEED Certification Procedures.
  - 1. EQ Credit Low Emitting Materials, Option 1: Meet emissions testing and requirements of CDPH Standard Test Method v1.1-2010 or later.
  - EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
    - a. Applies only to interior paints and coatings applied onsite.

# 2.3 MATERIALS

- F. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
- G . Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
  - 1. Impact Resistance: 16 ft-lb/in. per ASTM D256, Method A.
  - 2. Tensile Strength: 9000 lbf/sq. in. per ASTM D638.
  - 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D790.
  - 4. Heat Deflection: 265 degrees F at 264 lbf/sq. in. per ASTM D648.
  - 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.

- H. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils (0.076 mm) with pressure-sensitive adhesive backing, suitable for exterior applications.
  - Opaque Vinyl: Basis of Design: 3M Scotchcal Electro Cut Graphic Film, or a comparable product by the following:
    - a. Gerber Scientific Products.
  - 2. Translucent Vinyl: Basis of Design 3M Scotchcal Electro Cut Graphic Film, Dusted Crystal Translucent Vinyl, or a comparable product by the following:
    - Gerber Scientific Products.
  - 3. Printed Vinyl Sheet: Digitally printed vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing. Apply UV and water resistant coating to face of sheet. Apply sheet to panels indicated.

#### 2.4 FINISHES

- C. Painted Finishes: Specification is based on products listed by Matthews Paint.
  - Comparable products by one of the following are also acceptable. See Section 016000
     Product Requirements for submittal requirements.
    - a. Akzo Nobel.
  - Substitutions for products by manufacturers other than those listed above: See Section 016000 - Product Requirements.
  - 3. Acrylic, Polycarbonate:
    - a. Primer: 74 777SP Tie Bond 0.4 0.6 mils DFT.
    - b. Topcoat: VOC MAP, 2.0 mils DFT minimum, satin sheet unless indicated otherwise.
  - 4. Clear Coat:
    - a. VOC 281 228SP VOC Satin Clear, 2.0 mils DFT minimum, satin sheen unless indicated otherwise.

## 2.5 FABRICATION

- C. Panel Signs:
  - 1. Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner signs.
  - 2. Edge Condition: Square.
  - 3. Corner Condition: Square.
  - 4. Mounting: Unframed, as indicated.
    - a. Wall or Projection mounted with concealed attachment.
    - b. Manufacturer's standard anchors for substrates encountered.
  - 5. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.

# E. Applied Decal Signs:

1. Applied Vinyl Characters: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing. Apply copy to surfaces indicated.

#### 2.6 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 013515 LEED Certification Procedures.
- C. Manufacturer's optional accessories required by the project:
  - 1. Double sided stick tape.
  - 2. Blank back plate for glass.
  - Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

## **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.
- B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 013515 LEED Certification Procedures.

#### 3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

## 3.3 INSTALLATION

- A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. All paints and coatings, including accessories, applied on site must comply with the VOC limits, emissions testing and Submittal requirements for IEQ Credit Low-Emitting Materials as specified in Section 013515 LEED Certification Procedures (LEEDv4).

# 3.4 ADJUSTING

A. Adjust and lubricate hardware for proper operation.

# 3.5 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

# 3.6 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

# 3.7 SCHEDULE

## A. Code-Required Signage:

- 1. Custom signage. Off-the-shelf signage will not be accepted.
- Application: Room/bathroom/occupancy/etc. signage with braille as required. Assume custom color of backsurface paint and custom font to match building branding standards.
- Finish: 1/8" acrylic lens with subsurface paint. Font and color to be selected by Architect.
- 4. Location: All rooms where required by code.

## B. Room Identification Signage:

- 1. Custom signage. Off-the-shelf signage will not be accepted.
- 2. Application: Adjacent to each swing door in Library Spaces for room identification and naming. Finish Size: 8" x 6".
- 3. Finish: 1/8" acrylic lens with subsurface paint. Font and color to be selected by Architect.

# 3.2 Location: All rooms where required by code

# B. Address Signage:

- 1. Custom signage.
- 2. Application: Applied to transom glass above each entry door.
- 3. Finish: Vinyl, architect to select from manufacturer standards.
- 4. Location: At all entry doors.

## **PART 1 GENERAL**

#### 1.1 SECTION INCLUDES

- A. Plastic sheet wall protection.
- B. Fiber reinforced plastic sheet.

### 1.2 RELATED REQUIREMENTS

- A. 01 35 15 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 01 60 00 Product Requirements: For substitution and additional product requirements.
- C. 01 74 19 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

#### 1.3 SUBMITTALS

- A. Product Data: Provide product criteria, characteristics, accessories, jointing and methods, and termination details for curtains, track and accessories.
- B. LEED Submittals: For components of this section submit the following in compliance with Section .
  - 1. Materials and Resources Submittals:
    - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: disclosed in a 3rd party verified EPD that conforms to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
- C. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- D. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's hardware, operation, materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
  - 3. Recommendations on maintenance schedule.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum of 5 years of experience.

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 01 35 15 LEED Certification Procedures.

# 1.6 WARRANTY

A. Installation Warranty: Contractor shall correct defective Work within a 2 year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

# PART 2 PRODUCTS

#### 2.1 DESCRIPTION

A. Surface applied wall protection including plastic sheet wall protection and fiber reinforced plastic laminate.

## 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84. B. Provide materials that meet guidelines in Section .
  - MR Credit BPDO Environmental Product Declarations (EPD), Option 1: LCA or EPD reports or compliant summary for each product in this section with a compliant evaluation.

# 2.3 MATERIALS

- A. Plastic Sheet Wall Protection:
  - 1. Solid Surface material wall protection:
    - a. Manufacturer: Acrovyn Plastic Wall Covering.
    - b. Location: Paging Area, Staff General Office.
    - c. Color: To be selected from full line of Manufacturer's Standards
- B. Fiber Reinforced Plastic Sheet (FRP):
  - 1. Manufacturer: Crane Plastic Laminate Wall Covering.
  - 2. Finish: Smooth.
  - 3. Color: White.
  - 4. Location: Clean/Utility Room.

- C. Corner guards.
  - 1. Stainless Steel Corner Guards:
    - a. Basis of Design: Stainless Steel Corner Guard by InPro Corporation.
      - 1) Comparable products by one of the following are also acceptable. See Section 01 60 00 Product Requirements for submittal requirements.
        - a) Construction Specialties Inc.
      - 2) Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 Product Requirements.
    - b. Material: 304 Stainless steel.
    - c. Finish: #4 Satin.
    - d. Height: Top of floor base to ceiling.
    - e. Leg Length: 1-1/2 inch.
    - f. Mounting: Double-faced self-adhesive tape and fasteners.
    - g. Location: 12 locations TBD on site

### 2.4 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.
- C. Trim:
  - 1. Material: Aluminum.
  - 2. Manufacturer: Schluter.

# **PART 3 EXECUTION**

# 3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work, including location of blocking.
- B. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 35 15 LEED Certification Procedures.

#### 3.2 PREPARATION

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Wall and Corner Protection

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

# 3.3 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Install components plumb, level, square, and in proper alignment with drawings.
- C. All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.

# 3.4 ADJUSTING

A. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

# 3.5 CLEANING

- A. Dispose of all waste material in accordance with project's Waste Management Plan.
  - 1. See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

# 3.6 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

# **PART 1 - GENERAL**

- 1.1 SECTION INCLUDES
  - A. Toilet Room Accessories.
- 1.2 RELATED REQUIREMENTS
  - A . 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
  - B. 016000 Product Requirements: For substitution and additional product requirements.
  - C . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

#### 1.3 SUBMITTALS

- A . Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- B. Sample: Submit 1 sample of each accessory, illustrating color and finish.
- C . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures (LEEDv4).
  - LEED Submittal Coversheet.
  - Materials and Resources Submittals:
    - a. MR Credit BPDO Material Ingredients, Option 1: Documentation disclosing a manufacturer inventory in accordance with Section 013515 LEED Certification Procedures (LEEDv4).
- D. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- E. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Methods for maintaining system's materials and finishes.
  - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

### 1.4 MAINTENANCE MATERIAL

A. Keys: Provide 3 keys for accessories to Owner; master key all lockable accessories.

#### 1.5 QUALITY ASSURANCE

A . Manufacturer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification Procedures.

# **PART 2 - PRODUCTS**

#### 2.1 DESCRIPTION

A. Accessories to be installed in toilet rooms.

# 2.2 PERFORMANCE AND DESIGN CRITERIA

- A. Comply with ANSI/ICC A117.1, Americans with Disabilities Act (ADA Standards).
- B. Grab bars, shower seats, and dressing room benches shall be designed to resist a single concentrated load of 250 pounds applied in any direction, at any point on the grab bar or seat so as to produce the maximum loading effects, in accordance with ICC (IBC)-2018 Section 1607.8.2.
- C . Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

### 2.3 MANUFACTURERS

- A. Specification is based on Bobrick TrimLine Series.
  - 1. Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.

# 2.4 MATERIALS

- A. Stainless Steel Sheet:
  - 1. ASTM A666, Type 304.
- B. Stainless Steel Tubing:
  - ASTM A269/A269M, Type 304 or 316.
- C . Back paint, in accordance with Section 099000 Painting and Coating, where contact is made with building finishes to prevent electrolysis.

- D. Fasteners, Screws, and Bolts:
  - 1. Hot dip galvanized, tamper-proof, security type.
- E. Expansion Shields:
  - Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

### 2.4 TOILET ROOM PRODUCTS

- A. Basis of Design: Bobrick TrimLine Series
  - 1. Grab bars.
  - 2. Surface Mount Seat cover dispensers.
  - 3. B35139 surface mount sanitary napkin disposals.
  - 4. Recessed toilet paper dispensers B35883.
  - 5. Recessed combination paper towel dispenser/waste receptacle B39003.
  - 6. Recessed Soap dispensers B306.
  - 7. Mobile device holder with bag hook.
- B. Baby Changing Station:
  - 1. Manufacturer: Koala Kare Horizontal Stainless Steel.
  - 2. Product: #KB110-SSRE/ KB111-SSRE.
  - 3. Recess mounted.
- C. (LVG-1) Lavatory Guards:
  - 1. Product: Lav Guard 2 E-Z manufactured by Truebro, Inc.: www.truebro.com.
  - 2. Antimicrobial (ASTM G21 and G22 0 growth) molded closed cell vinyl covers; 1/8" nominal wall thickness; 70-80 Shore A, Finish: smooth, high gloss, UV resistant, paintable.

### 2.5 ACCESSORIES

A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

### **PART 3 - EXECUTION**

- 3.1 EXAMINATION
  - A . Verify existing conditions meet the manufacturer's requirements before starting work.
- 3.2 PREPARATION
  - A . Prepare surfaces to receive work in accordance with manufacturer's instructions.
- 3.3 INSTALLATION
  - A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
  - B. Install plumb and level, securely and rigidly anchored to substrate.

C . Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings.

# 3.4 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

# 3.5 ADJUSTING

A. Adjust and lubricate hardware for proper operation.

# 3.6 CLEANING

A. Dispose of all waste material in accordance with Section 017419 - Construction Waste Management and Disposal and project's Waste Management Plan.

# 3.7 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

# **PART 1 - GENERAL**

#### 1.1 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

## 1.2 RELATED REQUIREMENTS

- A . 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 016000 Product Requirements: For substitution and additional product requirements.
- C . 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- D. 092116 Gypsum Board Assemblies: Roughed-in wall openings and blocking.

#### 1.3 SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.
- C . Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, and location.
- D. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- E. Maintenance Data: For user's operation and maintenance of system including:
  - 1. Test, refill or recharge schedules and re-certification requirements.
  - 2. Methods for maintaining system's materials and finishes.
  - 3. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

## 1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of work specified in this section with minimum 5 years of experience.

# 1.5 DELIVERY, STORAGE, AND HANDLING

A . As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

# **PART 2 - PRODUCTS**

#### 2.1 DESCRIPTION

A . Fire extinguishers and cabinets with accessories for proper use.

### 2.2 PERFORMANCE AND DESIGN CRITERIA

- A . Portable fire extinguishers shall be selected and installed in accordance with this section and NFPA 10.
  - 2012 IBC.906.2.

### 2.3 MATERIALS

- A . Fire Extinguishers:
  - 1. Multi-Purpose Dry Chemical Extinguisher:
    - a. Specification is based on MP Series by Larsen's Manufacturing Co.
      - 1) Comparable products by one of the following are also acceptable. See Section 016000 Product Requirements for submittal requirements.
        - a) JL Industries, Inc: www.jlindustries.com.
        - b) Ansul, Inc: www.ansul.com.
      - 2) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.
    - b. Performance Criteria:
      - Complying with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
      - 2) Labeled by UL for the purpose specified and indicated.
      - 3) Class: A:B:C.
      - 4) UL Rating: 4A-80B:C.
      - 5) Extinguisher Model: Larsen's #MP10.
      - 6) Size: 10 pound.
    - c. Features:
      - 1) Finish: Baked polyester powder coat.
      - 2) Color: Red.
      - 3) Location: Per Architectural plans.
- B. Fire extinguisher cabinets:
  - Fully recessed cabinets:
    - a. Specification is based on Ridge Series Cabinet by Nystrom.
      - 1) Comparable products by one of the following are also acceptable. See Section 016000 Product Requirements for submittal requirements.
        - a) Larsen's Manufacturing Co.
        - b) JL Industries, Inc: www.jlindustries.com.

- c) Ansul, Inc: www.ansul.com.
- 2) Substitutions for products by manufacturers other than those listed above: See Section 016000 Product Requirements.
- b. Performance Criteria:
  - 1) Sized to fit specified fire extinguisher.
  - 2) Provide Flame Shield option to maintain fire rating of assembly.
- c. Features:
  - 1) Fully recessed
  - Door and Trim Material: Cold steel sheet with recoat able white polyester finish.
  - 3) Door Style: Flat with vertical lite
  - 4) Trim Style: Flat with square corners.
  - 5) Glazing: Clear Acrylic.
  - 6) Finish of Cabinet Exterior Trim and Door: White.

# 2.4 ACCESSORIES

- A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Manufacturer's accessories required by the project:
  - 1. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

## **PART 3 - EXECUTION**

- 3.1 EXAMINATION
  - A. Verify existing conditions meet the manufacturer's requirements before starting work.
- 3.2 PREPARATION
  - A. Prepare surfaces to receive work in accordance with manufacturer's instructions.
- 3.3 INSTALLATION
  - A . General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- 3.4 ADJUSTING
  - A . Adjust and lubricate hardware for proper operation.
- 3.5 CLEANING
  - A . Dispose of all waste material in accordance with Section 017419 Construction Waste Management and Disposal and project's Waste Management Plan.

Tacoma Public Library – Main Branch Renovation SECTION 10 44 00 FIRE PROTECTION SPECIALTIES

# 3.6 PROTECTION

A . Protect installed work as required by the manufacturer to maintain product performance, design criteria, and warranty.

**END OF SECTION** 

10 44 00 - 4

## **PART 1 - GENERAL**

#### 1.1 SECTION INCLUDES

- A. Metal lockers.
- B. Locker benches.

### 1.2 RELATED REQUIREMENTS

- A . 013000 Administrative Requirements: For additional requirements of preinstallation meeting.
- B . 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- C. 016000 Product Requirements: For substitution and additional product requirements.
- D. 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E. 092219 Non-Structural Metal Framing: Blocking and nailers.

## 1.3 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 013000 Administrative Requirements.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

### 1.4 SUBMITTALS

- A. Product Data: Provide data on locker types, sizes, and accessories.
- B. Shop Drawings: Indicate locker plan layout, numbering plan.
- C . Samples: Submit two samples 3 x 6 inches in size, of each color scheduled; applied to specified substrate.
- D. Manufacturer's Installation Instructions: Indicate component installation assembly.
- E . LEED Submittals: For components of this section submit the following in compliance with Section 013515 LEED Certification Procedures.
  - 1. Materials and Resources Submittals:
    - a. LEED Materials Submittal Form for Building Product Disclosure and Optimization: Section 013515.02 LEED BPDO Submittal Coversheet.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.
- B. As required by SMACNA Guideline Chapter 3 and Section 013515 LEED Certification

Procedures.

### **PART 2 - PRODUCTS**

- 2.1 DESCRIPTION
  - A. Metal lockers and benches.
- 2.2 PERFORMANCE AND DESIGN CRITERIA
  - A. Code required criteria.
    - Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

### 2.3 METAL LOCKERS

- A . Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
  - 1. Color: Color to be selected by Architect from standards.
- B. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
  - 1. Body and Shelves: 24 gage, 0.0239 inch.
- C . Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
  - 1. Door Frame: 16 gage, 0.0598 inch, minimum.
- D. Doors: Hollow double pan, sandwich construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
  - 1. Door Outer Face: 18 gage, 0.0478 inch, minimum.
  - 2. Door Inner Face: 20 gage, 0.0359 inch, minimum.
  - 3. Form recess for operating handle and locking device.
  - 4. Provide louvers in door face, top and bottom, for ventilation.
- E . Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.
  - 1. Hinge Thickness: 14 gage, 0.0747 inc

- F. Coat Hooks: Stainless steel or zinc-plated steel.
- G . Number Plates: Provide oval shaped plates. Form 1.5 inch high of block font style with ADA designation, in contrasting color.
- H. Fabricate accessible lockers with bottom shelf no lower than 15 inches above the floor. Place hooks, coat rods, and any additional shelves no higher than 48 inches above the floor.
- I. Locking device: Padlock style.

### 2.4 METAL LOCKER UNITS

- A. Width: 12 inches.
- B. Depth: 18 inches.
- C. Height: 72 inches.
- D. Configuration: Varies; per plans
- E. Mounting: Per Plans
- F. Base: Metal base.
  - 1. Base Height: 4 inch.
- G. Top: Sloped metal with closures.
- H. Locking: Equipped for padlock hasps.
- 1. Latching/Locking: Lift trigger of 14 gage steel with padlock eye.
- J. Ventilation Method: Door louvers
- K. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
- L. Doors: Hollow channel edge construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
- M . Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; attached securely to locker body and door.
- N. Provide rubber silencer(s) at latch and door.
- O. Locking device supplied by Owner.
- P. Number Plates: Provide oval shaped aluminum plates. Form numbers approximately 1/2 inch high of block font style with ADA designation, in contrasting color.
- Q. Provide ventilation openings at top and bottom of each locker.
- R . Form recess for operating handle and locking device.

- S . Finish edges smooth without burrs.
- T. Fabricate tops, ends and closure pieces to match door finish.
- U. Latch function:
  - Latch engage the frame at a minimum of three points on doors greater than 42 inches, two points at any door equal to or less than 42 inches. Locking device function "positive automatic type" where by the door may be locked when open and closed without unlocking.

### **PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

#### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C . Place and secure on prepared base.
- D . Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels and filler panels.
- G. Install accessories.
- H. Replace components that do not operate smoothly.

### 3.3 CLEANING

- A. Clean locker interiors and exterior surfaces.
- B. Dispose of all waste material in accordance with Section 017419 Construction Waste Management and Disposal and project's Waste Management Plan.

## 3.4 SCHEDULE

- A. TTK Metal Lockers without Legs, 12" Deep:
  - 1. Manufacturer: Tennsco.
  - 2. Application: 72" high heavy-duty metal lockers, single or multi tier locker without legs.
  - 3. Finish: Painted, manufacturer standard color.
  - Location: See plans: staff room, staff office

## **PART 1 GENERAL**

#### 1.1 SECTION INCLUDES

- A. Marker Boards
- B. Tack Boards
- C. Hanging Display System for Gallery Walls

## 1.2 RELATED REQUIREMENTS

- A. 01 60 00 Product Requirements: For substitution and additional product requirements.
- B. 01 74 21 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- C. 06 10 00 Rough Carpentry for backing and blocking required.

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of specialty, indicating colors, locations, overall dimensions.
- B. Samples: Submit sample of finish options for verification.
- C. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

## 1.4 DELIVERY, STORAGE, AND HANDLING

A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

## **PART 2 PRODUCTS**

### 2.1 DESCRIPTION

A. Interior Specialties: Miscellaneous specialties on building interior.

## 2.2 PERFORMANCE AND DESIGN CRITERIA

A. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

## 2.3 MATERIALS

A. Marker Boards:

- 1. Basis of Design: Claridge magnetic glass board.
  - a. Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 Product Requirements.
- 2. Material: Nonglare magnetic glass.
- 3. Size: 4' x 8'.
- 4. Mounting: Concealed (Invisi-mount).
- Accessories: Aluminum marker tray, manufacturer's standard extruded profile, one piece full length of board, molded ends, concealed fasteners, satin finish; (2) sets of magnets.
- 6. Color and Finish: Architect to select from manufacturer's full range.

#### B. Tack Boards:

- 1. Basis of Design: Composition Cork by Forbo Bulletin Board.
  - a. Comparable products by one of the following are also acceptable. See Section 01 60 00 Product Requirements for submittal requirements.
  - Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 - Product Requirements.
- 2. Material: Composition cork: ground cork and linoleum.
- 3. Size: As indicated on Drawings.
- 4. Cork Thickness: 1/4 inch.
- Backing Fabric: Jute.
- 6. Mounting: 1" VELCRO® brand tape or screws.
- 7. Accessories: Provide 5/4 MDF frame, painted.
- 8. Color and Finish: Architect to select from manufacturer's full range.

## C. Adjustable Gallery Wall Hanging System:

- 1. Basis of Design: Arakawa CRJ rail system with all required accessories.
  - Substitutions for products by manufacturers other than those listed above: See Section 01 60 00 - Product Requirements.
- 2. Material: Extruded aluminum with clear finish and paintable cover
- 3. Length: As indicated on Drawings.

- 4. Weight Capacity: 78 lbs on 2 cables
- 5. Mounting: Per manufacturer's instructions to achieve full capacity
- 6. Accessories to be provided by contractor:
  - i CR1-CRJ Rail Clip (Qty: 60)
  - ii AF3P116SS Midway gripper for art (QTY 20)
  - iii 300 linear feet of 1/16" cable; cut lengths to be determined
  - iv Quantity of plastic end cap sets required per plans
  - v Cable Cutting Kit (QTY 1)

## PART 3 EXECUTION

## 3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

## 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Protect from damage until Substantial Completion; repair or replace damage items.

## 3.3 CLEANING

- A. Dispose of all waste material in accordance with project's Waste Management Plan.
  - See Section 01 74 19 Construction Waste Management and Disposal for additional requirements.

**END OF SECTION** 

## **PART 1 - GENERAL**

#### 1.1 SECTION INCLUDES

A. Kitchen appliances.

### 1.2 RELATED REQUIREMENTS

- A . 013000 Administrative Requirements: For additional requirements of preinstallation meeting.
- B. 013515 LEED Certification Procedures: For additional requirements related to LEED Certification
- C. 016000 Product Requirements: For substitution and additional product requirements.
- D. 017419 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E. DIV 22 Plumbing Piping: Plumbing connections for appliances.
- F. DIV 26 Equipment Wiring: Electrical connections for appliances.

## 1.3 ADMINISTRATIVE REQUIREMENTS

- A . Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 013000 Administrative Requirements.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

## 1.4 SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Data: Manufacturer's data indicating dimensions, rated power figures, capacity, and operating features of each piece of residential equipment specified.
- C . Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Electric Appliances: Listed and labeled by CSA/UL and complying with NEMA standards.

### 1.6 DELIVERY, STORAGE, AND HANDLING

A . As required by SMACNA Guideline Chapter 3 and Section 013515 - LEED Certification Procedures.

#### 1.7 WARRANTY

- A. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- B. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

## **PART 2 - PRODUCTS**

- 2.1 DESCRIPTION
  - A. Kitchen Appliances.
- 2.2 PERFORMANCE AND DESIGN CRITERIA
  - A . Accessibility Requirements: For appliances required to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.
- 2.3 KITCHEN APPLIANCES:
  - A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
  - B. Refrigerator 36" wide, counter depth, ADA compliant with integral ice maker:
    - 1. Location: Staff Breakroom (230), Common Kitchen (209)
  - E. Microwave Oven; front venting, built in to casework:
    - 1. Location: Staff Breakroom (230), Common Kitchen (209
  - G. Dishwasher 24" wide quiet operation:
    - 1. Location: Staff Breakroom (230), Common Kitchen (209

# 2.4 ACCESSORIES

A . All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

## **PART 3 - EXECUTION**

- 3.1 EXAMINATION
  - A. Verify utility rough-ins are present and correctly located.
- 3.2 INSTALLATION
  - A. Install in accordance with manufacturer's instructions.
  - B. Anchor built-in equipment in place.
- 3.3 ADJUSTING
  - A. Adjust operating equipment to efficient operation.
- 3.4 CLEANING

- A . Dispose of all waste material in accordance with Section 017419 Construction Waste Management and Disposal and project's Waste Management Plan.
- B. Remove packing materials from equipment.
- C. Wash and clean equipment.

**END OF SECTION** 

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## PART 1 GENERAL

#### 1.1 SECTION INCLUDES

A. Section includes manually operated window roller shades.

## 1.2 RELATED REQUIREMENTS

- A. 01 35 15 LEED Certification Procedures: For additional requirements related to LEED Certification
- B. 01 43 39 Mockups: For additional requirements related to the mockups in this section.
- C. 01 60 00 Product Requirements: For substitution and additional product requirements.
- D. 01 74 21 Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E. Floor plan for locations and dimensions.

### 1.3 ADMINISTRATIVE REQUIREMENTS

#### 1.4 SUBMITTALS

- A. Qualification Data: For installer.
- B. Product Data: For each type of product.
  - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- C. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- 1. Show guides, enclosures, and accessories as proposed to be installed in each location.
- 2. Provide accurate to 0.0625 inch; field measurements for custom shade fabrication on the Roller Shades manufacturers input forms.
  - LEED Submittals: For components of this section submit the following in compliance with Section 01 35 15 - LEED Certification Procedures.
    - 1. Low-Emitting Materials Submittals:
      - LEED Low Emitting Materials (LEM) Submittal Form: Section 01 35 15.01 LEED Low-Emitting Materials Submittal Coversheet.
      - EQ Credit Low Emitting Materials, Option 1: Additional VOC content requirements for wet-applied products: Certification from the manufacturer that the product meets the applicable VOC limits listed in Section 01 35 15 - LEED Certification Procedures.

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Roller Window Shades

- E. Samples: For each exposed product and for each color and texture specified.
- F. Roller-Shade Schedule: Use same designations indicated on Drawings.
- G. Product certificates.
- H. Product test reports.
- Maintenance data.

### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Consultant specifically approves such deviations in writing.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### 1.6 COORDINATION

- Attend Pre-Con meeting as well as any subcontractor meetings required to coordinate the work.
- B. The WC shall participate and cooperate with the electrical contractor, the window shade manufacturer and the Commissioning agent to verify and certify the installation is in full conformance with the specifications and is fully operational. This work to occur during the commissioning stage and is in addition to preliminary acceptance required for each floor.

# 1.7 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.
- B. As required by SMACNA Guideline Chapter 3 and Section 01 35 15 LEED Certification Procedures.

### **PART 2 PRODUCTS**

### 2.1 DESCRIPTION

A. Manually-operated roller shades with capability for single shade cloth.

### 2.2 PERFORMANCE AND DESIGN CRITERIA

A. Provide materials that meet guidelines in Section 01 35 15 - LEED Certification Procedures.

- 1. EQ Credit Low Emitting Materials, Option 1: Meet the applicable VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
  - Applies only to interior paints and coatings.

### 2.3 MANUFACTURERS

- A. Window Shade: Basis-of-Design: Subject to compliance with requirements, provide products from MechoShade Systems, Inc. or comparable product by one of the following:
  - 1. Draper
  - Nysan Solar Control Inc.; Hunter Douglas Company.
  - 3. Substitutions: See Section 01 60 00 Product Requirements.

### 2.4 WINDOW ROLLER SHADES

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop metal bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
  - 1. Roller Mounting Configuration: Single roller and Double roller, offset with outside over the inside.
  - 2. Roller Drive-End Location: As indicated.
  - 3. Direction of Shadeband Roll: Regular, from back of roller.
  - 4. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

## E. Shade Cloth:

- 1. Shade Cloth Material: As indicated on drawings.
- 2. Shade Cloth Bottom (Hem) Bar: Steel or extruded aluminum.
  - a. Single Shade Opacity: Blackout

- b. Type: Enclosed in sealed pocket of shadeband material.
- c. Color and Finish: As selected by Architect from manufacturer's full range.

#### F. Installation Accessories:

- 1. Provide manufacturer's sheet metal valence, and accessories, color to be selected from manufacturer's standard colors.
- Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
  - a. Closure-Panel Width: As indicated on Drawings.
- 3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
- 4. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
- 5. Installation Accessories Color and Finish: As selected from manufacturer's full range.

### 2.5 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-filtering Fabric: Woven Fabric, stain and fade resistant.
  - 1. As Specified in Finish Legend.

## 2.6 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
  - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).

### 2.7 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

B. All accessory materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 - LEED Certification Procedures.

### **PART 3 EXECUTION**

#### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Conduct field inspection on an area-by area and floor-by-floor basis during construction to confirm proper mounting conditions per approved shop drawings.
- C. Verifications of conditions: Examine the areas to receive the work and conditions under which the work would be performed and notify General Contractor and Owner of conditions detrimental to the proper and timely completion of the work.
- D. Do not proceed until unsatisfactory conditions have been corrected in that area.
- E. Verify products have been stored, and will be installed, in accordance with project's Construction Indoor Air Quality Management Plan specified in Section 01 35 15 LEED Certification Procedures.

### 3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units, according to manufacturer's written instructions.
  - 1. Shadebands: Located so shadeband is not closer than 2 inches (50 mm) to interior face of glass. Allow clearances for window operation hardware.
- B. Install roller shades and set intermediate stops of all shades to assure the alignment of the shade bands within a single group.
  - 1. Tolerance: Maximum Variation from alignment shall not exceed +/- 0.125 inches.
- C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- D. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- E. All miscellaneous installation materials required to comply with EQ credit: Low Emitting Materials, Option 1 in accordance with Section 01 35 15 LEED Certification Procedures.

### 3.3 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

### 3.4 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.
- B. Adjust, align and balance roller shades to operate smoothly, easily, safely and free from binding or malfunction throughout entire operational range.
- C. Installer shall set Upper, Lower, and up to 3 intermediate stop positions of all motorized shade bands, and assure alignment in accordance with the above requirements.
- D. Certify the operation of all motorized shades and turn over each floor for preliminary acceptance.

### 3.5 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.
- C. Dispose of all waste material in accordance with project's Waste Management Plan.
  - 1. See Section 01 74 21 Construction Waste Management and Disposal for additional requirements.

**END OF SECTION** 

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## **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

### 1.2 WORK INCLUDED

A. Operation and Maintenance Manual.

### 1.3 SUBMITTALS

- A. General: Comply with Section 20 05 00 and Division 01.
- B. Preliminary O&M: Submit preliminary review O&M manual for review.
- C. Final O&M: Submit Final O&M manuals per Division 01.

### **PART 2 - PRODUCTS**

#### 2.1 GENERAL

A. General Contents: A maintenance manual shall be compiled containing maintenance and operating information and maintenance schedules for all project mechanical systems. See Division 01 for quantities, organization, format, and other requirements; meet additional requirements as specified herein.

#### 2.2 SUBMITTAL DATA AND TECHNICAL O&M DATA

#### A. Submittal Data:

- General: Provide a copy the submittal data (clearly identified and marked to suit each item). Note: The submittals are not retained by the Owner and a copy is therefore required in the O&M.
- 2. Product Data: Manufacturer's technical product data, with manufacturer's model number, description of the equipment, equipment capacities, equipment options, electrical power voltage/phase, special features, and accessories. Label data sheets with same designation as used on contract documents. Provide for all items requiring maintenance and for items that may require replacement over a 30-year period or be revised due to an Owner building improvement.
- 3. Shop Drawings: Provide copy of final shop drawings as approved for each area where shop drawings were required to be submitted.
- B. Technical O&M Data: Provide for each equipment or item requiring maintenance. Label O&M data to clearly indicate which equipment on the project it applies to (use same designation as used in the Contract Documents). Data to include:
  - 1. Manufacturer's operating and maintenance manuals and instructions.
  - 2. Itemized list of maintenance activities and their scheduled frequency.

- 3. Maintenance instructions for each maintenance activity.
- 4. Manufacturer's parts list.
- 5. Manufacturer's recommended lubricants.
- 6. Size, quantity and type of filters required (as applicable).
- 7. Size, quantity and type each belts unit requires (as applicable).
- 8. Size, quantity and type of fuses (as applicable).
- C . Sources: Provide names, addresses, and phone numbers for local manufacturer's representative, service companies, and parts sources for mechanical system components.
- D. Start-Up Reports: Include copies of all equipment and system start-up reports.
- E. Balancing Report: Include a full copy of the balancing report under a dividing tab for the specification section (or building system) where this work is specified. Where balancing is provided by others, obtain from the balancer a copy of the report to insert in the O&M's.

### 2.3 MAINTENANCE SCHEDULES

- A . General: Provide Maintenance schedules with an itemized list of maintenance activities and their scheduled frequency (i.e., weekly, monthly, semi-annually, etc.) for item requiring maintenance.
- B. Special Maintenance: List any critical maintenance items or areas requiring special attention.
- C . Start-Up/Shut-Down: Provide normal start-up, operating, and shut-down procedures; emergency shut-down procedures; and (where applicable) seasonal shut-down procedures.

### 2.4 REDUCED RECORD DRAWINGS

A. Reduced As-Built Drawings: Provide reduced as-built construction drawings for fire suppression, plumbing, HVAC, Controls. Drawings' size shall be 11" x 17", except where such size precludes the reading of portions of the drawing, a larger size may be used.

### **PART 3 - EXECUTION**

**NOT USED** 

**END OF SECTION** 

## PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Division 22 Plumbing Systems.
- C. Division 23 Heating, Ventilation, and Air Conditioning (HVAC) Systems.
- D. Division 25 Integrated Automation.

### 1.2 WORK INCLUDED

- A. General Mechanical System Requirements.
- B. Mechanical System Motors.
- C. Identification and Labeling.

## 1.3 DEFINITIONS

- A . Abbreviations, Terms and Symbols: Where not defined elsewhere in the Contract Documents, shall be as defined in RS Means Illustrated Construction Dictionary, Fourth Addition and in the ASHRAE Handbook of Fundamentals, latest edition.
- B . "As required" means "as necessary to form a safe, neat, and complete working installation (or product), fulfilling all the requirements of the specifications and drawings and in compliance with all codes."
- C . "Concealed" means "hidden from view" as determined when areas are in their final finished condition, from the point of view of a person located in the finished area. Items located in areas above suspended ceilings, in plumbing chases, and in similar areas are considered "concealed." Items located in cabinet spaces (e.g. below sinks) are not considered concealed.
- D. "Coordinate" means "to accomplish the work with all others that are involved in the work by: directly discussing the work with them, arranging and participating in special meetings with them to discuss and plan the work being done by each, obtaining and completing any necessary forms and documentation required for the work to proceed, reaching agreement on how parts of the work performed by each trade will be installed relative to each other both in physical location and in time sequence, exchanging all necessary information so as to allow the work to be accomplished with a united effort in accordance with the project requirements".
- E . "Finished Areas" means "areas receiving a finish coat of paint on one or more wall surface."
- F. "Mechanical", where applied to the scope of work, includes all project fire suppression systems, plumbing systems, HVAC systems, and controls for these systems and all work covered by specification Divisions 20, 22, 23, and 25. Such work is shown on multiple drawings and is not limited to a particular set of sheets, or sheets prefaced with a particular letter.

- G . The term "related documents" (as used at the beginning of each specification section), and the Specification Divisions and Sections listed with it, is only an indication of some of the specification sections which the work of that section may be strongly related to. Since all items of work relate to one another and require full coordination, all specification sections, as listed in the Table of Contents, shall be considered as being "related documents", and shall be considered (by this reference) in the same manner as if they had all been listed under the term "related documents" in each specification section.
- H. "Work included" (as used at the beginning of each specification section), and the items listed with it, is only an indication of some of the items specified in that Section and is in no way limiting the work of that Section. See complete drawings and specifications for all required work.
- "Verify" means "Contractor shall obtain, by methods independent of the project Architect/Engineer and Owner, the information noted and the information needed to properly perform the work". Where used as "verify existing" the reference is to all existing items related to the work (i.e. piping systems, duct systems, electrical power, controls, structural conditions, space available, building construction type, etc.); the "verify" definition shall include "Confirm by means independent of any existing field labeling and independent of the Architect/ Engineer and Owner what the existing piping (or duct) system contains, sizes, what the flow direction is, what normal pressures/temperatures are, what other systems and areas the piping (or duct) is interconnected to; what the existing control voltages/signal types are by direct measurement: what the existing electrical power voltages and phases are by direct measurement; and additional field verification and coordination to ensure that compatible products are provided, correct connections made, and all work performed to allow for fully functioning systems." "Means independent of existing field labeling" shall include methods such as: the use of exterior pressurized sources to pressurize piping system lines, use of flow tests with dyes, physical tracing of piping and all connections to, electronic detection methods, electronic/electric line tracing, electrical measurements, physical disassembling of system, excavation or uncovering of concealed systems, use of insertion cameras and similar efforts.
- J. "Substitution": As applied to equipment means "equipment that is different than the 'Basis of Design' equipment scheduled on the drawings (or otherwise indicated in the contract documents)".

### 1.4 GENERAL REQUIREMENTS

- A. Scope: Furnish all labor, materials, tools, equipment, and services for all mechanical work. This section applies to all Division 20, 22, 23, 25 specifications and to all project mechanical work. All mechanical equipment and devices furnished or installed under other Divisions of this specification (or by the Owner) which require connection to any mechanical system shall be connected under this division of the Specifications.
- B. General: All work shall comply with Division 00, General Conditions, Supplementary Conditions, Division 01, and all other provisions of the Contract Documents.

### C. Code:

- Compliance: All work shall be done in accordance with all applicable codes and ordinances. Throughout the Project Documents, items are shown or specified in excess of code requirements; in all such cases, the work shall be done so that code requirements are exceeded as indicated. Comply with code accessibility requirements.
- 2. Documentation: Maintain documentation of all permits and code inspections for the mechanical work; submit documentation showing systems have satisfactorily passed all AHJ inspections and requirements.

- Code Knowledge: Contractor and workers assigned to this project shall be familiar and knowledgeable of all applicable codes and ordinances. Code requirements are typically not repeated in the Contract Documents. By submitting a bid, the Contractor is acknowledging that the Contractor and workers to be utilized on this project have such knowledge.
- 4. Proof of Code Compliance: Prior to final completion, satisfactory evidence shall be furnished to show that all work has been installed in accordance with all codes and that all inspections required have been successfully passed. Satisfactory evidence includes signed inspections by the local code authority, test lab results, qualified and witnessed field tests, and related acceptance certificates by local code authorities, and field notes by the Contractor as to when all inspections and tests occurred.
- D. Complete Systems: Furnish and install all materials, appurtenances, devices, and miscellaneous items not specifically mentioned herein or noted on the drawings, but which are necessary to make a complete working installation of all mechanical systems. Not all accessories or devices are shown or specified that are necessary to form complete and functional systems.

### E. Review and Coordination:

- 1. General: To eliminate all possible errors and interferences, thoroughly examine all the Drawings and Specifications before work is started, and consult and coordinate with each of the various trades regarding the work. Such coordination shall begin prior to any work starting, and continue throughout the project.
- 2. Suppliers: Suppliers of products shall review the documents to confirm that their products are suitable for the application and that all manufacturers requirements and recommendations have been satisfactorily addressed in the Contract Documents. Where not addressed the supplier shall notify bidders and the Engineer prior to bidding to resolve any issue or include in their bid an adequate amount to resolve the issue.
- F. Conflicts and Discrepancies: Notify the Architect/Engineer of any discrepancies or conflicts before proceeding with any work or the purchasing of any materials for the area(s) of conflict until requesting and obtaining written instructions from the Architect/Engineer on how to proceed. Where conflicts occur, the most expensive and stringent requirement (as judged by the Architect/Engineer) shall prevail. Any work done after discovery of such discrepancies or conflicts and prior to obtaining the Architect/Engineer's instructions on how to proceed shall be done at the Contractor's expense.
- G . Drawings and Specifications: Drawings and specifications are complementary and what is called for in either is binding as if called for in both. The drawings are diagrammatic and show the general arrangement of the construction and therefore do not show all offsets, fittings and accessories which are required to form a complete and operating installation. Mechanical work is shown on multiple drawings and is not limited to a particular set of sheets, or sheets prefaced with a particular letter.

## H. Offsets/Fittings:

Piping Systems: Include in bid all necessary fittings and offset to completely connect up all systems, maintain clear access paths to equipment, and comply with all project requirements. Offsets are required to route piping around building structural elements, roof slopes, mechanical systems, electrical systems, and numerous other items. Due to the schematic nature of the plans such offsets are typically not shown. Contractor is responsible to determine the quantity of offsets and fittings required, and the labor involved. No added payment or "extras" will be granted for the Contractor's failure to correctly estimate the number of offsets and fittings and labor required. Contractor is

- advised that equipment and fixture connections may require more than 20 elbows per plumbing fixture and coil per pipe line.
- 2. Duct Systems: Include in bid all necessary fittings, offsets, and transitions to completely connect all systems, maintain clear access paths, and comply with all project requirements. Offsets are required to route ducts around building structural elements, roof slopes, mechanical systems, electrical systems, and numerous other items. Due to the schematic nature of the plans such offsets are typically not shown. Contractor is responsible to determine the quantity of offsets and fittings required, and the labor involved. No added payments or "extras" will be granted for the Contractor's failure to correctly estimate number of offsets, fittings, transitions and labor required. Contractor is advised that transitions are required at connections to all equipment, to all air inlets/outlets, crossing of beam lines, at crossing with piping, and similar locations.
- I. Design: The level of design presented in the documents represents the extent of the design being furnished to the Contractor; any additional design needed shall be provided by the Contractor. All design by the Contractor shall be performed by individuals skilled and experienced in such work, and where required by local code (or elsewhere in the documents) shall be performed by engineers licensed in the State where the project is located. Include in bid the costs of all such project design; including engineering, drafting, coordination, and all related activities and work. Such designs services are required for many building systems; including but not limited to ductwork at equipment, piping at fixtures and equipment, hanger/support systems, temporary duct/piping systems, mechanical offsets/adjustments to suit other system, seismic anchors, and for methods/means of accomplishing the work. Where design or performance criteria to be met is not stated (or is unclear), develop proposed criteria (based on code, similar projects, and related data) and submit the proposed criteria for review prior to performing full design work.
- J. Special Tools: Furnish to the Owner one complete set of any and all special tools such as odd size wrenches, keys, etc. (allen wrenches are considered odd), which are necessary to gain access to, service, or adjust any piece of equipment installed under this contract. Each tool shall be marked or tagged to identify its use. Submit a written record listing the special tools provided, date, and signed by the Owner's representative receiving the tools.
- K . Standards and References: Shall be latest edition unless a specific edition, year, or version is cited, or is enforced by the AHJ.

## L. Warranties:

- 1. General: Products and workmanship shall be warranted to be free from all defects, capable of providing satisfactory system operation, and conforming to the requirements of the Contract Documents. Include in the project bid all costs associated with project warranties to ensure that the warranty extends for the required period; possible project delays and failure by others to complete their work may cause the start of the warranty period to be delayed. The Contractor shall be responsible for increasing the warranty dates by corresponding amounts to provide the required warranty periods.
- 2. Basic Project Warranty: As described in the General Conditions, Supplementary Conditions, and Division 01. See individual specification sections for specific warranty requirements. Start date and duration are as indicated in General Conditions, Supplementary Conditions, and Division 01. Where not indicated otherwise, the basic project warranty shall start at project substantial completion and be for one year.
- 3. Special Warranties: See individual specification sections for special warranty requirements and extended warranty periods beyond the basic project warranty.

### M. Permits and Fees:

- Obtain and pay for all permits, licenses, fees and inspections as required by the Code and as specified herein (unless noted otherwise).
- 2. Pay all charges made by any utility company or municipality for material, labor or services incident to the connection of service (unless noted otherwise).
- N. Commissioning: All mechanical systems are to be commissioned per Section 20 08 00. The Contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. At a minimum, the Contractor shall provide a documented and signed record to verify that all equipment and systems installed under this contract have been inspected and functionally tested to verify full compliance with the contract specifications. In many cases, this shall require the Contractor to create or otherwise provide procedures and checklists for approval by the Commissioning Consultant prior to the start of functional testing. Reference Division 01 and coordinate all commissioning activities with the Commissioning Consultant.
- O . LEED: This project is pursuing USGBC LEED certification. This certification process requires certain reports and documentation from the Contractor; and the use of specific energy efficient and environmentally friendly materials and systems. See USGBC, Division 01, and individual specification sections for specific requirements.

### 1.5 SUBSTITUTIONS

A . General: See Division 00 and 01 for information and requirements regarding substitutions. Manufacturers not scheduled on the plans or listed as "Acceptable Manufacturers" require prior approval and shall submit a substitution request form (see Division 01 for requirements and limitations). See Paragraph 2.01 this specification section regarding "Acceptable Manufacturers".

### B. Redesign:

- The Contract Documents show design configurations based on particular manufacturers. Use of other manufacturers' products (i.e. substitutions) from what is shown (or specified) may require redesign of mechanical, plumbing, controls, fire protection, electrical, structural, and general building construction to accommodate the substitution.
- 2. Review the installation requirements for substitutions and provide redesign of all affected construction. The redesign shall be equal or superior in all respects to the Architect/Engineer's design (as judged by the Architect/Engineer), including such aspects as equipment access, ease of maintenance, utility connection locations, unit electrical requirements, noise considerations, unit performance, and similar concerns.
- 3. Redesign shall be done by the Contractor and shall meet the requirements and have the approval of the Architect/Engineer prior to beginning work. Apply for and obtain all permits and regulatory approvals.
- C . Construction Modifications: Provide all required construction modifications to accommodate the substituted products; this includes all mechanical, plumbing, controls, fire protection, electrical, structural, and general building construction. Construction modification shall comply with code, specifications, and be equal to designed construction.
- D. Costs: Cost of redesign, construction costs, and all additional costs incurred to accommodate substituted equipment shall be borne by the Contractor.
- E. Submittals: In addition to other required submittals, submit shop drawings showing the redesign for substituted equipment; submittal shall include installation plans and sections, connecting services (i.e. ducts, piping, electrical) locations and routing, required service

clearances, and related installation details. Submit data required by other disciplines to allow review of the impact of the substitution (i.e. weights, electrical).

#### 1.6 QUALITY ASSURANCE

- A . Experience: All work shall be performed by individuals experienced and knowledgeable in the work they are performing, and experienced with the same type of systems and building type as this project. By virtue of submitting a bid, the Contractor is acknowledging that workers to be utilized on this project have such experience and knowledge. Upon request of the Engineer, submit resumes showing the work history, training, and types of projects worked on, for individuals assigned to this project.
- B. Code: Utilize workers experienced and knowledgeable with codes pertaining to their work; verify code compliance through-out the project.
- C . ASME: All pressure vessels, pressure vessel safety devices, and pressure vessel appurtenances shall comply with the standards of, and bear the stamp of ASME.
- D . Quality Assurance Checks: Prior to ordering products and making submittals, confirm the following for each:
  - General: Product is suitable for the intended purpose and complies with the Contract Documents.
  - 2. Manufacturer: Product's manufacturer is listed as an acceptable manufacturer in the Contract Document's or a substitution request (where allowed) has been submitted and the manufacturer has been listed as acceptable.
  - Electrical (for products requiring electrical power):
    - a. Product is for use with the voltage/phase as indicated on the electrical plans (or for the electrical circuit the item will be connected to).
    - b. Product's ampacity requirements (MCA) do not exceed that indicated on the electrical plans (or for the electrical circuit the item will be connected to).
    - c. Where product is a replacement for an existing product, and is to be re-connected to an existing circuit, the existing voltage/phase has been field verified and product matches voltage/phase available.
  - 4. Weight: Product's weight is no greater than that indicated.
  - Space Verification: Product will fit in the space available, and along the path available to install the item, will have adequate service clearances, and will not impede on any clearances required for other items in the space the item will be located.
  - 6. Installation: A suitable method for installing the product has been selected which meets the project schedule and other requirements.
  - 7. Anchorage/Support: The manufacturers recommended method of anchorage and support is consistent with the method indicated in the Contract Documents, and the item has provisions suitable for such anchorage/support.
  - 8. Lead Time: The product's fabrication, shipping, and delivery period meets the project schedule requirements.
  - 9. Substituted Equipment: Where equipment is not the basis of design confirm all requirements for substituted equipment have been met and shop drawings of construction revisions have been (or are being) prepared.

- Controls: Item is compatible with the controls it will be connected to and has been coordinated with the firm providing the project control work to provide the specified (or required) sequence of operation.
- 11. Listing: Item is Listed when required to be as such. And if the item is to be installed as part of a Listed system or assembly, it is compliant with the Listing of the overall system or assembly.
- 12. Existing Buildings/Systems: Product size, weight, connecting services (i.e. electrical, controls, power, plumbing, etc.) are configured and suitable for existing items they connect to or interface with.
- E . Check-Out: The Contractor shall be responsible to verify that proper installation and proper connections have been provided for all mechanical work. Contractor shall provide installation checkout, start-up services, and perform a thorough check of all mechanical systems to verify proper installation and operation. Contractor shall operate all items multiple times under varying conditions to confirm proper operation. Contractor shall submit a checklist listing all equipment, fixtures, and similar items furnished on this project, with a date and initials indicating when the item was checked, a list of what was checked, and by whom. Such check shall, as a minimum utilize documents provided by the equipment manufacturer. Such a check-out is in addition to any commissioning activities specified (unless noted otherwise).

#### 1.7 SUBMITTALS

#### A. General:

- 1. See Division 00 and 01 for submittal requirements.
- By making a submittal (of shop drawings or product data) the Contractor represents that
  they have reviewed them for compliance with the Contract Documents, including
  detailed connection and installation features and requirements, and that the submitted
  item is their proposed method of compliance with the Contract Documents.
- 3. Perform no portion of the work for which the Contract Documents require a submittal until the respective submittal has been made, the review completed by the Architect/Engineer, and all issues resolved.
- 4. The Owner and Architect/Engineer are depending on the submittal process as a final review and confirmation of materials and various aspects of the work, and may make changes in the project due to information contained in the submittals and with the understanding that the opportunity to make changes exist until submittals are made and the review is completed. The Contractor is responsible for added costs which may be incurred if work is performed which limits the Owner the opportunity to make such changes (e.g. work done prior to a submittal being made or the submittal review being completed).
- 5. Submittals shall be logically organized, neat and legible. Submittals to include:
  - a. Name of project.
  - b. Owner's name.
  - c. Specification section reference and paragraph (or drawing number or detail) submittal is for.
  - d. Contractor name and contact information.
  - e. Subcontractor name and contact information.

f. Date of submittal.

- Electronic Files: Submittals that are sent electronically shall have a separate .pdf file
  corresponding to the each specification section. Files shall be named with the
  specification number and title.
- B. Quality Assurance: By submitting an item for review, the Contractor is claiming that all "Quality Assurance Checks" (see paragraph 1.06 this specification Section) have been performed and satisfactorily passed and no further comment from the submittal reviewer is required for the "Quality Assurance Checks".
- C . Variations: Only variations that are specifically identified as described herein will be considered. Provide with the submittal (in addition to other information required): description of the proposed variation, entity who is proposing the variation, why the variation is being proposed, any cost changes associated with the variation, and any other pertinent data to allow for review. Failure to submit information on the variation as described will result in the submittal review being conducted without considering the variation.
- D. Product Submittals Information Required:
  - Manufacturer's professionally developed documents, containing product description, model number, and illustrations. Mark clearly to identify pertinent information and exact model and configuration being submitted.
  - 2. List of accessories and options provided with product.
  - 3. Product dimensions and clearances required.
  - 4. Product weight.
  - 5. Submittal identified with product name and symbol (as shown on the drawings or written in the specifications) and specification Section and paragraph reference.
  - 6. Performance capacity and characteristics showing compliance with the Contract Documents.
  - 7. Manufacturer's and local manufacturer's representative names, addresses, and phone numbers.
  - 8. For equipment requiring piping or duct connections:
    - Type of connections required.
    - Size and locations of connections.
  - 9. For electrically operated equipment:
    - a. Number and locations of electrical service connections required.
    - b. Voltage required.
    - c. Fuse or circuit breaker protection requirements.
    - d. Motor starter requirements; if motor starter is furnished with the equipment, submit product information on motor starter.
  - 10. For equipment requiring control connections:
    - a. Type of control signals required.
    - b. Control communication protocol.
    - c. Information on control devices furnished with equipment.
    - d. Location of control connections.
  - 11. Manufacturer's installation instructions.

- 12. See each specification Section for additional submittal requirements.
- 13. Edited Content: Submittals shall indicate the equipment and options that are to be provided. Copies of an unedited catalog will be rejected. Pages/items that are not applicable shall be deleted prior to submittal to the Engineer.

### E. Shop Drawing Submittals:

- Shop drawings shall be professionally drafted using AutoCAD, Revit, or an equivalent compatible program (hand sketches are not acceptable). Shop drawings shall be independently developed by the Contractor and not be a copy of the Contract Drawings.
- Submit electronic files in original drafting format (i.e. \*.dwg) and pdf format with as-built documentation.
- 3. Provide shop drawings for the following systems:
  - a. Fire suppression systems.
  - b. VRF system refrigerant piping.
  - c. Condensate piping.
  - d. HVAC control systems.
  - e. For any parts of any system which are to be installed differently than as shown on the drawings.
  - f. Construction revisions to accommodate Substituted Equipment.
  - g. Other areas/work as noted in the Contract Documents.
- F . For those systems requiring shop drawings, reference system's specification Section for additional requirements.
- G . Re-Submittals: If submittals are marked 'Rejected' or 'Revise and Resubmit', the Contractor shall revise the submittal to satisfy the comments or conform to project requirements, and submit to the Engineer for review. Only those items that were rejected or required a resubmittal will be reviewed by the Engineer; All other items will not be reviewed. All resubmittals shall be at least one of the following:
  - Provide a 'Re-Submittal Summary Sheet' which indicates how each comment was addressed (it is acceptable to add the responses to a copy of the original submittal review comments).
  - 2. Cloud (or otherwise clearly identify) the revised portions to indicate what is different from the original submittal.

### 1.8 SCHEDULE OF VALUES

- A. Breakdown: Provide schedule of values for the following categories (as a minimum); provide a materials and labor breakdown for each category.
  - 1. Mobilization.
  - 2. General Project Management, General Design, General Coordination, Submittals.
  - 3. Insulation.
  - 4. Plumbing:
    - a. Underground.
    - b. Aboveground.

- c. Fixtures and Trim.
- 5. HVAC System:
  - a. Equipment.
  - b. HVAC Ductwork and Accessories.
- 6. Controls:
  - a. Engineering and shop drawings.
  - b. Rough-in.
  - c. Trim.
  - d. Programming.
- Balancing.
- 8. Commissioning.
- 9. O&M Manual, Record Data.
- 10. Punchlist, Closeout, Owner Training.
- B. Closeout: The dollar value for "Punchlist, Closeout, and Owner Training" shall in no case be less than 5% of the total dollar value of the mechanical work.
- C . Proof of Operation: In addition to payments held out for retainage and project final completion as specified above and in Division 01, the Owner reserves the right to withhold a percentage of the funds for any of the above categories until the systems (of that category) have been proven to operate as specified and have been completely tested, adjusted, commissioned, and balanced.

#### 1.9 RECORD DOCUMENTS

- A . Field Record Drawings: Maintain a set of full size contract plans at the project site upon which all changes from the as-bid plans are noted. Plans shall be maintained clean, dry and legible; with information recorded concurrent with construction progress. These plans shall also include actual locations (with dimensions) of all underground and concealed mechanical systems. Connection points to outside utilities shall be located by field measurements and so noted on these record drawings. All addenda, change order, field orders, design clarifications, request for information, and all other clarifications and revisions to the plans shall also be made a part of these record drawings. Plans shall be available for weekly review by the Architect/Engineer. Label drawing "As-Builts" with date, name of Contractor, and name of individual overseeing the work.
- B. Final Field Record Drawings Submittal: Deliver to the Architect/Engineer the original Field Record drawings and one full size copy (may be scanned, and submitted in PDF format).

# 1.10 PRODUCT HANDLING, PROTECTION AND MAINTENANCE

#### A. Protection:

- 1. Protect all products from contamination, becoming unclean, and from damage of any kind and whatever cause; when being handled, in storage, and while installed, until final project acceptance.
- 2. Completely cover fixtures, motors, control panels, equipment, and similar items to protect from becoming unclean and damage of any kind.
- 3. Protect premises and work of other trades from damage due to Mechanical work.

- B. Openings: Cap all openings in pipe, ductwork and equipment to protect against entry of foreign matter until all work that could cause unclean conditions or damage is complete (including work that has dust or fumes associated with it). Caps shall be of sufficient strength and seal integrity to prevent entry of water or fumes for the most extreme conditions they may be exposed to (i.e. high velocity water spray, high winds, concrete splash, etc.)
- C . Storage: Provide properly conditioned and sheltered storage facilities for products to prevent damage of any kind and to maintain new condition. Provide adequate venting arrangements to avoid condensation damage.

### D. Operation and Maintenance:

- General: Inspect products periodically to confirm conditions and maintenance needs.
  Keep records of inspections and (upon request) forward to the Architect/Engineer prior
  to project final acceptance. Operation and Maintenance shall be in accordance with
  manufacturer's written procedures and recognized best maintenance practices. Keep
  records of maintenance and (upon request) forward to the Architect/Engineer prior to
  project final acceptance.
- 2. Stored Products: Provide maintenance (i.e. equipment rotation, lubrication, flush, cleaning, etc.) and inspection on products while stored to maintain new condition.
- 3. Installed Products: Provide maintenance and inspection of products and operate mechanical systems until substantial completion or specified Owner Instruction has been provided (whichever is later). Maintenance shall include all labor and materials and all manufacturers' recommended maintenance (i.e. strainer cleaning, filter changes, bearing lubrication, belt tensioning, etc.). In addition to scheduled maintenance, review all equipment periodically to allow detection of improper operation or any special maintenance needs; review shall be consistent with best practices for the product but in no case less than a site visit every two weeks. Document all maintenance activities.
- E . Damaged Products: Damaged products shall be replaced with new. Where damage is limited to paint (or similar finish), the product may remain if the finish is restored to a new condition (as judged by the Architect/Engineer).

### 1.11 JOB CONDITIONS

### A. Special Requirements:

- 1. Maintain emergency and service entrance usable to pedestrian and vehicle traffic at all times. Where trenches are cut, provide adequate bridging for traffic.
- 2. Coordinate startup and shutdown of all mechanical systems and utilities with related trades and the Owner's representative.
- Coordinate all construction activities with the Owner's Representative and cooperate fully so as to minimize conflicts and to facilitate Owner usage of the premises during construction.
- 4. Provide temporary services to occupied areas to accommodate Owner's use during construction. All temporary work shall comply with same specifications as for new work and be of same quality.

### B. Downtime Restrictions:

 Contractor shall notify the Owner at least 72 hours in advance of any intended shutdown of any building services or systems and obtain Owner approval prior to proceeding.

- Electrical power to the building shall not be interrupted at any one time for more than 15 minutes.
- C . Schedule of Work: Arrange work to comply with schedule of construction, and so as not to violate any downtime restrictions, and to accommodate the Owner's scheduled use of the premises during construction.

## 1.12 ENGINEER FIELD REVIEWS AND TEST WITNESSING

- A . General: Arrange construction schedule and notifications to the Engineer to accommodate Engineer's schedule and the possibility of review times occurring up to 14 days after notification, and for the possible failure to satisfactorily pass Engineer's reviews requiring revisions and re-reviews.
- B. Notification: Notify Engineer at least 7 days in advance of readiness for reviews; arrange mutually agreed upon times for the reviews to occur.
- C . Access: Provide ladders, any special tools and safety equipment to allow Engineer's access to areas and equipment. Remove and reinstall ceiling tiles, access panels, and similar items where requested to allow for reviews.
- D. Review of Systems with Equipment:
  - 1. Prior to Engineer's review, system's equipment shall have received specified start-up and be substantiated by a written report.
  - 2. Prior to Engineer's review, systems shall have been operating properly for at least five consecutive days prior to the scheduled review date.
  - 3. Personnel shall be present to operate the system's equipment and controls, and to vary system settings as directed by the Engineer to allow for a review of operation over a range of settings.
- E . Re-Review Fees: The project budget allows for one review by the Engineer for specified reviews and witnessing. The Engineer shall be compensated for additional reviews required due to failed work or failed tests; such compensation will include travel time and mileage and be billed at the Engineer's current billing rates. See Division 00 and 01 for additional information.

### 1.13 REFERENCES

A. ASME A13.1: Scheme for the Identification of Piping Systems.

## PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

A . General: Any reference in the Specifications or on the Drawings to any article, device, product, material, fixture, form or type of construction by manufacturer, name, make, model number, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The manufacturers listed as Acceptable Manufacturers may bid the project for the items indicated without submitting a substitution request; however that does not relieve the products from having to comply with the Contract Documents.

- B. Substitutions: Products by manufacturers listed as "Acceptable Manufacturers" (other than those listed as the "Basis of Design") are considered substitutions and shall comply with the requirements for substitutions. See Paragraph titled "Substitutions" in Part 1 of this specification section.
- C . Considerations: In reviewing a manufacturer for acceptance, factors considered (as compared to the specified item) include: engineering data showing item's capacity, performance, proper local representation of manufacturer, likelihood of manufacturer's future local support of product, service availability, previous installations, previous use by Owner/Engineer/Architect, product quality, availability/quality of maintenance and operation data, electrical requirements, capacity/performance, acoustics, physical dimensions, weight, items geometry and access requirements, utility needs, and similar concerns.
- D. Limitations of the Term "Acceptable Manufacturer": The listing of a manufacturer as an Acceptable Manufacturer does not necessarily mean that the products of that manufacturer are equal to those specified. The listing is only an indication of those manufacturers which have represented themselves as being capable of manufacturing, or have in the past manufactured, items equal to those specified. The burden to review products to confirm equivalency with the specified products is on the Contractor. The Architect/Engineer shall be the final judge as to whether an item is equal to that specified.
- E . Quality: Products provided by Acceptable Manufacturers shall be equal to or superior to the specified manufacturer's item in function, appearance, and quality, and shall fulfill all requirements of the Contract Documents. The Architect/Engineer shall be the judge as to whether an item meets these requirements or not.
- F. Manufacturer: To be considered as being made by a particular manufacturer, the product must be made directly by the manufacturer and have the manufacturer's name (or nameplate with name) affixed to the product (or on the product container where direct labeling is not possible). Example: manufacture "A" is listed as an acceptable manufacture; manufacturer "B" is not listed as an acceptable manufacturer; manufacturer "A" owns "B"; products from "B" do not qualify as being made by an acceptable manufacturer by virtue of ownership.

### 2.2 PRODUCTS - GENERAL

- A . Standard Products: Products shall be standard products of a manufacturer regularly engaged in the manufacture of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two year use shall include applications of equipment and materials under similar circumstances and of similar size. The two year's experience must be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Except that equipment changes made solely to satisfy code requirements, to improve unit efficiency, or to comply with unique project requirements are not required to have two year prior operation.
- B. Latest Design: Products shall be the latest design and version available from the manufacturer, including software. Discontinued products shall not be used.
- C . Service Support: Qualified permanent service organizations for support of the equipment shall be located reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
- D . Manufacturer's Nameplate: Equipment shall have a manufacturer's nameplate bearing the manufacturer's name, address, model number, serial number, and additional information as

required by code. Nameplate shall be securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable. Nameplate shall be of durable construction, easily read, with lettering minimum size 12 font.

- E. Compatibility: All components and materials used shall be compatible to the conditions and materials the items will be exposed to. All items exposed to the weather shall be galvanized, or be of stainless steel or similar corrosion resistant material.
- F . Sizes: Sizes indicated for products manufactured to standardized sizes (e.g. pipe, pipe fittings, valves, material gauges, etc.) are minimums. During bidding confirm that the sizes are available and meet project requirements. Where indicated sizes are not available provide the next larger available size; confirm this larger size will suit the construction and meet Contract Document requirements prior to ordering. Such size revisions are subject to Engineer's review; indicate size revisions on the product submittal and why the size is being revised.
- G . Non-Specified Items: Materials shown on the drawings but not specified shall be provided as shown and as required to suit the application illustrated and intended and shall be of commercial quality, consistent with the quality of similar type items provided on the project. Not all items shown on the drawings necessarily have a corresponding specification; such items shall be provided per this paragraph and so as to provide complete, finished, fully functioning mechanical systems.
- H. Weights: Do not exceed the weights shown unless added structural supports are provided. Such supports shall meet the requirements of the project Structural Engineer. The Contractor shall bear all costs for all redesign and added supports to accommodate heavier equipment. The Contractor shall reimburse the Engineer for all time associated with all review and analyses regarding the use of equipment heavier than that indicated.
- I. Temperature/Pressure Rating: All materials and components furnished shall be suitable for the temperature and pressures they will be exposed to. Contractor shall consider possible operating modes to ensure proper material ratings. Consideration shall include such factors as high temperatures caused by heat transfer from piping, coils, etc. when fans are shut down (e.g., motors, control devices, etc. installed within air handling units or mechanical rooms shall be rated for high temperatures due to such heat gain). Consideration shall include such factors as high temperatures caused by heat transfer from piping, water heaters, etc.
- J. Standardization: All products of the same type shall be by the same manufacturer and have the same characteristics and features to allow for Owner's standardization.
- K. Model Numbers: Any reference to a manufacturer's "model number" is a reference to a manufacturer's series number or type of product, and is not a complete "model number" in having all the necessary numbers/letters to convey all of the features, accessories, and options that are required. These series numbers are only meant to convey a type of product that may meet the project requirements. Where conflicts or discrepancies occur regarding a listed manufacturer's series or "model" number and specified capacities or features, the more stringent and expensive shall prevail.
- L . Application and Suitability: Products shall be designed and intended for: commercial and municipal application, for the use indicated, and be suitable for the operating conditions they will be exposed to. Firms supplying the products shall review the documents and related site and environmental data to confirm compliance. By making product submittals and using products they are being represented as appropriate for the project and application shown.

M. Special Products: Numerous products specified for this project are custom products, and require special and unique construction and features. Such special items may include: finishes, controls, field NRTL (Nationally Recognized Testing Laboratory) re-certification, field evaluations by accredited product testing laboratories for certification for the application, construction, configuration, capacities, accessories, spare parts, warranty, testing, flow rates, application, installation, delivery date, cleaning, etc. Include in bid all costs to provide items meeting all project requirements. Products may reference a manufacturer's series number, but are still special and custom, with the series number identifying only a reference point for the unit manufacturer. The series number is not to be construed as limiting the features or capabilities of the item. Contractor shall review all requirements and all vender quotes to ensure all requirements are being met and to include all costs in bid. No added cost will be paid for failure to include in bid all costs necessary to provide the special, unique, and custom items required.

### 2.3 ELECTRICAL

- A. General: All electrical devices, wiring, products, and work shall comply with the Division 26 specifications and code. See drawings for building occupancy type, types of construction, and areas which may require special wiring methods or other electrical work. Electrical disconnects shall be accessible as required by code, and shall not require removal of screens, equipment, or other items to access.
- B. Equipment: All equipment requiring power shall be factory wired to an equipment mounted junction box (or an accessible compartment with power terminals or electrical device) arranged to allow for connection of electrical power.
- C . Overcurrent protection: Circuit breakers, circuit breaker disconnects, fuses, and other current limiting devices indicated to be provided, shall be rated to suit the maximum overcurrent rating of the item served, and have other ratings, as required by code. Circuit breakers for HVAC and refrigeration unit equipment shall be UL listed by HACR type.
- D. Short Circuit Current Rating (SCCR): All equipment (or components) requiring the use of electrical power shall have a SCCR value to comply with code. The minimum rating shall be 65,000 Amps RMS Symmetrical unless a lower value is indicated on the plans or allowed by code. Where the Contractor wishes to utilize equipment having a lower rating, the Contractor shall be responsible to provide calculations substantiating that a lower SCCR is acceptable (and complies with code), or make revisions to the electrical system to accommodate the proposed equipment (or components).
- E . Product Certification (Listing): Products which require connection to electrical power shall be certified (i.e. listed) by a Nationally Recognized Testing Laboratory (NRTL) and be labeled (in a conspicuous place) with such certification (or certification mark). Certification shall comply with code, OSHA Standards, and Authority Having Jurisdiction (AHJ) requirements. NRTL's shall be recognized as such by OSHA and the AHJ. Certification shall be for the complete assembly (approval of individual components is not acceptable). Field evaluations to obtain certification shall be performed by accredited product testing laboratories acceptable to the AHJ and Engineer, be performed in accordance with code, NFPA 791, recognized practices, and be labeled to identify the certification. Certification is not required where the AHJ does not require it.
- F. Power Restart: All equipment, components and systems shall be configured to automatically restart upon restoration of power after a power failure (i.e. either generator power, UPS power, or utility power); unless specifically noted otherwise or required for safety reason to require manual restart. Provide staged restart as required by the control sequences or for proper generator operation or system operation.

## 2.4 MOTORS

- A . General: Where a piece of equipment specified includes an electric motor, the motor shall be factory installed and mounted. Motor starters and motor electrical disconnect switches shall be provided by the Contractor doing the work of the Section where the item was specified, unless specifically shown to be provided by Division 26 (or another Division). Wiring from the motor to motor starters and to electrical disconnects shall be by the Contractor doing the work of the Section where the item was specified, unless specifically shown to be provided by Division 26.
- B. Acceptable Manufacturers: General Electric, TECO-Westinghouse, Reliance, Gould, Century, Baldor, U.S. Motors, Marathon, and acceptable manufacturers for the equipment (see individual specification sections).
- C . Type: Motor type shall comply with code and applicable standard requirements and be configured to suit the application. Motors located indoors shall be open frame, drip-proof type, unless indicated otherwise. Motors located outdoors exposed to weather shall have corrosion resistant finish and shall be totally enclosed fan cooled (TEFC) or totally enclosed non-ventilated (TENV) type, unless indicated otherwise.
- D. Listing: All motors shall be UL listed.
- E . Efficiency: Motor efficiencies shall comply with code. Fractional horsepower motors shall be the electronically commutated (EC) type with speed control where noted and where non-EC motors are not available which comply with code efficiency requirements. Motor power factor shall comply with code, local utility requirements, and as indicated. Provide added power factor correction devices as necessary to comply.
- F . Sizing: Motors shall not be smaller than indicated and of adequate size to start and drive the respective equipment when handling the quantities specified without exceeding the nameplate full load current at the conditions indicated and for the expected operating conditions. If it becomes evident that a motor furnished is too small to meet these requirements as a result of the Contractor using substituted equipment or having revised the system arrangement, the Contractor shall replace it with a motor of adequate size at no additional cost to the Owner. Contractor shall also arrange with the Electrical Contractor to increase the size of the wiring, motor starter and other accessories as required to serve the larger motor at no additional cost to the Owner.
- G. Service Factor: Minimum 1.15.
- H. Variable Frequency Drive (VFD) Applications: Motors used with Variable Frequency Drives (VFD's) shall be rated for such use per IEEE standards and have shaft grounding protection.
- I. EC Motors (ECM):
  - General: Electronically commutated type with integral inverter to convert AC power (of voltage/phase indicated) to DC power, and solid state circuitry to vary output power and speed of motor. Motor shall have permanently lubricated bearings with an L10 life of 100,000 hours at expected operating conditions. Motor shall have rotor position and rotation detection as required for operation.
  - 2. Speed Range: Motor speed shall be controllable down to 25% of full speed.
  - 3. Manual Speed Control: Provide with manual speed adjustment dial for motor speed control. Dial shall be motor mounted unless indicated otherwise, operable by a screwdriver or by hand. Motor mounted controls shall be factory wired. Remote mount dials shall be hand operable (i.e. no tools required), shall be for mounting on a standard

- 2 x 4 electrical junction box, and be able to be located up to 100 feet remote from the motor. Motor control wiring for remote mount dials shall be factory wired from the motor to an equipment mounted junction box (with field supplied wiring from this J-box to the remote dial).
- 4. EMCS Control: Motor speed shall be adjustable via a remote 0-10V input signal (unless noted otherwise) from the building EMCS. Control wiring shall be factory wired from the motor to an equipment mounted junction box. EMCS control is not required where not indicated to be provided or where not utilized as part of the control sequence.
- 5. Control Power: Provide with integral transformer, factory wired, as needed to power motor controls. Locate transformer at motor or equipment.

#### 2.5 IDENTIFICATION AND LABELS

A . General: All piping, valves, and mechanical equipment shall be labeled. Labels in concealed accessible spaces shall be reviewed and verified by Architect/Engineer prior to being concealed.

### B. Piping:

- Type: Self-sticking colored identification markers, lettered to identify the pipe contents, and banded at each end with arrow tape indicating the direction of flow. Markers shall be similar and equal to Brady "System 1" and Seton "Opti-Code" markers. Spray painted stencil labeling is not acceptable. Some labels may be special order.
- 2. Identification Colors: Comply with ASME A13.1, and as follows:

Conveyed Material/System	<u>Background</u>	<u>Letters</u>
Potable Water	Green	White
Refrigeration	Black	White
Waste/Vent	Gray	White
Non-Potable Water	Yellow	Black

- 3. Lettering: Lettering shall identify the material conveyed in each pipe and shall match the designation used on the plans, but without abbreviations. Systems which have supply and return piping shall have piping labeled as such (i.e. heating water return, heating water supply, etc.). Systems that have different pressures shall be labeled to indicate such (i.e. Steam-Low Pressure, Steam- Medium Pressure, Natural Gas-Low Pressure, Natural Gas-Medium Pressure, etc.).
- Size: Size of letters and color field shall comply with ASME A13.1, repeated here for convenience:

Outside Diameter of	Length of	
Pipe or Covering	Color Field	Size of Letters
3/4 to 1-1/4 Inches	8 Inches	1/2 Inches
1-1/2 to 2 Inches	8 Inches	3/4 Inches
2-1/2 to 6 Inches	12 Inches	1-1/4 Inches
8 to 10 Inches	24 Inches	2-1/2 Inches
Over 10 Inches	32 Inches	3-1/2 Inches

5. Applications: Install on all exposed piping adjacent to each shut-off valve, at branches to indicate changes of direction, where pipes pass through walls and floors, on 20 foot centers or at least one in each room on each pipe. Markers shall be installed on all concealed accessible piping (i.e., piping above suspended ceilings, behind access doors, in accessible chases, etc.) near the point of access. For piping above suspended ceilings, markers shall be installed the same as if the piping was exposed (i.e., same as if the suspended ceiling was not in place). Markers shall be installed so

- as to be easily read by a person standing on the floor. Provide additional flow arrows at each pipe connection at valves having more than 2 ports (i.e. 3-way control valves).
- Other Requirements: See other specification Sections for additional requirements.

## C. Equipment:

- Labels: Laminated plastic (or phenolic) material, 1/16-inch thick, with black surface layer and white (unless other color indicated) sub-layer, with engraving through to expose white sub-layer. Minimum 2-inch high (unless indicated otherwise or required due to equipment size) with length to contain required lettering. Label shall be predrilled and be mechanically fastened to the equipment. Prior to making labels, submit a list of all proposed labels.
- 2. Lettering: All caps, engraved on label, with equipment designation (same designation as used on Contract Drawings; e.g. HVAC-101, EF-22, CP-1A). Air handling equipment (i.e. VAV terminal units, fans, etc.) labels shall include the room names and numbers or area of building served (use final installed room designations). Where systems serve portions of the building (i.e. wings or floors), include on label the area served. Lettering shall be in multiple rows, with equipment label on top row. Equipment lettering to be 5/8-inch high; area served lettering to be 3/8-inch high (except that smaller lettering may be used if necessary to fit label size).
- 3. Application: All scheduled mechanical equipment shall be labeled. The label shall be located on a side of the equipment so as to be easily read, with the marking visible to a person standing at the access level near the equipment (assuming any necessary access to a concealed unit has been made).

### D. Electrical Devices:

- Labels: Minimum 1/4-inch high (unless indicated otherwise) lettering, all caps, engraved on laminated plastic or phenolic material, at least 1/16-inch thick. Laminated plastic (or phenolic) shall have black surface layer and white (unless other color indicated) sub-layer, with engraving through to expose white sub-layer. Label shall be pre-drilled and be mechanically fastened to the item; where mechanical fastening is not possible use 3M VHB double sided specialty tape No. 4945. Prior to making labels, submit a list of all proposed labels.
- 2. Lettering: Label shall identify the item served (using the same designation as indicated on the Contract Drawings), the source of power (by panel and circuit breaker), and comply with code.
- 3. Application: Variable frequency drives, motor starters, disconnects, contactors, relays and similar items which control power to equipment and system components shall be labeled. The label shall be located so as to be easily read. See Division 25 for labeling of low voltage control components.

# E. Duct Access Doors:

- Labels: Minimum 1-inch high (unless indicated otherwise) lettering, engraved on laminated plastic or phenolic material, at least 1/16th inch thick. Laminated plastic (or phenolic) shall have red surface layer and white (unless other color indicated) sublayer, with engraving through to expose white sub-layer. Label shall be pre-drilled and be mechanically fastened to the duct access door. In lieu of laminate type, selfadhesive vinyl signs may be used.
- 2. Lettering: Label shall comply with code, and indicate the item being accessed (i.e. Fire/Smoke Damper, Fire Damper, CO2 Sensor, etc.). Labels shall include the room names and numbers or area of building served; use final installed room designations.

- 3. Application: All duct access doors serving fire dampers, fire/smoke dampers, smoke dampers, control dampers, items required by code, and control devices shall be labeled. Where these items are provided under Division 26, they shall be labeled by Division 26. Access door label is not required where it is readily obvious as to what is being accessed (e.g. duct coil where coil is easily seen). The label shall be located so as to be easily read, with the marking visible to a person standing at the access level near the access door (assuming any necessary access to a concealed label has been made).
- G . Concealed Items: Equipment, valves, dampers and similar items concealed above accessible ceilings shall have the ceiling marked below the item to identify the item and its location. The marking system shall consist of printed labels made by a professional labeling machine, black lettering on clear self sticking tape, with minimum 1/2-inch high lettering using Arial font. Apply labels to ceiling grid below concealed item. Labels shall identify equipment using the same designation indicated on the plans; valves shall be identified by size and system (e.g. EF-1, VAV-101, VALVE 4" CW). Prior to making labels, submit a list of all proposed labels.

# **PART 3 - EXECUTION**

#### 3.1 GENERAL

- A. Workmanship: Furnish and install products to provide complete and functioning systems with a neat and finished appearance. If, in the judgment of the Architect/Engineer, any portion of the work has not been installed in accordance with the Contract Documents and in a neat workmanlike manner, or has been left in a rough, unfinished manner, the Contractor shall be required to revise the work so that it complies with the Contract Documents, at no increase in cost to the Owner.
- B. Coordination: Coordinate the work with all trades that may be affected by the work to avoid conflicts, allow proper maintenance access, provide required clearances, and to allow for an organized and efficient installation of all systems.
- C . Submittals: Perform no portion of the work for which the Contract Documents require a submittal until the respective submittal has been made, the review completed by the Architect/Engineer, and all issues resolved.
- D. Examination and Preparation: Examine installation conditions and verify they are proper and ready for the work to proceed. Verify compatibility of materials in contact with other materials, and suitability for conditions they will be exposed to. Do not proceed with the work until unsatisfactory conditions have been corrected. Prepare area to accept the work and prepare products for the installation.
- E . Field Conditions: Check field conditions and verify all measurements and relationships indicated on the drawings before proceeding with any work. In verifying existing conditions, the Contractor shall verify by direct physical inspection, complete tracing out of systems, by applying test pressures, by excavation and inspection, use of pipeline cameras, and other suitable absolute certain methods to confirm the actual physical conditions that exist.
- F. Openings and Cutting and Patching in New Construction:
  - Openings General: The General Contractor shall provide all required spaces and provisions in structures of new construction for the installation of work of all other contractors or subcontractors.

- Coordination: The Contractors doing work subject to Division 20 shall furnish to the General Contractor (in a timely manner) all needed dimensions and locations of openings to allow for these openings to be provided as the construction adjacent to the opening is being done.
- 3. Cutting and Patching: Cutting and patching of structures in place made necessary to admit work, repair defective work, or by neglect of contractors and subcontractors to properly anticipate their requirements, shall be done by the General Contractor at the expense of the contractors or subcontractors responsible. Work shall be done in a fashion to duplicate the results that would have been obtained had the work been properly sequenced.
- 4. Patching Materials: Patching shall be with materials of like kind and quality of the adjoining surface by skilled labor experienced in that particular trade.
- G. Openings and Cutting and Patching in Existing Construction:
  - Openings--General: Provide all openings and cutting as needed to accommodate all
    work. Provide patching to restore all damaged and disturbed areas to pre-construction
    conditions (or better). The Contractor or subcontractor requiring the opening shall be
    responsible for making that opening. The opening shall be made by skilled labor
    experienced in providing openings in the material being penetrated.
  - 2. Areas To Be Cut and Patched: Wherever floors, walls, ceilings, plates, firestops and framing members are cut, these openings shall be substantially reinforced and sealed so as to maintain the strength and sealing ability of the element equal to that as if it had not been cut. All reinforcement/sealing shall satisfy the Architect/Engineer and comply with the governing codes. Such cut areas shall be patched and restored to a finished condition, equal to adjacent final finished areas that have not been cut.
  - 3. Cutting of Structural Features: Make no cuts or alterations to any structural framing members without explicit consent of the Engineer, and then only under his direction. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. All required cutting to install material shall be accomplished with the use of saw cutting equipment.
  - 4. Patching Materials: Patching shall be with materials of like kind and quality of the adjoining surface by skilled labor experienced in that particular trade.
- H. Cleaning: Clean all products (whether exposed to view or not) of all construction debris, and other materials; grease and oil spots shall be removed with appropriate cleaning agents and surfaces carefully wiped clean. Where cleaning cannot restore items to new conditions, the item shall be replaced with new.
- I. Site Work: All trenching, backfilling, compacting, and similar groundwork for utilities shall comply with specification, code, manufacturer, best construction practices, and WSDOT Standard Specifications for Road, Bridge, and Municipal Construction. Provide minimum 6-inch deep sand bedding, minimum 6-inch thick surrounding sand backfill, and 6-inch deep compacted backfill at buried items, unless noted otherwise or required otherwise. Washed 3/8-inch minus pea gravel may be used where allowed by product manufacturer and code. Subsequent backfill shall be in 6-inch lifts, and be compacted to 95% maximum density. Backfill material (above initial 6-inch sand) shall be free of organic material, and rocks larger than 3-inches in any direction.

# 3.2 INSTALLATION

A . General: Work shall be in accordance with manufacturer's written installation instructions, code, applicable standards, and best construction practices.

B . Space Verification: Prior to ordering materials verify that adequate space exists to accept the products, along the installation path, and to allow for proper maintenance access. Select products that will fit the space available; some optional materials (i.e. valve types, fitting types, substitutes manufacturer's etc.) may not be suitable. Verification shall be by direct field measurement of the actual space available and use of manufacturer's final submittal dimensions. Where the project involves new construction and long lead items and a time schedule not allowing for such direct field measurements, confirm in writing with all trades associated with building the space that adequate room is available. Review maintenance and service access space required and confirm requirements will be met. No submittals shall be made until such space verification work has been performed, and confirmed that adequate space is available. By virtue of making a submittal that Contractor affirms he has completed this verification.

### C . Installation Locations:

- 1. General: Unless dimensioned locations for items are shown, select the precise location of the item in accordance with the Contract Documents, coordinated with other trades and item connection locations, and subject to the Architect/Engineer's review. No allowances will be granted for failure to obtain the Architect/Engineer's review, failure to coordinate the work, and failure to comply with Contract Document requirements.
- 2. Manually Operated Components: Valves, damper operators, on/off switches, keypads, controls, and other devices which are manually adjustable or operated shall be located so as to be easily accessible by a person standing on the floor adjacent to the item. Any such items which are not in the open shall be made accessible through access doors in the building construction. See individual specification sections for additional requirements.
- 3. Monitoring Components: Gauges, thermometers, instrumentation, and other components which display visual information (i.e. operating conditions, alarms, etc.), shall be located and oriented so as to be easily read by a person standing on the floor. Provide necessary brackets, hangers, remote read devices and accessories as needed. Equipment control panels and graphic displays furnished with equipment (or integral to equipment) shall be located to be easily accessible by a person standing on the floor adjacent to the equipment, and be located between 4-feet and 6-feet above the finished floor.
- 4. Installation Issues: If circumstances at a particular location make the accessible installation of an item difficult or inconvenient, the situation shall be discussed with the Architect/Engineer before installing the item in a location that will result in poor access.
- ADA Accessibility: Locate items which are required to be ADA accessible in accordance with code (including but not limited to IBC, ICC A117.1 and local amendments) for accessibility; verify accessibility requirements with the AHJ.
- D . Replacement and Maintenance: Install mechanical equipment to permit easy access for normal maintenance, and so that parts requiring periodic replacement or maintenance (e.g. coils, heat exchanger bundles, sheaves, filters, bearings, etc.) can be removed. Relocate items which interfere with access or revise item installation location, orientation, or means of access.

# E. Building Access Doors:

 Access doors are typically not shown on the drawings; provide where indicated and where needed to provide access to valves, drains, duct access doors, equipment, control devices, dampers, and similar items requiring service or access that would otherwise be inaccessible. Provide access doors to allow for the future removal of items that would require the removal of permanent building construction (i.e. GWB ceilings, GWB walls, concrete construction, etc.)

- Select size, quantity, and locations of access doors. Review all drawings, construction materials, and work of other trades in determining access door requirements.
- 3. Developed dimensioned locations where needed for use by other trades or for coordination purposes.
- 4. Coordinate access door locations, size, and details with other trades.
- F. Rotating Parts: Belts, pulleys, couplings, projecting setscrews, keys and other rotating parts which may pose a danger to personnel shall be fully enclosed or guarded in accordance with Code, and so as not to present a safety hazard.

# G. Equipment Pads:

- 1. Outdoors At Grade:
  - a. General: All ground mounted mechanical equipment shall be installed on a concrete pad (unless indicated otherwise). Pad shall be minimum 4-inch thick, minimum 4" wider than the equipment all around. Set pad on minimum 6-inch gravel base, compacted to 95% density. Concrete shall be same as used for building footings (unless noted otherwise) and be placed in accordance with ACI standards.
  - b. Where the largest dimension for any pad exceeds 4 feet or the equipment exceeds 300 lbs, provide pad with welded wire fabric (6-inch x 6-inch, No. 6), centered in pad.
  - c. Where the largest dimension for the pad exceeds 6 feet or the equipment weight exceeds 400 lbs, see structural drawings.
  - d. Where the largest dimension exceeds 8 feet or the equipment weight exceeds 500 lbs see structural drawings.
  - e. Freeze Protection: Where project location is subject to freezing water below the bottom of the pad depth, provide thickened perimeter edge to frost depth (unless written direction from a structural engineer or the soils report does not require such depth).
- 2. Indoors: All base mounted mechanical equipment shall be installed on a concrete pad (unless indicated otherwise). Pad shall be minimum 4-inch thick, minimum 4" wider than the equipment all around, with pad anchored to building structure. See structural drawings for pad details. Where the largest dimension for any pad exceeds 4 feet or exceeds 300 lbs, provide pad with welded wire fabric (6-inch x 6-inch, No. 6), centered in pad. For equipment larger than 6 feet in any direction or weighing more than 400 pounds see structural drawings.
- H. Dissimilar Metals: Provide separations between all dissimilar metals. Where not specified in another way, use 10 mil plastic tape wrapped at point of contact or plastic centering inserts.
- I. Electrical Offsets: Provide offsets around all electrical panels (and similar electrical equipment) to maintain space clear above and below electrical panels to structure, and clearance of 3.5 feet directly in front of panel, except where indicated otherwise or required by code to be more. Such required offsets are typically not shown on the plans but are to be provided per this paragraph. Include in bid offsets for all systems near electrical panels.
- J. Piping Through Framing: Piping through framing shall be installed in the approximate center of the member. Where located such that nails or screws are likely to damage the pipe, a steel plate at least 1/16-inch thick shall be installed to provide protection. At metal framing, wrap piping to prevent contact of dissimilar metals. At metal and wood framing, provide

plastic pipe insulators at piping penetrations through framing nearest each equipment connection and on at least 32-inch centers.

- K . Safety Protection: All ductwork, piping and related items installed by this Contractor that present a safety hazard (i.e., items installed at/near head height, items projecting into maintenance access paths, etc.) shall be covered (at hazardous area) with 3/4" thick elastomeric insulation and reflective red/white self-sticking safety tape. All sharp corners on supports and other installed items shall be ground smooth.
- L . Equipment Access: Access to equipment is of utmost importance. Contractor shall apply extra attention to the location of pipe and duct routings and in coordinating all work so that equipment access and a clear maintenance pathway to equipment is maintained. Poor maintenance access will not be accepted. Contractor shall note that in essentially all areas piping and ducts need to run with slopes parallel to the roof (or floor above), in necessitating elbows/fittings/transitions at crosses of ducts/pipes and at all connections to mains and branches; and requiring added fittings to maintain a clear walking path.
- M . Pressure Tests: Maintain documentation of all pressure (and leakage) tests performed on systems and submit with project closeout documents. Records shall contain (as a minimum): date of test, system name, description portion of system being tested, method of test, initial and final test pressures (or of measured leakage rates, as applicable), indication of test pass or fail, name and signature of individual performing (or documenting) the test, initials of independent witness of test.

#### 3.3 PAINTING

- A. General: Painting shall comply with Division 09 specifications regarding painting. Colors, in all cases, shall be as selected by the Architect/Engineer. Color samples shall be submitted to the Architect/Engineer for approval prior to painting.
- B. The following painting shall be provided under Division 20:
  - 1. All exposed metallic surfaces (includes piping, ducts, hangers, conduits, etc.) provided by this Contractor (except equipment with factory finish or items specifically excluded) shall receive one coat of rust inhibiting primer and two (2) coats of selected finish paint.
  - All exposed insulated surfaces provided by this Contractor (except where specifically excluded) shall receive one coat of primer and two coats of selected finish paint.
  - 3. The inside of all ductwork (including visible dampers, roof vents, insulation pins, and any visible metal) behind grilles, registers, diffusers, and louvers shall be painted flat black.
- C. Items to be painted under Division 09:
  - Exposed duct work in finished areas.
  - 2. Exterior mechanical equipment.
  - Exposed piping in finished areas.

### 3.4 PENETRATION PROTECTION

A. Exterior and Watertight Penetrations: Where any work pierces the building exterior (or construction intended to be watertight) the penetration shall be made watertight and weatherproof. Provide all necessary products (e.g. caulking, flashing, screens, gaskets, backing materials, siding, roofing, trim, etc.). Where not detailed or indicated how to install submit shop drawings of the proposed methods. Flashing arrangements shall be per

SMACNA Architectural Sheet Metal Manual unless noted otherwise. Caulking alone is not an acceptable means of sealing penetrations.

- B. Equipment: Equipment or products located outdoors shall be watertight (except for provisions designed to intentionally accept water and having drain provisions) and shall be designed and intended by the manufacturer to be used outdoors at the project location. Where any work pierces the unit casing exposed to the outdoors the penetration shall be made watertight and weatherproof; provide all necessary products (e.g. caulking, flashing, gaskets, backing materials, etc.).
- C . Animal Protection: Mechanical system openings, overhangs, shrouds, coverings, gaps below units, and other elements where animals could enter or occupy shall be protected with screens to prevent animal entry or occupation. Screening shall be installed in a neat professional manner, square to the adjacent construction, and be securely attached with removable fasteners.

## 3.5 START-UP

- A. General: Provide inspections, start-up and operational checks of all mechanical systems and equipment. Maintain documentation of all start-up work and submit with project closeout documents. See individual specification Sections for additional requirements.
- B. Personnel: Inspection and start-up services shall be done by individuals trained in the operation, and knowledgeable with, the systems being started-up. Equipment start-up shall be by the manufacturer's authorized service representative where indicated (see individual specification Sections).
- C . Scheduling and Agenda: Submit a proposed detailed start-up schedule with proposed dates and times at least 30 days prior to the earliest proposed system start-up. Revise dates and times as mutually agreed upon with trades involved, and witnesses, before submitting a final start-up schedule.
- D. Witnessing: Start-up may be witnessed by the Engineer and Owner's representative (at their option). Notify the Engineer and Owner 7 days prior to the proposed start-up time.

## 3.6 OWNER INSTRUCTION

- A . General: Provide instruction to the Owner on the operation and maintenance of all installed mechanical systems.
- B. Personnel: Instruction on the operation and maintenance of products shall be by individuals trained and experienced in the installation, operation and maintenance of these products. Instruction shall be by the product manufacturer's authorized service representative where indicated (see individual specification Sections).
- C . Scheduling and Agenda: Submit a proposed instruction schedule (with proposed dates and times) and an instruction agenda at least 30 days prior to the earliest proposed instruction period. Coordinate Owner and Architect/Engineer review and arrange mutually agreed upon instruction schedule and the instruction agenda, and submit a final instruction schedule and agenda. Organize instruction by sub-systems corresponding to the project specifications (or similar logical grouping).
- D. Instruction: Demonstrate and explain normal start-up, normal shut-down, normal operation, normal settings, adjustments, signs of abnormal operation, emergency shut-down, safety concerns, and related information. Demonstrate and explain system maintenance requirements with references to the O&M Manual. Show how maintenance is performed,

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including how items are accessed, maintenance procedures, tools and parts required, and related information. Review typical repairs and explain how performed.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

### 1.2 WORK INCLUDED

- A. Protection of Items from Damage.
- B. Maintaining Utilities and Building Services.
- C. Cleaning.
- D. Temporary Systems.
- E. Review of Existing Conditions.
- F. Utility Locate.
- G. Cutting and Patching.
- H. Deactivation and Cap-off of Systems.
- I. Mechanical Demolition and Disposal.
- J. Hazardous Materials Discovery.

#### 1.3 DEFINITIONS

A . "Remove", "demo", and "demolish" mean "Remove and legally dispose of item and item accessories; except where indicated to be reinstalled, salvaged, or some other required work is indicated."

### PART 2 - PRODUCTS

# 2.1 GENERAL

A. Materials: All materials used for capping, temporary piping, repairs, reconnecting, reinstalling, and related work shall be same as specified for new systems.

## **PART 3 - EXECUTION**

#### 3.1 GENERAL

A . Protection: Existing items not being demolished shall be protected against damage. Where necessary to prevent damage or necessary to accomplish other work, items shall be disconnected and moved to a suitable protective storage location during the project and then reinstalled to their original location.

- B. Utilities and Building Systems: Maintain existing utilities and building systems in service (unless indicated otherwise) and protect from damage during project. Where utilities or building systems must be shut-off to accomplish the work, see drawing notes, Section 20 05 00, and Division 01 for downtime limitations and Owner coordination and notification requirements; coordinate interruptions with other trades.
- C . Cleaning: All existing items that remain during construction and were affected by the construction shall be cleaned to a like new condition.
- D. Equipment and System Contents: Equipment and systems contain fluids that are typical for such items (e.g. HVAC units contain refrigerant, oils; hydronic systems contain ethylene glycol, corrosion control chemicals, etc.) and require special removal methods and disposal.

# E. Existing Items:

- 1. Information and Field Verification: Routing, locations, and identification of existing items on plans are approximate and are limited. The relative location of systems shown on plans has not been verified, and is schematic only. Field verify locations, contents, and flow direction of all piping and ducts prior to performing any work associated with such systems (see also Section 20 05 00). Do not rely on existing labeling of systems; such labeling shall be considered wrong until verified by other physical evidence.
- Work Around: Existing building cavities (ceiling spaces, walls, etc.) contain a multitude of systems (e.g. conduit, wiring, fire suppression, light fixtures, low voltage system components, piping, ducts, etc.) typical for buildings of the type of this project. Added effort is required to identify and locate these systems, to work around such systems, and to temporarily disconnect and reconnect (and possibly remove and store) various building components to accommodate the work. Existing building elements will also require the work to be installed in smaller sections (i.e. shorter pipe or duct lengths) than normally possible, and to make system connections in awkward or cramped locations.
- 3. Revisions: Revise existing systems as needed to accommodate project work and new finishes. Work shall include adjusting locations of items to suit new ceiling heights, revisions to building element locations, revisions to finishes, and other changes.
- Electrical: Verify voltage, phase, horsepower, panel circuits, and other electrical parameters of existing items prior to beginning work and ordering replacement products. Electrical data listed on the drawings for such items has not been field verified.
- 5. Controls: Verify existing communication protocol, existing component manufacturers, and model numbers, LAN type(s), software, location of devices, quantity of system points, methods used in terminating communication wiring, overall system performance, and sequences.
- F. Cutting: Provide all cutting and openings as necessary to accomplish the work indicated. No structural members shall be cut unless Structural Engineer's approval is obtained first. Assume all building members are "structural" unless clearly evident otherwise. See Section 20 05 00 and Division 01 for additional requirements.
- G . Patching: Patch all wall/floor/ceiling/roof openings left by removal of existing items where wall/floor/ceiling/roof is to remain. Patch with materials and workmanship so as to match finish of adjacent undisturbed area, and to provide conditions equivalent to the original new construction.

- H. Owner's Salvage: Owner has first right to all items shown to be demolished. All items not wanted by Owner, and not indicated to be salvaged for reuse, shall be removed by the Contractor.
- Temporary Systems: Provide temporary services to existing buildings (and areas of buildings) as noted on the plans and as required to allow for continued occupancy during project. Such temporary systems include temporary cold water, hot water, waste, vent, controls, and related systems. Where not specifically indicated, such systems shall be Contractor design/build.

# 3.2 REVIEW OF EXISTING CONDITIONS

- A . General: Provide field investigation of all systems and existing conditions to confirm extent of demolition, routing of existing systems, existing building materials of construction, mechanical system types and materials involved, areas where cutting and patching is required, site access, sizes of existing system components, and all other aspects of existing building and systems and their relationship to the Work.
- B. Review Timing: Review existing conditions prior to bidding, again prior to commencing any work or ordering materials, and continually throughout the project.
- C. Review for Space and Routing:
  - 1. Review existing conditions (including dimensions) where equipment must be moved through to confirm adequate space and path.
  - Review existing conditions (including dimensions and locations of existing systems)
    where work will occur to determine impact on the locations and routing of new systems;
    include time to develop shop drawings and revisions to routing shown on the design
    drawings to accommodate existing conditions.
- D. Existing Record Drawings: Existing record drawings located at the Engineers office or Architect's office are available for review.
- E . Site Utility Locate: Contact utility agencies and utility locate services to locate utilities. Where such locate services are not provided by public utility locate services retain the services of a private locate company. Such locate work shall include the use of ground penetrating radar (or equivalent technology) and pot-holing to determine the exact location of utilities where connections to these utilities occurs, and to determine the location of utilities in the vicinity of the work.
- F. Camera Investigation: Provide a camera review of underground waste piping as noted on the plans. Submit a color video documenting the existing pipe conditions. Work shall be by a firm specializing in underground drain piping cleaning and associated investigation; and is subject to review and approval by the Engineer.
- G . Construction Thickness: Where needed to perform the work, and to prevent damage to adjacent construction, verify the thickness of existing concrete floors and other elements by selective drilling or saw cutting.
- H. Reinforcement Location: Existing concrete floors and walls being cut shall be x-rayed prior to cutting to determine existing reinforcement locations. Reinforcement shall not be cut. Cuts and core drills shall maintain at least 6-inch distance from rebar and other structural elements in concrete (unless noted otherwise).

### 3.3 EXISTING CONSTRUCTION

- A. Existing Invert Elevations: For bidding purposes, assume that the invert elevation (i.e.) of all underground piping is 6 feet below finish floor (or existing grade for piping outside the building) at work location (unless noted otherwise). Verify depth before beginning work.
- B. Concrete Slabs: All slab on grade concrete floors shall be assumed to be 8" thick, with #4 rebar reinforcement 12" O.C. each way (unless noted otherwise). All upper floors shall be assumed to be 8" thick with #4 rebar 24" O.C. each way (except where existing drawings indicate otherwise).
- C . Ceiling Construction: All ceiling construction shall be assumed to be two layers of 5/8" type X GWB installed over 2 x 6 20 gauge steel stud framing on 16" centers (unless noted otherwise).
- D . Wall Construction: All walls shall be assumed to be constructed of 8 x 16 solid grouted CMU (unless noted otherwise).

### 3.4 DEMOLITION

- A . General: Review site conditions and identify all demolition work; include in bid all costs for demolition and disposal. Coordinate all demolition work with other trades. Confirm items to be salvaged or reused, and overall demolition scope.
- B . Scope: Not all items to be demolished are necessarily shown on the drawings, but are covered by notes and specifications. In addition to demolishing items indicated, demolish all associated items (unless indicated otherwise); this includes such items as supports, insulation, piping, drains, control wiring/conduit, power wiring/conduit, unions, valves, and similar accessories. Demolish all utilities serving demolished items completely or back to active mains where mains are to remain active; assume such utilities extend at least forty feet from the demolished items (unless indicated otherwise). Demolish all mechanical items located in building elements which are being demolished (i.e. located in walls, chases, roof assemblies, etc.). Demolish items as required to accomplish the work.
- C . Prevent Damage: Where existing building systems are to be reused to serve new items, carefully execute the demolition work to prevent damage to items to be reused and to prevent the demolition of items that are intended for reuse.
- D. Depth: Abandoned items, anchors, inserts, and other projections embedded in existing construction and not being concealed by new construction shall be removed to 1" below the adjacent finished surface, and the disturbed area patched.

## E. Cap-Offs and Terminations:

- Permanent: Provide cap-off of all existing utilities and systems that are cut or served demolished items. All cap-offs shall occur in concealed locations (unless indicated otherwise). Cap-off's shall be of equivalent material as the item being capped and be insulated where the connected system was insulated or where doing so will reduce energy consumption or prevent condensation.
- Temporary: Provide temporary cap-off of all existing utilities and systems to allow continued use of all systems until the final system components are installed and connected.
- 3. Wiring Terminations: Terminate all control wiring and electrical power connections in a manner that complies with code and allows remaining items to function as intended.

- F. Disposal: Dispose of all demolished items and all waste materials off site in accordance with code and legal requirements. See Division 01 for waste management requirements.
- G . Refrigerants: Shall be recovered by a licensed competent person and disposed of in accordance with code and legal requirements. Provide license certificate and disposal records to Owner.
- H . Equipment Services Reuse: Where equipment is being demolished and replaced with new at the same location, but new control or power devices (or other utility services) are not indicated to be provided; salvage and reuse the existing utility services (i.e. control devices, wiring, disconnects, starter, plumbing, etc.) that served the demolished item to serve the new item. Carefully remove items to prevent damage, and in a manner to allow reuse. Clean items that are going to be reused and all accessories to like new condition. Revise utility services as needed to serve the new equipment.

### 3.5 REMOVAL AND REINSTALLATION

- A. General: Where items are required to be removed to allow for other work and then be reinstalled when the other work is done, comply with the following.
- B. Removal: Carefully remove items to prevent damage and in a manner to allow for reinstallation. Remove all related items to the extent needed to allow for the Work.
- C . Package: Package item to allow for transport and storage without damaging. Label packaging to identify contents; include unique identifier number, brief description, and location (room number) item was removed from.
- D . Documentation: Compile list of removed items and documentation needed to allow for their reinstallation.
- E. Storage: Store items in secure and protective area until ready for reinstallation.

# F. Reinstallation:

- 1. Reinstall items and accessories as completion of other work allows. Provide all necessary connections and services to allow item to function properly; not all such connections are illustrated on the plans.
- 2. Provide new fasteners, supports, anchors, gasketing, seals, pipe connectors, unions and related items to allow for complete and proper connections and operation of reinstalled items.

### 3.6 HAZARDOUS MATERIALS

A . Hazardous Materials Discovery: If materials containing hazardous materials (other than those indicated) are discovered, do not disturb. Notify Owner to allow review and determine resolution. Assume in bidding and scheduling that there will be two occurrences of finding such materials, causing a 5 day project work stoppage each occurrence.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 WORK INCLUDED

- A. Thermometers.
- B. Pressure Gauges.
- C. Strainers.
- D. Unions.
- E. Flexible Connectors.
- F. Access Doors.

## 1.3 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Product Data: Submit product information data for all items to be used.

# 1.4 REFERENCES

- A . ANSI Z21.24: Connectors for Gas Appliances.
- B. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.
- C. ASME B16.39: Malleable Iron Threaded Pipe Unions: Classes 150, 250, and 300.
- D. ASME B40.3 Bimetallic Activated Thermometers.
- E. ASME B40.100 Pressure Gauges and Gauge Attachments.
- F. IMC: International Mechanical Code.
- G. UPC: Uniform Plumbing Code.

# 1.5 GENERAL REQUIREMENTS

A. Domestic (Potable) Water Systems: All items in contact with potable water shall be lead free in accordance with ANSI/NSF 61. Plastic piping system components shall comply with ANSI/NSF 14.

B. System Requirements: Products shall comply with additional requirements cited for the specific systems the products are being installed in; see specific system specification sections.

## PART 2 - PRODUCTS

# 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Thermometers: Trerice, Weiss, Winters.
- C . Pressure Gauges: Trerice, Weiss, Winters.
- D. Strainers: Watts, Keckley, Mueller, Sarco, Taco, Paco, Bell & Gossett, Armstrong, Wilkins.
- E. Unions: Anvil, Nibco, Watts, Epco, Victaulic, Ward, Jefferson Union.
- F. Dielectric Connecters: Victaulic Precision Plumbing Products, Elster Perfection.
- G. Flexible Connectors: Universal, Mason, Dormont, OPW, Unisource, Twin City Hose.
- H. Access Doors: J. R. Smith, Zurn, Josam, Acudor, Elmdoor, Kees, J.C. Industries.
- I. Escutcheons: Selected by Contractor.

## 2.2 THERMOMETERS - DIGITAL

- A . Type: Light powered digital LCD display industrial thermometer. Weiss DVU Series (or approved).
- B . Construction: Aluminum of high impact ABS case, LCD display, thermister temperature sensor, self-powered solar (light) panels, stem of brass or aluminum construction, with separate brass socket (i.e. thermowell). Bulb chambers tapered to match taper in thermowell to give metal to metal contact. Scale case adjustable over a minimum 180° range, with locking fastener.
- C . Stem Length: Stem insertion length approximately one-half of pipe diameter. Where installed on insulated piping systems, provide a longer stem thermometer and extended neck socket (thermowell) to extend thermometer base past the insulation.
- D. Display: LCD with minimum 1/2-inch high numbers, and 10 second update.
- E . Accuracy: Plus or minus 1% of reading or 1 deg F (whichever is greater). Recalibration by case potentiometer adjustment.
- F. Ranges: 50 to 300 deg F, in tenth degree increments.

### 2.3 PRESSURE GAUGES - DIGITAL

- A . Type: Light powered digital LCD display pressure gauge. Weiss DUGY series (or approved).
- B. Construction: 4-1/2" round case, stem mounting, black impact resistant phenolic (or fiberglass reinforced polypropylene) flangeless case, solid face, acrylic window, gold plated

ceramic pressure sensor, brass socket, and 1/4" npt (or 1/2" npt) bottom connection. Materials in contact with system fluid shall be constructed of type 316 stainless steel. Shut off cock not allowed (use ball valve). Rated for use with the system pressures and temperatures to be exposed to, but rated no less than 250 psi at 250° F.

- C. Display: LCD with minimum 5/8-inch high numbers and two second update.
- D. Accuracy: 0.5% of full scale per ASME B40.7 AA.
- E . Pressure Gauge Ranges: 0 to 1.5 times systems normal operating pressure (at point of measurement). Except: systems which operate at a vacuum, provide range from 30 to 0 inches mercury vacuum; where measuring differential pressure provide range 1.5 times normal measured pressure.

### 2.4 STRAINERS

# A. Water Systems:

- 1. Copper Piping Systems 2-1/2" and Smaller: Bronze body, "Y" type, screwed or solder type end connections, 125 lb class (rated 125 psi steam working pressure at 350 deg F minimum) and 400 psi (WOG) rated working pressures at 210 deg F, stainless steel 20 mesh wire screen, and gasketed retainer cap. Reinforce wire mesh with perforated stainless steel sheet for sizes 2" and 2-1/2". Ratio of net free area of screen to pipe free area greater than 3.5. Provide with blowdown valve, ball type, with 3/4" NPT male end connection. Valve manufacturer shall be listed as an "Acceptable Manufacturer" in the hydronic piping system specification section.
- 2. Copper Piping Systems 3" and Larger: Bronze or ductile iron body, "Y" type, flanged end connections, 150 lb class (rated 150 psi steam working pressure at 400 deg F minimum), brass or stainless steel screen with 3/64" perforations for 3" and 3/32" perforations for larger sizes; with gasketed threaded retainer cap. Ratio of net free area of screen to pipe free area greater than 3. Provide with blowdown valve, ball type, with 3/4" NPT male end connection. Valve manufacturer shall be listed as an "Acceptable Manufacturer" in the hydronic piping specification section.
- 3. Steel Piping Systems: Ductile iron, cast iron, or carbon steel construction, "Y" type, 250 lb class (rated 250 psi steam working pressure at 450°F minimum), with stainless steel screen. Screen shall be 20 mesh for strainers up to 2" in size, and have 3/32" perforations on larger sizes. Sizes 2-1/2 inch and less shall have threaded end connections; larger sizes shall have flanged end connections. Provide with bolted and gasketed strainer cap on flanged strainers; provide threaded gasketed retainer cap on threaded strainers. Provide with blowdown valve, ball type, with 3/4" NPT male end connection. Valve manufacturer shall be listed as an "Acceptable Manufacturer" in the hydronic piping system specification section.

#### 2.5 UNIONS

- A . Dielectric Unions: Shall not be used. Provide "dielectric connector" with standard union where union is required at connection point of dissimilar materials.
- B. Unions on Copper Pipe:
  - General: Pressure and temperature ratings to match (or exceed) piping system being installed in: minimum Class 125.
  - 2. 2-Inch Pipe and Smaller: Wrought copper solder joint copper to copper union, complying with ASTM B16.18.
  - 3. 2-1/2-Inch Pipe and Larger: Brass flange unions.

# C. Unions on Steel Pipe:

- 1. General: Pressure and temperature ratings to match (or exceed) piping system being installed in; minimum Class 150.
- Threaded: Malleable iron union, threaded connections, with ground joints, complying with ASME B16.39. Provide with brass-to-iron seat (except provide iron-to-iron seat where the conveyed material is detrimental to brass).
- 3. Welded and Flanged: Flange unions; see individual system specification sections.
- D . Dielectric Connector: Schedule 40 steel pipe nipple, zinc electroplated, with internal thermoplastic lining which is NSF/FDA listed and meeting all code requirements for potable water applications. Suitable for continuous use up to 225 deg F and 300 psi. "Clearflow" dielectric waterway (or approved). For systems operating at temperatures greater than 225 deg F provide flanged connections with insulating gaskets.

### 2.6 FLEXIBLE CONNECTORS

A . Pump Flexible Connectors: Twin sphere type, constructed of peroxide cured EPDM with Kevlar tie cords, multilayered. Embedded solid steel rings shall be used at raised face flanged ends. Shall have an external ductile iron reinforcement ring between spheres. Rated minimum 225 psi at 230°F. Control rods shall be used as recommended by the manufacturer for the application; rods shall have 1/2-inch thick neoprene bushings, washers and accessories sized to accommodate system loads and conditions. Same size as pipe installed end, with end connections to suit connecting piping. Mason Industries "SafeFlex" SFDEJ Series, and SFDCR Series.

# B. Piping Flexible Connectors:

General Use: Corrugated hose type with outer braided wire sheath covering.
 Corrugations shall be close pitch annular type. Minimum working pressure of 250 psig,
 minimum length of 12 inches (or 12 times the connector's nominal diameter, whichever
 is more), and screwed or flanged end connections. Metal for hose shall be bronze or
 stainless steel; braided sheath shall be stainless steel, any type of ASTM 300 series.

#### 2.7 ACCESS DOORS

- A . Hinged lockable steel access door, for mounting on face of wall, with minimum 16 gauge frame and 16 gauge door, concealed hinge, cam and cylinder lock, and anchor straps or anchor frame with mounting holes. Provide Type 304 stainless steel construction with No. 4 finish where used in restrooms, locker rooms, kitchens, and similar "wet" areas. Provide steel construction with prime coated finish in other areas. Door shall have rounded corners, and concealed pivoting rod hinge. Size shall be 12" x 12" (unless indicated otherwise) but shall be large enough to allow necessary access to item being served and sized to allow removal of the item (where access door is the only means of removal without disturbing fixed construction).
- B . Fire Rating: Door shall maintain fire rating of element installed in; reference drawings for required rating.
- C. Access doors shall all be keyed alike. Provide two (2) keys for each door.

### 2.8 ESCUTCHEONS

A. Type: Circular metal collar to seal pipe penetrations at building elements (i.e. walls, floors, cabinets, and ceilings); one piece type except that split hinge type may be used for applications on existing piping.

- B. Construction: Constructed of chrome plated brass or polished stainless steel, sized to tightly fit pipe exterior surface (or pipe insulation where insulated) and to fully cover the building element penetration.
- C . Projection: Shallow face type with maximum projection from wall not to exceed 1.2 times inner diameter of escutcheon.
- D . Special Applications: For sprinkler heads and similar special applications see items' specification Section.

# **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A . Thermometers: Install thermometers and thermal wells in piping at locations indicated, and so as to be easily read.
- B. Pressure Gauges: Install pressure gauges at inlet and outlets of all pumps; at each side of pressure reducing valves; and as indicated. Provide with ball-type isolation valves.
- C . Strainers: Install strainers ahead of each control valve as indicated. Provide valve in blow-off connection on strainers, valve shall be same size as blow-off tapping.
- D . Suction Diffusers: Install suction diffusers on all base mounted pumps and where indicated.
- E . Unions: Install unions in pipe connections to control valves, coils, regulators, reducers, all equipment, and where it may be necessary to disconnect the equipment or piping for repairs or maintenance; and as indicated. Where flanged connections occur at equipment additional unions are not required unless indicated otherwise. Dielectric unions shall not be used.
- F. Dielectric Connectors: Install connectors between all connections of copper and steel piping (or equipment), and other dissimilar metals. Where flanged connections occur use insulating type flanges. Dielectric unions shall no be used.
- G . Flexible Connectors Pumps: Install at all suction and discharge connections (except not required on pumps 1 HP and less).
- H. Flexible Connectors Piping: Install at pipe connections to equipment with rotating elements (except not required at hydronic heating/cooling coils unless specifically noted), at building expansion joints, where required for seismic isolation, per code, and where indicated. Provide flexible connector in gas piping connections to all equipment; size flexible connectors to match pipe size shown on plan, with reducer after the flexible connector to match the equipment connection size.
- I. Access Doors: Provide access doors where indicated on the drawings and where needed to provide access to trap primers, water hammer arresters, cleanouts, valves, coils, controls, mechanical spaces, and similar items requiring service or access that would otherwise be inaccessible. Consult architectural drawings and coordinate location and installation of access doors with trades which are affected by the installation. Access doors are typically not shown in the plans. Review ceiling and wall types and locations of items requiring access to determine quantity and sizes of access doors required.
- J. Escutcheons: Provide at all pipe penetrations through building elements, except where penetration is concealed (unless specifically noted otherwise). Items located in accessible cabinet spaces (e.g. below sinks) are not considered concealed.

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**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 WORK INCLUDED

- A. Pipe Hangers and Supports.
- B. Duct Hangers and Supports.
- C. Mechanical Equipment Anchors and Supports.

### 1.3 QUALITY ASSURANCE

- A . Pipe Hanger Standards: Manufacturers Standardization Society (MSS) Standards SP-58, SP-89, SP-69, and SP-90.
- B. General: All methods, materials and workmanship shall comply with Code; including IBC, IMC, UPC, NFPA Standards, and ASME standards.

#### 1.4 SUBMITTALS

- A. General: Submittals shall comply with Section 20 05 00.
- B. Product Data: Submit product data for all hangers, supports, and anchors. Data to include finish, load rating, dimensions, and applicable agency listings. Indicate application for all items by system type, size, and other criteria as appropriate to project.

## C. Shop Drawings:

- 1. General: Shop drawings shall clearly indicate dimensions, anchor and support type, anchor and support size, anchor and support spacing, finish, configuration, and systems/equipment to be applied to.
- 2. Attachments: Submit shop drawings for proposed attachment methods to building structure where the method of attachment has not been shown on the drawings, or where attachment methods other than those shown on the drawings are desired to be used.
- 3. Fabricated Supports: Submit shop drawings for all fabricated supports.
- 4. Finished Areas: Submit shop drawings for all supports that will be exposed in finished areas.

### 1.5 GENERAL REQUIREMENTS

A . Seismic: Provide adequate hangers, supports, anchors, and bracing to serve as seismic restraints. Seismic restraints shall comply with Section 20 05 48. Provide seismic restraint calculations and information per Section 20 05 48 and as required by code.

B. Design and Manufacture: All pipe hangers and supports shall be designed and manufactured in accordance with MSS-SP 58.

## 1.6 REFERENCES

- A. ADC: Air Duct Council Flexible Duct Performance and Installation Standard, 5th Edition.
- B. ASHRAE-F: American Society of Heating, Refrigeration, and Air Conditioning Engineers, Handbook of Fundamentals.
- C. ASME B31.1: Power Piping.
- D. ASME B31.9: Building Services Piping.
- E. ASTM A36: Standard Specification for Carbon Structural Steel.
- F. ASTM A108: Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.
- G . ASTM A123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- H. ASTM A153: Standard specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- I. ASTM A653: Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
- J . ASTM A907: Standard Specification for Steel, Wire, Epoxy Coated.
- K . ASTM A924: Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot Dip Process.
- L. IBC: International Building Code.
- M. IMC: International Mechanical Code.
- N. Federal Spec QQ-W-461H: Wire, Steel, Carbon (Round, Bare, and Coated).
- O . Mason SRG: Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork, Electrical Systems and Floor Mounted Equipment, 6th Edition.
- P. MSS SP-58: Pipe and Hangers and Supports Materials, Design and Manufacture.
- Q. MSS SP-69: Pipe and Hangers and Supports Selection and Application.
- R. MSS SP-89: Pipe Hangers and Supports Fabrication and Installation Practices.
- S . MSS SP-90: Guidelines on Terminology for Pipe Hangers and Supports.
- T. SMACNA-DCS: HVAC Duct Construction Standards, 3rd Edition.
- U. SMACNA SRM: Seismic Restraint Manual Guidelines for Mechanical Systems, 2nd Edition.

V. UPC: Uniform Plumbing Code.

# **PART 2 - PRODUCTS**

## 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Hangers and Supports: Grinnell, B-Line Systems, Unistrut, Erico, PHD, Basic-PSA, Pate, Caddy, Unisource, Metraflex, American Insulation Sales, Thermal Pipe Shields, Miro Industries.
- C . Anchors: Rawplug, Phillips, Hilti, Michigan, Simpson, Fastenal, Red Head, Grinnell, B-Line Systems, Unistrut, PHD, Basic-PSA, Metraflex.

#### 2.2 GENERAL

#### A. Finish:

- 1. Indoor Applications: Electro-plated zinc in accordance with ASTM B 633, or hot-dip galvanized after fabrication in accordance with ASTM A 123; except that hanger straps may be formed from pre-galvanized steel.
- Outdoor Applications: Hot-dip galvanized after fabrication in accordance with ASTM A 123, ASTM A 153, or ASTM A 653 (as applicable to item).
- B . Identification: Steel pipe hangers and supports shall be stamped with the manufacturer's name, part number, and size.
- C . Hanger Rods: Threaded hot rolled steel. Hanger rods shall be sized so that the total load imposed (including pipe or duct, insulation, hangers, and fluid) does not exceed the following:

Nominal Rod Diameter	Maximum Load
1/4 Inch	240 Pounds
5/16 Inch	440 Pounds
3/8 Inch	610 Pounds
1/2 Inch	1130 Pounds
5/8 Inch	1810 Pounds
3/4 Inch	2710 Pounds
7/8 Inch	3770 Pounds
1 Inch	4960 Pounds

D . Hanger Straps: Galvanized steel, minimum 1" x 22 gauge (except where required by Code to be heavier or noted otherwise), of lock-forming grade conforming to ASTM A924, G90 (minimum) galvanized coating conforming to ASTM A 653. Minimum yield strength of 30,000 psi. Straps shall be sized so that the total load imposed does not exceed the following:

Strap Size	Maximum Load
1" x 22 Gauge	230 Pounds
1" x 20 Gauge	290 Pounds
1" x 18 Gauge	380 Pounds
1" x 16 Gauge	630 Pounds
1-1/2" x 16 Gauge	990 Pounds

E . Beam Attachments: Constructed of malleable iron or steel, MSS standard types designed for clamping to building structural support beam. "C" clamp type shall have cup point set

screws with locknuts and retaining straps. Center loaded type beam clamps shall have horizontally adjustable clamping bolt (or rod with nuts).

- F. Concrete Anchors: Wedge type expansion anchors, with hex nut and washer, and stainless steel split expansion rings. Tested to ASTM E 488 criteria, UL listed, with exposed anchor head stamped with code to identify anchor length.
- G. General Anchors (Screws, Nuts, Bolts, Fasteners):
  - 1. General: Constructed of materials suitable for the conditions exposed to and materials being joined, with minimum 50 year service life. Stainless steel construction where exposed to corrosive conditions. Configuration, size and grade to suit application, accommodate expected forces, and provide anchoring to structural element (or allow for proper fastening of items). Minimum safety factor of 2.5 (or as required by code, whichever is greater). Comply with ASTM A307, SAE J429, SAE J78, or ASTM A 563; bolts and nuts shall have unified inch screw threads (course, UNC).
  - Test Reports: Provide independent test report indicating fastener strength (pullout and shear) as installed in the materials and applications of this project (when required by the Engineer or AHJ).
  - 3. Finish: In finished areas, the portion of fastener exposed to view shall match the exposed finish of item being fastened.
  - 4. Vandal Resistant Type: Require unique tool to remove; two-hole spanner type, torx-head type, or equivalent. Coordinate with other trades and use same type through-out project (unless noted otherwise).

# H. Manufactured Strut Systems:

- 1. Channels: Minimum 12 gauge, 1-5/8 x 1-5/8" (unless noted otherwise), with slots/holes to suit application.
- Accessories: Channel nuts press formed, machined and hardened with gripping slot, fabricated from steel conforming to ASTM A 108 or ASTM A 36. Fittings fabricated from steel in accordance with ASTM A 907.
- 3. End Caps: Vinyl cap, capable of withstanding high temperatures without degradation, manufactured specifically for use with manufactured strut. Unistrut Series P2859 or P2860 (or approved).
- I. Steel: Structural steel per ASTM A 36.
- J. Wood: Only allowed to be used where building structural elements are of wood construction same type, grade used for building structural members. Where located outdoors shall be the pressure treated type; with all cut portions of wood painted with wood preservative.
- K . Field Galvanizing Compound: Brush or spray applied galvanizing treatment; consisting of a premixed ready to apply liquid organic zinc compound, with 95% metallic zinc content by weight in dry film. ZRC worldwide "ZRC Cold Galvanizing Compound".
- L . Rooftop Pipe Supports: Designed for rooftop support of piping to distribute load evenly over roof surface; factory fabricated. Shall be constructed of thermoplastic, polycarbonate, or polyethylene material, with attached strut support for anchoring of pipe, pipe attachment hardware, and sized to suit piping used with and so that pressure on roof does not exceed 150 pounds per square foot. Provide style with height to match pie height requirements above the roof. Strut and hardware shall be hot-dipped galvanized or have electrogalvanized finish. Plastic materials shall have UV stabilizers to resist UV deterioration. For piping systems subject expansion and contraction, provide roller type support allowing pipe

- movement, having a foam bottom to minimize roof abrasion. Caddy "Pyramid ST", Pyramid 50", "Pyramid 150", Pyramid RL".
- M. Rooftop Equipment Sleepers: Factory fabricated sleepers, constructed of minimum 18 gauge galvanized steel, all joints fully welded, with integral base plate pressure treated top wooden nailer, and integral top flashing having side turndown over wood nailer. Size to suit equipment supported, with minimum height above roof as indicated, and configuration to suit roof and roof insulation used with. Pate Co. "es-Equipment Supports", Thybar "TEMS", (or approved equal).

# 2.3 PIPE HANGERS AND SUPPORTS

- A. Copper Pipe: All hangers used directly on copper pipe shall be copper plated or have a factory applied 1/16-inch thick (minimum) plastic coating on all contact surfaces.
- B. Cushion Clamps: Pipe clamps with a vibration dampening insert between the pipe and clamp, with a nylon inserted lock-nut on clamp. Insert shall be constructed of a thermoplastic elastomer, designed to tightly fit and match pipe size and clamp used with; suitable for system temperatures.
- C . Type: Shall be MSS type selected in accordance with MSS-69; except that MSS type 24, 26, and 34 shall not be used.
- D. Trapeze Hangers: Shall be constructed of carbon steel angles, manufactured strut channels, or other structural shapes with flat surface (or installed saddle) for pipe support. Provide steel washer where hanger rod nuts bear on trapeze hanger. Pipe anchors shall be two piece clamp type designed for use with trapeze style (i.e. inserted into strut channel opening) or one piece type designed for welded or bolted attachment to trapeze; shaped to match pipe size (or pipe size plus insulation thickness on insulated systems). Pipe guides shall comply with paragraph titled "Alignment Guides"; or be steel angles with vertical leg height equal to pipe diameter (or pipe diameter plus insulation thickness on insulated systems); or be two piece clamp type pipe anchors sized and installed to serve as a quide.

## E. Insulated Pipe Supports:

- 1. Insulation material at pipe support shall consist of expanded perlite, calcium silicate or high density phenolic. Where located outdoors or used on chilled water piping, insulation material, shall be water resistant. Insert shall have a flame resistant jacket of nylon reinforced kraft paper bonded to aluminum foil cover on insulation, with galvanized steel shield. Insulation material shall have no more than 5% deformation at 100 psi and a thermal conductivity no more than 0.32 Btu/hr-sf-deg F-inch (rated at 75 deg F). Insulation shall be suitable for temperatures and conditions it will be exposed to without degradation over a 30 year life.
- 2. All insulation and materials shall have a fire hazard rating not to exceed 25 for flame spread and 50 for smoke development, as tested by ASTM E84.
- 3. Insert shall be same thickness as adjoining pipe insulation, sized to match pipe diameter used on.
- 4. Minimum insulation and shield lengths, and minimum shield gauge:

Nominal Pipe	Insulation	Shield	Minimum**
Diameter	Length	Length	Shield
In Inches	In Inches	In Inches	<u>Gauge</u>
1/2 to 1	*	4	20
1-1/4 to 2	6	4	20
2-1/2 to 6	6	4	18

Larger Sizes 9 6 16

- \* Insert not required; shield at insulation is acceptable.
- \*\* Provide with 360° shield where pipe is clamped (or has a 360° anchor).

## F. Expansion Joints:

General: Type to suit application (i.e. where located in middle of pipe run provide type
to accept expansion/contraction in both directions; where installed at end of pipe run
provide type to accept pipe expansion/contraction in one direction). Size to match
piping installed in. Provide with axial movement as noted, or (where not noted) as
Contractor calculated plus 25 percent excess travel, and in accordance with expansion
joint manufacturer's sizing recommendations.

# 2. Systems Below 200 deg F:

- a. Bellows Type Steel Piping: Corrugated bellows type, suitable for 150 psi working pressure at 380 degree F temperature. Bellows shall be of type 304 or 316 stainless steel construction. Able to accept expansion in either direction longitudinally. Metraflex Series MNLC or MN (or approved).
- Bellows Type Copper Piping: Externally pressurized, packless, bellows type, suitable for 150 psi working pressure at 500 degree F temperature, copper construction. Able to accept expansion in either direction longitudinally. Hyspan Series 8500 (or approved).
- c. Mechanically Coupled Slip Type: Where mechanically coupled joint systems are allowed on steel piping systems; slip type expansion joint providing up to 3-inch axial end movement, with mechanically coupled pipe ends, rated for 150 psi working pressure and 230 degrees F. Victaulic Style 150 (or approved).
- d. Mechanically Coupled Systems: Where mechanically coupled joint systems are allowed, and system expansion/contraction can be accommodated by pipe joints having appropriate end gaps and appropriate quantity of mechanically coupled joints. See Section 23 21 15.

## 2.4 DUCT HANGERS AND SUPPORTS

- A . Hangers: As shown in SMACNA-DCS except that wire shall not be used and all materials used shall comply with these specifications.
- B. Vertical Duct Supports at Floor: 1-1/2" x 1-1/2" x 1/8" (minimum) galvanized steel angle and to support ducts, maximum 12 foot on center, and as shown in SMACNA-DCS. For ducts over 30 inches wide provide riser reinforcing with hanger rods between the riser support and riser reinforcing.
- C . Vertical Duct Supports at Wall: 1-1/2" x 1/8" (minimum) strap or 1-1/2" x 1-1/2" x 1/8" (minimum) angle bracket and as shown in SMACNA-DCS.
- D . Hanger Attachments to Structure: As shown in SMACNA-DCS to suit building construction and as allowed on structural drawings. Provide washers at all fasteners through hanger straps (regardless of SMACNA-DCS allowances). Where C-clamps are provided, retainer clips shall be used. Friction beam clamps shall not be used.
- E . Hanger Attachments to Ducts: As shown in SMACNA-DCS except that wire shall not be used as any form of support or attachment for ducts.
- F . Flexible Duct Strap: Woven polypropylene hanging strap, minimum tensile strength of 400 lbs, minimum 1.75-inches wide, designed and intended for flexible duct support.

G . HVAC Support Wire: Steel, minimum 12 gauge, soft-annealed wire, complying with Federal Specification QQ-W-461H, and IBC for support of ceilings and accessories installed in ceilings.

## **PART 3 - EXECUTION**

### 3.1 INSTALLATION - GENERAL

- A . General: Provide all necessary bolts, nuts, washers, fasteners, turnbuckles, hanger rods, rod connectors, stanchions, wall/roof/floor backing and attachments, bridging between structural members, and any other miscellaneous accessories required for the support and anchoring of all pipes, ducts, and mechanical equipment. All supports, whether from floor, walls, or hung from structure, are Contractor's responsibility. Anchors and supports shall be adequate to accommodate forces equipment will be exposed to. Any field cut pieces of galvanized materials shall be hot-dip galvanized after cutting; or be solvent and wire brushed clean and receive field applied galvanizing treatment. This field applied galvanizing (only allowed with prior permission for minor localized cuts) shall use multiple coats to provide as near equal protection as possible to factory (or hot-dip) applied coatings.
- B. Backing: Install steel or wood backing in walls (anchored to studs) and in ceiling (anchored to joists or trusses), as required to provide support for items.
- C . Installation: Install all inserts, anchors, and supports in accordance with manufacturer's instructions, code requirements, and best professional practices. The most restrictive criteria governs.
- D. Welded Assembly Finish: All welded steel support assemblies shall have a power wire brush and primer paint finish where installed indoors and be have factory applied hot-dip galvanized finish where installed outdoors (or subject to moisture); unless another finish is specified.
- E . Attachments: Attach to anchoring element (i.e. building structure, concrete pads, etc.) as shown on drawings (reference structural drawings). Where not detailed on the drawings, the Contractor shall design and submit shop drawings of proposed attachment methods to the Engineer for review.

# F. Application:

- Where not detailed on the drawings (or otherwise indicated), the selection and design of supports is the Contractor's responsibility, in compliance with code and Contract Document requirements; subject to submittal review and acceptance by the Engineer.
- Exposed supports in finished areas shall be arranged to minimize their visibility; be free
  of dents, scratches and labels, and be configured in a manner to match the decorum
  and finish of the room they are installed in. Exposed supports in finished areas shall be
  cleaned to allow for field painting (unless a chrome, stainless steel, or similar finish has
  been indicated).
- 3. HVAC Support wire and flexible duct strap shall only be used for support of ceiling air inlets and outlets, or at flexible duct supports.
- G. Manufactured Strut ("Unistrut"): Provide end caps on all strut ends at the following locations:
  - 1. Where exposed to view in finished areas.
  - 2. Where near maintenance access paths.
  - 3. Where personnel injury could occur if the ends were not covered.

H. Seismic: Provide bracing and added supports to restrain movement in a seismic event. Items serving as seismic restraints shall comply with Section 20 05 48.

#### 3.2 INSTALLATION OF PIPE HANGERS AND SUPPORTS

- A. General: Aboveground pipe shall be anchored to the structure to prevent sagging, to keep pipe in alignment, and to resist the forces the pipe will be exposed to; piping shall be supported independent of equipment so that no loads bear on the equipment.
- B. Adjustment: All pipe supports shall be provided with a means of adjustment for the aligning and leveling of the pipe after installation.
- C . Applications: Selection, sizing, and installation of pipe supports and accessories shall be in accordance with the manufacturers recommendations, standards MSS SP-89 and MSS SP-69, UPC, and IMC. Refrigerant piping and similar piping subject to vibration (i.e. high pressure tubing) shall be installed with cushion clamps.
- D. Support Spacing: Provide piping support spacing according to the most restrictive of the following: UPC, IMC, ASME B31.1, B31.9, local codes, manufacturers recommendations or Contract Documents specific requirements. Provide supports at each change in direction of piping and at each side of concentrated loads (such as in-line pumps, valves greater than size 5", and similar items). On hubless cast iron piping provide supports at each branch connection; and hubless cast iron piping greater than size 2" shall have supports on both side of piping couplings.
- E . Trapeze Hangers: Four or more pipes running parallel may be supported on trapeze hangers provided the slopes of such pipes allow use of common trapeze. Suspend trapeze hanger from the building structure using hanger rods; attach to the building structure using concrete inserts, beam clamps, or other approved methods. Where trapeze width exceeds 30 inches, and where building attachment restrictions require more anchor points, provide three (or more) hanger rod supports. Provide pipe anchors to secure piping to trapeze on minimum 20 foot spacing; size and install pipe anchor to allow longitudinal movement of pipe (unless noted otherwise) with minimal vertical and transverse movement; where pipe is subject to expansion/contraction provide anchoring and alignment guides per paragraph titled "Thermal Expansion/Contraction".
- F. Vertical Piping Supports: Support piping at each floor line with pipe clamps and at intermediate points as required so that hanger spacing does not exceed allowable spacing and as required to prevent excessive pipe movement and so as to comply with the maximum spacings cited above. Support all pipe stacks at their bases with a concrete pier or suitable support. For vertical pipe drops which occur away from a wall or similar anchoring surface, provide angled bracing from nearest structure on two sides of drop to provide rigid anchoring of pipe drop. Provide riser clamps and vertical supports on all vertical vent piping where the vertical pipe length exceeds 5'.
- G . Pre-Insulated Pipe Supports: Protect all insulated pipe at point of support with pre-insulated pipe supports. Such supports shall be in place at time of installing pipe.
- H. Underground Pipe: Shall be evenly supported on approved bedding materials, as appropriate for the type of piping being used. Such bedding and backfilling shall be as specified in Section 20 05 90.
- I. Thermal Expansion/Contraction:
  - 1. General: All expansion devices and associated system features to accommodate pipe thermal expansion/contraction shall be Contractor designed (except where a specific

- design has been provided), in accordance with MSS SP-69, ASME B31.9, ASME B31.1, ASHRAE-F, and expansion joint manufacturer's guidelines. See Section 20 05 48 for requirements to accommodate building movement and system vibration.
- Locations: Where straight pipe runs exceed 50 feet in length, and where piping is subject to expansion and contraction of 1/2-inch lengthwise or more, provide expansion joints or expansion loops (use specific type where indicated) to accommodate system expansion/contraction.
- 3. Expansion: Unless expansion/contraction lengths have been indicated, calculate expansion contraction using worse case temperatures system will be exposed to (e.g. installed seasonal temperature of system versus high/low operating temperature, or system high/low operating values, etc.) and pipe expansion factors from ASHRAE-F.
- 4. Supports, Guides, Anchors: Pipe shall be supported with roll type or anti-friction plate type supports to allow movement relative to expansion devices without imparting movement to hangers; brace hangers as needed in order to prevent movement. On systems operating below 125 deg F roll type or anti-friction plate type supports are not required provided the required expansion/contraction can be accommodated by direct movement of the pipe (or pipe insert) on the installed supports. Provide alignment guides on each side of expansion devices and at intermediate points to maintain pipe alignment as recommended by alignment guide manufacturer. Provide pipe anchors at the end of runs to ensure pipe expansion into expansion devices.

#### 3.3 INSTALLATION OF DUCT HANGERS AND SUPPORTS

- A . General: Provide anchors and supports for all ductwork. Supports and hangers shall comply with SMACNA-DCS, except that hanger spacing and hanger maximum loads shall be governed by whichever is more restrictive between these specifications or SMACNA-DCS.
- B . Hanger Spacing -- Rectangular Duct:

Duct AreaMaximum SpacingUp to 4 Square Feet8 Feet4.1 to 10 Square Feet6 Feet10 Square Feet and Up4 Feet

C . Hanger Spacing -- Round Duct:

Duct AreaMaximum SpacingUp to 24 Inch Diameter8 Feet25 Inch to 48 Inch Diameter6 Feet49 Inch Diameter and Up4 Feet

- D . Hanger Spacing Flexible Duct: 4 feet, and at changes of direction as needed to maintain duct elevation and smooth airflow.
- E. Vertical Ducts: Support at each floor level, but in no case less than on 12 foot intervals.
- F. Flexible Duct: Support with methods shown in ADC. Metal strap in contact with the flexible duct shall have minimum 1.5-inch width.
- G . Fittings: Provide supports at each change in direction of duct for ducts with 4 square foot area or more, or for ducts larger than 24 inch diameter. Locate hangers at inside and outside corners of elbows--or at each end of fitting on each side.

- H. Concentrated Loads: Provide additional supports at each side concentrated loads such as modulating dampers (24" x 24" and larger), duct heaters (18" x 18" and larger), sound attenuators (all sizes), and similar items.
- I. End of Duct: At end of duct run, hangar shall be located no more than 1/2 the allowed hangar spacing from the end of the run.

# 3.4 CEILING SERVICES

- A. Less than 20 Pounds: Ceiling mounted services, air inlets/outlets, and accessories weighing less than 20 pounds shall be positively attached to the ceiling suspension main runners (or ceiling support members) or to cross runners with the same carrying capacity as the main runners (or support members).
- B. 20 to 56 Pounds: Ceiling mounted services, air inlets/outlets, and accessories weighing 20 pounds but not more than 56 pounds, in addition to the above, shall have two No. 12 gauge wire hangers (or minimum 1" x 22 gauge hangar straps) connected from the terminal or service to the ceiling system hangers or to the structure above. These added hangers may be slack.
- C . Greater Than 56 Pounds: Ceiling mounted services, air inlets/outlets, and accessories weighing more than 56 pounds shall be supported directly from the building structure by approved hangers.

### 3.5 MECHANICAL EQUIPMENT ANCHORS AND SUPPORTS

- A . General: Provide anchoring and supports for all mechanical equipment. All equipment shall be anchored to (or supported from) the building structure. In lieu of anchoring to the building, anchor outdoor equipment to the concrete pad serving the equipment.
- B. Suspended Equipment: Support as indicated on the plans. Where not indicated use the methods shown (or consistent with) Mason SRG and SMACNA-DCS; submit shop drawings of the proposed methods to the Engineer for review.
- C . Roof Mounted Equipment: Install on roof curbs or roof sleepers as indicated. Anchor equipment to the curb (or sleeper), with the curb (or sleeper) in turn anchored to the building structure.
- D. Vibration Isolation: Equipment shall be supported and anchored in such a way so that no equipment vibration is transmitted to the building structure.
- E . Seismic: Coordinate with requirements of Section 20 05 48; provide anchors and bracing to resist seismic forces.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

#### 1.2 WORK INCLUDED

- A. Pipe Sleeves.
- B. Duct Sleeves.
- C. Duct Closure Collars.
- D. Firestop Seals.
- E. Non-Firestop Seals.

# 1.3 DEFINITIONS

- A . Firestop System: Specific firestop materials or combination of materials installed in a specific way in openings in a specific rated assembly to restore (or maintain) the fire rating and smoke passage resistance properties of the assembly.
- B. Firestop Seal: Same as "Firestop System".
- C . Rated Assembly: Wall, floor, roof, ceiling, roof/ceiling or other construction which is required (by code or the Contract Documents) to have a fire-resistance rating, be a smoke barrier, or to limit the passage of smoke.

## 1.4 SUBMITTALS

- A. General: Shall comply with Section 20 05 00.
- B. Product Data: Provide product data on all material to be use. Provide MSDS for all sealants, caulks and similar materials.
- C . Shop Drawings General: Shop drawings of proposed sealing/flashing assembly for roof and exterior wall penetrations.
- D. Shop Drawings Firestop: Provide firestop system shop drawings showing:
  - 1. Listing agency's detailed drawing showing opening, penetrating items, and firestop materials. Drawing shall be identified with listing agency's name and number or designation, fire rating achieved, and date of listing for each firestop system.
  - 2. Identify where each firestop system is to be used on the project.
  - Manufacturer's installation instructions.
  - 4. For proposed systems that do not conform strictly to the listing, submit listing agency's drawing marked to show modifications and stamped approval by the firestop system manufacturer's fire protection engineer.

5. Other data as required by the AHJ.

#### 1.5 REFERENCES

- A . ASTM A 36: Standard Specification for Carbon Structural Steel.
- B. ASTM C534: Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- C . ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E 814: Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- E. UL 1479: Standard for Fire Tests of Through-Penetration Firestops.
- F. UL 723: Surface Burning Characteristics of Building Materials.
- G. SMACNA-DCS: SMACNA HVAC Duct Construction Standards, 3rd Edition.
- H. SMACNA-ARCH: SMACNA Architectural Sheet Metal Manual, 7th Edition.
- USGBC LEED: US Green Building Council LEED Reference Guide for Green Building Construction.

### 1.6 GENERAL REQUIREMENTS

A. Corrosion Protection: All sleeves exposed to water, moisture, chemicals, or subject to corrosion shall be constructed of corrosion resistant materials suitable for the exposure. Steel sleeves shall be hot dip galvanized after assembly. Provide additional coatings as noted or as required to resist corrosion.

### PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Firestop Seal Materials: 3M, Dow Corning.
- C . Non-Firestop Seal Materials: 3M, GE, Dow Corning, Tremco, Pecora, Sonneborn, Pipeline Seal & Insulator.

#### 2.2 PIPE SLEEVES

# A. Diameter:

- 1. Belowground: Inside diameter of belowground pipe sleeves shall be at least 2 inch larger than the outside diameter of the pipe or pipe covering (for covered piping systems), so as to allow free movement of piping.
- 2. Aboveground: Inside diameter of aboveground pipe sleeves shall be at least 1-inch larger than the outside diameter of the pipe or pipe covering (for covered piping systems), so as to allow free movement of piping.
- 3. Large Movement: Provide larger sleeves where a larger space around pipe exterior is required by code, where specifically noted, where pipe movement will occur (i.e.

expansion/contraction or seismic), at expansive soils, other unusual conditions are present, and where required to accommodate large piping movement.

- B. Length: Horizontal sleeves through finished areas (where sleeve is exposed to view) shall be sized to be flush with finished surfaces; other horizontal sleeves may terminate flush to 2-inches past the element being penetrated. Vertical sleeves shall be sized to extend one inch above the final floor elevation.
- C . Structural Type: Fabricated from schedule 40 steel pipe. Waterstop shall consist of fully welded 2-inch larger diameter collar, minimum 1/4 inch thick steel, located on sleeve so as to be centered within the element being penetrated. Provide waterstop on sleeves where sleeves are installed in the following locations: in cast-in-place concrete, where any part of the sleeve ends are exposed to water, where installed in floors with water-proofing or water stopping membranes, in rooms with floor drains, and where needed for anchoring/support purposes. Prime paint all surfaces with rust-inhibiting paint.

## D. Non-Structural Type:

# 1. Belowground Type:

- a. Non-Waterstop Type: Fabricated from any of the following: 18 gauge galvanized sheet metal, 22 gauge spiral seam galvanized steel duct, schedule 40 PVC, HDPE thermoplastic or Schedule 40 galvanized steel pipe.
- b. Waterstop Type: Constructed of HDPE thermoplastic or Schedule 40 steel pipe, with waterstop. Waterstop shall consist of 2-inch larger diameter collar, minimum 1/4 inch thick, located on sleeve so as to be centered within the element being penetrated, fully welded (for steel) or bonded/formed (for HDPE) to sleeve. Sleeve shall be suitable for use with "Link-Seal" type seal. Prime paint all surfaces with rust-inhibiting paint.

# 2. Aboveground Type:

- a. Non-Waterstop Type: Fabricated from 18 gauge galvanized sheet metal or 22 gauge spiral seam galvanized steel duct. Provide with galvanized steel angle tabs, collars, or similar to allow for anchoring where sleeve cannot be retained in place by element being penetrated.
- b. Waterstop Type: Fabricated from 18 gauge galvanized sheet metal or 22 gauge spiral seam galvanized steel duct. Cold galvanize cut edges of sleeve. Waterstop shall be constructed of same material as sleeve, be fully welded to sleeve, 2-inch larger diameter, located on sleeve to allow sealing of gap between sleeve and element being penetrated.
- E . Flexible Type: Flexible cellular elastomeric insulation, complying with ASTM C 534, Type 1, minimum 1/2-inch thick. Water vapor permeance shall not exceed 0.08 perms. Operating Temperature Limits -20 degrees F to 180 degrees F. Provide in sheet or pre-fabricated pipe size; provide multiple wraps as required.

# 2.3 DUCT SLEEVES

A . Size: Inside dimension of duct sleeves shall be at least 1-inch larger than the outside dimension of the duct or duct covering (for covered duct systems). For duct system conveying air or gases operating above 200 deg F provide sleeve dimension minimum 2-inch larger than duct or duct covering (for covered duct systems). Provide larger sleeves where a larger space around duct exterior is required by code, by duct or flue system manufacturer, to provide required thermal clearances, where specifically noted, where unusual conditions are present and where required to accommodate large movement.

- B. Length: Horizontal sleeves through finished areas (where sleeve is exposed to view) shall be sized to be flush with finished surfaces; other horizontal sleeves may terminate flush to 2-inches past the element being penetrated. Vertical sleeves shall be sized to extend one inch above the finished floor.
- C . Structural Type: Fabricated from schedule 40 steel pipe for round openings and 3" x 3" x 3/8" welded steel angles for other openings (unless noted otherwise). Prime paint all surfaces with rust-inhibiting paint.

### D. Non-structural:

- Aboveground Type: 24 gauge spiral seam galvanized steel duct or 20 gauge longitudinal seam galvanized steel duct for round openings. Fabricated of 18 gauge galvanized sheet metal for other openings; configured to suit duct.
- E. Flexible Type: Flexible cellular elastomeric insulation, complying with ASTM C 534, Type 1. Water vapor permeance shall not exceed 0.08 perms. Operating Temperature Limits -20 degrees F to 180 degrees F. provide in sheet or pre-fabricated pipe size.

### 2.4 DUCT CLOSURE COLLARS

- A. General: Closure collars shall provide closure of opening between duct and opening in element penetrated and shall abut tight up to and overlap duct and shall consist of rolled angle material (for round ducts) and welded framed angles (for rectangular and round ducts).
- B. Size: Closure collars shall be sized to match duct and opening applied to and shall have minimum 2-inch overlap on duct side and 2-inch overlap at opening/penetrated element side but shall completely cover opening in element penetrated with minimum 1-inch overlap to undisturbed element (i.e. wall, floor, etc.).
- C . Material: Closure collars shall be fabricated of 20 gauge galvanized steel for ducts 15 inches diameter and less and shall be fabricated of 18 gauge galvanized steel duct for all larger ducts and all square and rectangular ducts.

## 2.5 FIRESTOP SEALS

- A . General: Commercially manufactured through-penetration and membrane-penetration firestop systems to prevent the passage of fire, smoke and gases, and to restore the original fire-resistance rating of the barrier penetrated.
- B. Listing: Firestopping shall be listed by UL in "Fire Resistance Directory" (category to match the application), or be qualified by another independent agency acceptable to the AHJ.
- C . Rating: Firestop system and devices shall be tested in accordance with ASTM E 814 or UL 1479, with "F" and "T" ratings as required to maintain the fire-resistance rating of the barrier penetrated, and as required by code.
- D . Fire Hazard: Materials shall have a flame spread of 25 or less, and a smoke development rating of 50 or less; when tested in accordance with ASTM E 84 or UL 723.
- E. Cabling Applications: Firestop systems used with loose electrical cabling shall be the type that allows for removal of the cable or installation of new cables without damage to the firestop system, or the need to replace or repair firestop materials.
- F. Insulation: Firestop system shall be applicable to insulated systems to allow the insulation to run continuous through the firestop system (unless noted otherwise).

### 2.6 NON-FIRESTOP SEALS

#### A . Indoor Sealants:

- Smoke or Sound Sealant Applications: For use where a firestop seal is not required, but smoke or sound seal is required. Single component, elastomeric or acrylic latex type sealant with STC ratings per ASTM E90. Sealants shall be of the following types, or approved equal:
  - a. 3M "Smoke and Sound Sealant SS100".
  - b. Tremco "Tremstop".
- Other Areas Dry (Not Normally Exposed to Water/Moisture): Single component, latex sealant complying with requirements of ASTM C834. Sealants shall be of the following types, or approved equal:
  - a. Tremco Corporation "Tremflex 834".
  - b. Pecora Corporation "AC-20 Arylic Latex".
  - c. Sonneborn Building Products "Sonolac".
- 3. Other Areas Wet (Exposed to Water/Moisture): Single component, mildew resistant silicone sealant complying with requirements of ASTM C920, Type S, Grade NS, Class 25. Color white. Sealants shall be of the following types, or approved equal:
  - a. Dow Corning "786 Mildew Resistant Silicone".
  - b. Pecora Corporation "898 Silicone Sanitary Sealant".
  - c. Tremco "Tremsil 200".

#### B. Outdoor Sealants:

- General: Single component, non-sag, low modulus, silicone elastomeric sealant conforming to requirements of ASTM C920, Type S, Grade NS, Class 100/50. Sealant shall be of the following types, or approved equal.
  - a. Dow Corning "790 Silicone Building Sealant".
  - b. Pecora Corporation "890 Silicone".
  - c. Tremco "Spectrem 1".
- Adjacent to Aluminum: Single component, non-sag, medium modulus, silicone elastomeric sealant conforming to requirements of ASTM C920, Type S, Grade NS, Class 50. Sealant shall be primer-less type for use in joints adjacent to fluoropolymer coatings. Sealants shall be of the following types, or approved equal:
  - a. Dow Corning "795 Silicone Building Sealant".
  - b. GE Silicones, Momentive, SCS2000 and SCS7000.
  - c. Pecora "895 Silicone".
  - d. Tremco "Spectrem 2".

# C. Expanding Foam Sealant:

- General: Single component, polyurethane insulating sealant with flame spread index of 25 or less and smoke development rating of 50 or less. Shall expand and fully cure within 24 hours to a semi-rigid, closed cell, water and air resistant foam. Sealant shall be of the following types, or approved equal.
  - a. DAP "Kwik Foam".

- b. Fomo Products "Handi-Foam".
- c. Todol Products "EZ Flo Gun Foam".
- D. Full Water Immersion Sealant: Polysulfide or Polyurethane; ASTM C920, M or Type S, Grade NS, Class 25, uses M and A; approved by manufacturer for "continuous water immersion", single or multi-component.
  - 1. Tremco "Vulkem 116".
  - 2. Sonneborn "Sonalastic Polysulphide Sealant".
- E. ecommendations. Seal shall be Pipeline Seal and Insulator, "Link-Seal" (or approved).
- F. Specialty: Packed fiberglass or wool insulation; with silicone sealant rated for use with temperatures and other conditions encountered.
- G. Grout: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout. Nonshrink; recommended for interior and exterior applications. Design mix shall provide 5000-psi, 28-day compressive strength. Premixed and factory packaged.

## **PART 3 - EXECUTION**

#### 3.1 PIPE SLEEVES

- A. General: Provide sleeves for all piping passing through walls, floors, partitions, roofs, foundations, footings, grade beams, and similar elements. Except that sleeves are not required at core drilled penetrations through solid concrete or where formed openings equivalent to a core drilled opening are provided. Sleeves shall be the following type (horizontal/vertical refer to position of sleeve):
  - 1. Horizontal, Belowground:
    - a. Belowground on Both Sides of Element Penetrated: Non-structural, belowground, non-waterstop type; except that penetrations of footings shall be structural type.
    - b. Belowground on One Side of Element Penetrated: Structural type.
  - 2. Horizontal, Aboveground:
    - a. Concrete and Masonry Walls: Structural type.
    - b. Other Walls: Non-structural type.
  - 3. Vertical, Slab on Grade: Structural type; except at piping serving individual fixtures or individual heating units in finished areas, the flexible type may be used. Where not installed to be concealed (as in a plumbing chase) install height of flexible type so it is concealed by the floor finish, cabinet base, or an escutcheon.
  - 4. Vertical, Not Slab on Grade:
    - a. Concrete Floors/Roofs: Structural type.
    - b. Other Floors/Roof: Non-structural aboveground type. Use waterstop type in rooms with floor drains, at plumbing chases, and similar areas.
- B. Installation: Set sleeves plumb or level (or sloped as required for sloped pipes) in proper position, tightly fitted into the work. Set sleeves properly in element for specified projection past adjacent surfaces (see sleeve product specification); cut ends of sleeve as necessary.

C. Insulation: Insulation shall run continuous through sleeves (unless noted otherwise).

### 3.2 DUCT SLEEVES

- A. General: Provide sleeves for all ducts passing through walls, floors, partitions, roofs, foundations, footings, grade beams, and similar elements, except that sleeves are not required at core drilled penetrations through solid concrete or where formed openings equivalent to a core drill and provided and where no floor drain serves the room where the penetration occurs. Sleeves shall be the following type aboveground:
  - 1. Horizontal, Aboveground:
    - a. Concrete and Masonry Walls: Structural type.
    - b. Other Walls: Non-structural type.
  - 2. Vertical, Slab on Grade: Structural type.
  - 3. Vertical, Other than Slab on Grade:
    - a. Concrete Floors/Roofs: Structural type.
    - b. Other Floors/Roof: Non-structural aboveground type.
- B. Installation: Set sleeves plumb or level (or sloped as required for sloped duct) in proper position, tightly fitted into the work. Set sleeves properly in element for specified projection past adjacent surface (see sleeve product specification); cut ends of sleeve as necessary.
- C. Insulation: Insulation shall run continuous through sleeves (unless noted otherwise).

### 3.3 DUCT CLOSURE COLLARS

- A. General: Closure collars shall be provided for all exposed ducts on each exposed penetration where the duct passes through any floors, walls, ceilings, roofs, partitions, and similar elements. Closure collars shall additionally be provided where so noted on the drawings and at all duct penetrations into mechanical rooms, boiler rooms, and rooms housing mechanical equipment (on both sides of the penetration).
- B. Installation: Collar shall be installed tight against surfaces and shall fit snugly around the duct or duct covering. Sharp edges of the collar around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier of insulated ducts. Collars shall be anchored to element penetrated, with fasteners appropriate to material fastening to, on maximum 6 inch centers.

## 3.4 FIRESTOP SEALS

- A . General: At each through-penetration and membrane-penetration in rated assemblies, where required to limit the passage of smoke, and as required by code or in the Contract Documents, provide a firestop system. Firestop system shall be installed in accordance with the manufacturer's instructions and listing.
- B. System Selection: Contractor is responsible to select the firestop systems to be utilized, corresponding to the construction of the assembly penetrated, and types of penetrations. Contractor shall submit proposed firestop systems to be utilized, shall also review such systems with the AHJ and obtain AHJ approval.
- C . Preparation: Prepare surfaces as recommended by firestop material manufacturer. Examine and confirm that conditions are acceptable to proceed with the installation. Provide maskings and temporary coverings to prevent contamination or defacement of adjacent surfaces.

D. Installation Review:

- 1. Notify Architect/Engineer when firestopping work is complete and ready for review. Provide minimum 7 days notice to allow scheduling of review. An independent testing agency may be utilized to perform an inspection.
- 2. Notify AHJ when firestopping work is complete and ready for inspection. Provide sufficient advance notice to allow scheduling of the inspection without adversely impacting project schedule.
- Do not cover or conceal firestopping until all inspections have been satisfactorily completed.

## 3.5 NON-FIRESTOP SEALS

A . General: Provide seals around all ducts, conduit, and piping passing through sleeves, walls, floors, roofs, foundations, footings, partitions, and similar elements. Seals shall be watertight where the penetration may be exposed to water or moisture. Provide type of sealant to suit the application. Provide smoke and sound type at all penetrations of rooms which contain mechanical equipment on both side of element penetrated to a depth of 5/8-inch (unless noted otherwise).

#### B. At Sleeves:

- Between Sleeve and Penetrated Element: Fill openings around outside of pipe sleeve with same material as surrounding construction, or with material of equivalent fire and smoke rating and properties that allow a tight seal between the sleeve and the surrounding construction. Seal full depth of sleeve for vertical penetrations.
- 2. Between Pipe and Inside of Sleeve: Provide sealant between outside of pipe or pipe covering (for covered piping systems) and inside of sleeve. Seal depth shall be minimum 1-inch each side. Provide Link Seal type for belowground penetrations, vault wall penetrations, and slab-on-grade penetrations (not required where flexible type sleeves are used).
- C . No Sleeves: Provide "Link-Seal" type for belowground penetrations, vault wall penetrations, and slab-on-grade penetrations. Provide sealant at other areas, type to suit the application. Fully seal between outside of pipe or pipe covering (for covered piping systems) and surrounding construction. Seal depth shall be minimum 1-inch each side.
- D. Plumbing Fixtures: Provide sealant between fixture and abutting building surfaces. Seal so no water or overspray from fixture can enter building construction. See Section 22 40 00.
- E . High Temperature Systems: On piping systems operating above 200 deg F, use "Specialty" seal; pack full depth of penetration with silicon type sealant applied 1/2-inch depth over packing, each end.
- F . Preparation: Remove loose materials and foreign matter impairing adhesion of seal. Perform preparation in accordance with recognized standards and sealant manufacturers recommendations. Protect elements surrounding area of work from damage or disfiguration due.
- G . Installation: Install sealants immediately after joint preparation. Install sealants free of air pockets, foreign embedded matter, ridges, and sags. Tool exposed joint surface concave and with a neat finished appearance.

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

#### 1.2 WORK INCLUDED

- A. Vibration Isolation.
- B. Seismic Restraints.

#### 1.3 DEFINITIONS

- A . "Equipment" is defined to mean any item with power connections (fans, HV units, AHU units, etc.), and also to include all hoods; but does not include pumps less than 3 hp.
- B. "Equipment Requiring Vibration Isolation" is defined to be any equipment (as defined above) with rotating components (e.g. pumps, fans, etc.).

## 1.4 SUBMITTALS

- A. General: Submittals shall comply with Section 20 05 00.
- B. Product Data:
  - 1. Submit product data on all items to be used.
  - 2. Submit calculations showing vibration isolation selection for all isolation devices provided under this specification section (i.e. where isolation is not furnished integral with the equipment or by the manufacturer of the equipment).
- C. Shop Drawings: Submit shop drawings for all fabricated support assemblies.
- D. Submit calculations showing seismic restraint calculations, restraint selection, proposed locations of all seismic control bracing, and details of bracing construction.

## 1.5 GENERAL REQUIREMENTS - VIBRATION ISOLATION

#### A. General:

- 1. Select and provide all vibration isolation devices for all equipment requiring vibration isolation so as to provide complete installed mechanical systems free of the transmission of vibration and vibration generated noise to the structure.
- 2. Vibration isolation is shown on the drawings for various items but is not shown for all items requiring isolation. Provide all isolation as indicated and specified herein.
- B. Supplier: Where not provided by the equipment manufacturer, all vibration isolation devices and support assemblies shall be supplied as a coordinated package by a single vibration isolation manufacturer, under this specification section.

C . Equipment Manufacturer Items: Isolation devices furnished by equipment manufacturer shall comply with this specification section and be selected by the manufacturer to suit, and provide satisfactory performance, for the applications of this project.

#### 1.6 GENERAL REQUIREMENTS - SEISMIC RESTRAINTS

- A . General: Mechanical equipment, piping, and ductwork seismic restraints are typically not shown on the drawings but are to be provided as specified herein. Contractor is responsible to select and provide all seismic anchoring devices for all mechanical equipment, all piping, and all ductwork.
- B. Fire Sprinkler: Seismic bracing for fire sprinkler system shall be as specified per NFPA 13 but in no case be less than that required in this Section.

## C. Seismic Restraint Systems:

- 1. The Contractor shall retain a specialty consultant or equipment manufacturer to develop seismic restraint systems and perform seismic calculations in accordance with code and requirements specified in this section. Calculations, restraint selections, and installation details shall be done by a professional engineer experienced in seismic restraint design and installation and licensed in the State where the project is located.
- 2. The seismic design, consisting of calculations, restraint selection, installation details, and other documentation, shall be submitted. This submittal shall be signed and sealed by a professional Engineer.
- 3. The seismic restraint design shall clearly indicate the attachment points to the building structure and all design forces (in X,Y, and Z direction) at the attachment points. The seismic restraint engineer shall coordinate all attachments with the building's structural engineer of record, who shall verify the attachment methods and the ability of the building structure to accept the loads imposed.
- 4. The seismic restraint design shall be based on actual equipment data (dimensions, weight, center of gravity, etc.) obtained from submittals or the manufacturers. The equipment manufacturer shall verify that the attachment points on the equipment can accept the combination of seismic, weight, and other loads imposed.
- 5. Analysis should include calculated dead loads, static seismic loads, wind loads, and the capacity of materials utilized for the connection of the equipment or system to the structure. Analysis should detail anchoring methods, anchoring materials, anchor sizes, embedment, and related details. All seismic restraint devices should be designed to accept, without failure, the calculated seismic forces.
- 6. Forces shall be calculated in accordance with accepted engineering practice and code requirements, using appropriate seismic "zone" and other factors for the building type, systems involved, and project location.
- 7. This project's building is considered a "non-essential" facility.

# 1.7 REFERENCES

- A . IBC: International Building Code.
- B. IMC: International Mechanical Code.
- C . MASON: Mason Industries Seismic Restraint Guidelines for suspended piping, Ductwork, Electrical Systems and Floor Mounted Equipment, 2005 6th Edition.

- D . OSHPD: Office of Statewide Health Planning and Development, State of California, Fixed Anchorage.
- E. SMACNA/SRM: Seismic Restraint Manual Guidelines for Mechanical Systems, 2<sup>nd</sup> Edition.
- F. UPC: Uniform Plumbing Code.

## **PART 2 - PRODUCTS**

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Products: Mason, Peabody, Kinetics Noise Control, Vibration Eliminators, VMC Group.
- C . Expansion Devices/Flexible Connectors: Unisource Manufacturing, Twin City Hose, and as specified in Section 20 05 19, 23 21 13, and 23 33 00.

#### 2.2 NEOPRENE ISOLATORS

- A. Isolation Pads: Oil resistant bridge bearing neoprene pads, minimum 3/4-inch thick, with cross-ribbed or waffle design. Size pads for not more than 50 psi or as recommended by vibration isolator manufacturer. Provide load distribution plates (minimum 3/8" plate steel) to evenly load pads. Mason Type SW (or approved).
- B. Washer Bushings: Bridge bearing neoprene washer insert to provide isolation between anchor bolt and washer from support member/equipment. Mason Series HG (or approved).

#### 2.3 SPRING ISOLATORS

- A . General: The load carried by each isolator shall be carefully calculated and isolators selected so that the static deflection will be the same and the supported equipment will remain level. Isolators shall be so designed that the ends of the springs will remain parallel during and after deflection to operating height. At operating height, springs shall have additional travel to complete (solid) compression equal to at least 50 percent of the operating deflection. Suspension isolator springs shall have a static deflection not less than 1-inch (unless noted otherwise), except that for units with components rotating at 1000 rpm and less, the static deflection shall be not less than 2-inches (unless noted otherwise). Floor isolator springs shall have deflection of not less than 1-inch. All isolators shall provide at least 95% isolation efficiency. Deflections other than these may be used where circumstances warrant and more optimum isolation results can be achieved; provided that a written explanation is submitted for Engineer review and approval.
- B . Suspension Type Spring Isolators: Shall consist of a rigid steel frame with a stable steel spring in the bottom part of the frame, and double deflection neoprene (or rubber) isolating pad at the top of the frame. Where supporting rods pass through the frame, a clearance of not less than one-half rod diameter shall be provided all around the rod and neoprene bushings provided to prevent steel to steel contact. Mason Series DNHS or Series 30N (or approved).

## 2.4 SEISMIC RESTRAINTS

- A. General: Comply with code, SMACNA-SRM and MASON.
- B. Materials:

- Steel shall be per ASTM A36; hangers and other devices shall be per Section 20 05 29 and as shown in SMACNA-SRM or MASON. Sheet metal used for bracing shall be no less than 16 gauge. Material for straps shall be galvanized steel, no less than 18 gauge.
- 2. Cabling: Cables shall be minimum 1/8" diameter, 7 x 19 strand, galvanized steel with clear vinyl coating. Provide with galvanized thimble, clamps, and accessories. End termination and clamping/application shall comply with SMACNA-SRM.

#### C . Flexible Connectors:

- 1. Piping Systems:
  - a. Flexible Connectors: As specified in Section 20 05 19.
  - b. Seismic "V" Connectors: "V" design connector with braided hose and attachment fittings. Shall be constructed of type 321 stainless steel hose and braid with carbon steel elbows and ends (for steel piping systems); and bronze hose and braid with copper elbows and ends (for copper piping systems). Unit shall allow for 2" movement in all planes, and have minimum 150 psi working pressure at the system temperature installed. Unisource Manufacturing (or approved).
- 2. Ductwork: Flexible connectors as specified in Section 23 33 00.

#### **PART 3 - EXECUTION**

## 3.1 VIBRATION ISOLATION

- A . General: Provide vibration isolators for all rotating equipment so that no vibration is transmitted to the structure. Isolators shall be the type indicated; except where not shown, type shall be as selected by vibration isolation manufacturer (or equipment manufacturer) to provide adequate isolation.
- B. Installation: Install all vibration isolators in accordance with isolator manufacturer's instructions and isolated equipment manufacturer's recommendations.
- C . Inadequate Isolation: Should vibration isolators prove inadequate to prevent transmission of vibrations to the building structure or limit equipment vibration generated noise, such isolators shall be replaced with isolators having the largest deflection that can be practically installed or otherwise modified/replaced to produce satisfactory isolation. Such replacement shall be at no additional cost to the Owner.
- D. Equipment with Rotating Components not Requiring Isolation:
  - 1. In-line and sump type pumps.
  - 2. Split system ductless air conditioning and heat pump units; indoor portion.
  - 3. Grade mounted condensers.

## 3.2 SEISMIC RESTRAINTS

A . General: Provide seismic restraints as required by code and as specified. Comply with SMACNA-SRM, MASON, and code referenced standards for seismic provisions. Anchoring system and restraints shall be able to withstand anticipated seismic forces. Coordinate with equipment manufacturers for proper equipment anchor attachments to withstand anticipated forces. Coordinate with project structural engineer for attachment of seismic restraints to building.

- B. Piping: Longitudinal and transverse bracing shall be required for all piping 2-1/2-inch diameter and larger and on all fuel gas piping 1-inch and larger. Bracing shall be applied as follows:
  - 1. Transverse bracing shall occur at maximum intervals of 40 feet, except on fuel gas piping on maximum intervals of 20 feet.
  - 2. Longitudinal bracing shall occur at maximum intervals of 80 feet, except on fuel gas piping on maximum intervals of 40 feet. Transverse bracing for one pipe section may also act as a longitudinal bracing for a pipe section connected perpendicular to it, if the bracing is installed within 2 feet of the elbow or tee of similar size. Piping conveying fluids at 100 degrees F and higher shall have expansion devices provided in-between longitudinal braces to allow for thermal expansion.
  - 3. Bracing may be omitted when the top of the pipe is suspended 12 inches or less from the supporting structural member and the pipe is suspended by an individual hanger, per code.
- C . Ductwork: Longitudinal and transverse bracing shall be required for all round ducts 28 inches in diameter and larger, for rectangular ducts 6 square feet and larger, and on all duct systems used for life safety and smoke control installed in either the horizontal or vertical position. Bracing shall be applied as follows:
  - 1. Transverse bracing shall occur at maximum intervals of 30 feet (20 feet for essential facilities), at each duct turn and at the end of a duct run.
  - Longitudinal bracing shall occur at maximum intervals of 60 feet (40 feet for essential facilities). Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it, if bracing is installed within 4 feet of the intersection and sized and installed on the larger duct.
  - Groups of ducts may be combined in a larger size frame using overall dimensions and maximum weight of ducts. At least two sides of each duct must be connected to the angles of the brace.
  - 4. Walls, including non-bearing fixed partitions which have ducts running through them, may replace a transverse brace.
  - 5. Bracing may be omitted when the top of the duct is suspended 12 inches or less from the supporting structural members and on roof top ductwork.

# D. Equipment:

- 1. Equipment Not Requiring External Vibration Isolation:
  - a. General: Shall be rigidly connected to the structure per Section 20 05 29. Restraints (where required) shall utilize welded steel frames, steel braces, straps, or cables. Provide elastomeric (or neoprene) pads (1/4" thick) between seismic straps and equipment.
  - b. Base Mounted Equipment:
    - 1) Provide anchorage per Section 20 05 29 and bracing as needed to maintain equipment anchorage with anticipated seismic forces.
    - 2) All equipment shall have seismic bracing where the height of the equipment is 3 or more times the smallest base dimension and where the equipment anchorage alone is not adequate to maintain equipment anchorage with anticipated seismic forces.
    - 3) All water heaters shall have seismic bracing. Equipment which utilizes (or contains) flammables, combustibles, or hazardous materials shall have

seismic bracing where the equipment anchorage alone is not adequate to resist anticipated seismic forces.

- c. Other Equipment: All equipment located 31" or more from the point of attachment to the supporting structure shall have seismic bracing. Equipment which utilizes (or contains) flammables, combustibles, or hazardous materials shall have seismic bracing.
- 2. Equipment with External Vibration Isolation:
  - a. General: Restraints shall not impede operation of vibration isolators, and shall use methods complying with SMACNA-SRM or MASON.
  - b. Base Mounted Equipment:
    - All equipment shall have seismic bracing where the height of the equipment is 3 or more times the smallest base dimension and where the equipment vibration isolation components are not adequate to maintain equipment in place with anticipated seismic forces.
    - Provide housed spring isolators, seismic snubbers, padded welded steel angle restraint assembly (with minimum 1/4" clearance between pad and equipment), or slack cable restraints.
  - c. Other Equipment:
    - All equipment located 31" or more from the supporting structure shall have seismic bracing. Equipment which utilizes (or contains) flammables, combustibles, or hazardous materials shall have shall have seismic bracing.
    - Utilize slacked cable bracing to accommodate equipment movement due to vibration isolator operation but installed so as to prevent more than 2-inch movement in any direction.

## E. Bracing Arrangements:

- 1. Do not use branch ducts or piping to brace main runs or consider as braces for equipment.
- 2. Do not brace items to dissimilar parts of a building or dissimilar building systems that may respond in a different mode during an earthquake. (Examples: wall and roof, solid concrete wall and lightweight roof, existing building structure and new isolated building structure.)
- F. Building Expansion Joints: At building expansion joint crossings, provide seismic "V" connectors in piping allowing at least 1 inch movement in all directions and flexible connectors in ductwork (on both sides of expansion joint) allowing at least 1/2 inch movement in all directions. Provide multiple connectors as required. Provide flexible connectors in ductwork in four places, and of sufficient length to allow relative duct movement (i.e. from one side of building expansion joint to the other) of at least 1-inch in all directions; provide hanger types that will not hinder such movement.

# 3.3 TEST AND INSPECTION

- A . Field Inspections: Prior to initial operation, the vibration isolators and seismic devices shall be inspected for conformance to drawings, specifications, and manufacturer's data and instructions. Check all flexible connectors/expansion devices for proper location, guiding, and end anchoring.
- B. Vibration Isolator Inspection: After installation of isolators and seismic restraint devices, remove all shipping blocks and other items that may prevent proper isolator operation.

Inspect isolators to verify that the machinery moves freely on its spring isolators within limits of stops or seismic restraint devices. Eliminate or correct interferences.

C . Tests: Check for vibration and noise transmission through connections, piping, ductwork, foundations, and walls. Adjust, repair, or replace isolators as required to reduce vibration and noise transmissions to specified levels. Re-balance, adjust, or replace machinery with noise or vibration levels in excess of those given in the machinery specifications or machinery manufacturer's data. Check for proper operation of expansion devices and associated items during system warm-up.

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

#### 1.2 WORK INCLUDED

- A. Air Balancing.
- B. Plumbing System Water Balancing.
- C. Report.

#### 1.3 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Company: Submit name of Company proposed to do the balancing and sample balancing forms. Where the Company has not been pre-qualified, and substitutions are allowed after bidding (see Division 00 and 01), submit information regarding firm qualifications.
- C . Personnel: Submit list of personnel that will be assigned to the project and their qualifications, and list of past projects.
- D. Reports: Preliminary and final balancing reports.

# 1.4 REFERENCES

- A . AABC-NS: Associated Air Balance Council, National Standards for Field Measurements and Instrumentation.
- B. ASHRAE: Handbook of Fundamentals.
- C . ACGIH-IV: American Conference of Governmental Industrial Hygienists, Industrial Ventilation, A Manual of Recommended Practice.
- D. NEEB-PS: National Environmental Balancing Bureau Procedural Standard for Testing, Adjusting and Balancing Environmental Systems.

# 1.5 GENERAL REQUIREMENTS

- A . General: Balancing shall be done by a company which specializes in this type of work and is totally independent and separate from the Company which has installed the systems to be balanced.
- B. Balancers Qualifications:
  - 1. General: Work of this Section shall be performed by balancing firms meeting the following and having prior approval from the Engineer:

- Professional Affiliation: Firm shall be an Associated Air Balance Council (AABC) member balancer or National Environmental Balancing Bureau (NEBB) certified balancer.
- b. Experience: Firm shall have satisfactorily completed the balancing work for at least 5 similar projects in the last 3 years. Similar is defined to mean: within 10% of the same quantity of units and air inlets/outlets, involve same type of systems, be the same type of facility (i.e. school, hospital, etc.). The lead field balancer (i.e. the individual who will be on site directing and participating in the balancing efforts) shall have at least 5 years of experience performing balancing work on similar projects.
- c. References: Have five references for similar projects which have been completed in the last three years that will give a good or better performance rating. References shall be engineers, architects, or building owners. As part of the qualification process at least three of these references will be contacted and a rating obtained for the following: timeliness of work (i.e. able to complete work on schedule), cooperative nature of balancer's staff (i.e. ability to work well as a team with other project trades and professionals), overall quality of balancing work, quality of balancing report. Each item will be rated on a scale of 1 to 5 (5 being excellent), with the result averaged, score must be of 4 or better.
- Pre-Qualified Balancers: As a convenience to the Contractor, the following balancing
  firms have been pre-qualified. This is not in any way intended to limit competition or
  prevent other firms from submitting qualifications, but is intended as an aid to
  Contractors by identifying firms that have been confirmed as meeting the qualification
  requirements.
  - a. Neudorfer Engineers
  - b. Hardin and Sons
  - c. Test Comm
  - d. Advanced Mechanical Services
  - e. Testing and Commissioning (TAC) Services
  - f. AccuABC
- 3. Qualification Process: Firms not pre-qualified who desire to perform the balancing work shall submit a substitution request form in accordance with Contract Document requirements (reference Division 00 and 01). In addition to the information required on the substitution request form, submit: Company information, resumes of staff to be assigned, lists of projects, and references (with name of project, staff assigned to project, and contact name and phone number).
- C . Balancing Issues: Notify the Engineer in writing of all problems or discrepancies between actual conditions and what design documents show as work proceeds.
- D . Engineer's Authority: The Balancer shall be directly responsible to the Engineer and shall perform this work and make system adjustments as directed by the Engineer.
- E. Lead Balancer: The Balancer shall assign an individual as "lead balancer" to work in the field to directly supervise the balancing work and field technicians. This lead field balancer shall have at least 5 years of experience performing balancing work on similar projects.
- F. Added Site Visits:

1. Trade Coordination Purposes: The Balancer shall include in his bid two extra site visits (beyond those otherwise included) and associated added time to assess system

- readiness for balancing, resolve system issues, coordinate balancing work, and perform other activities related to balancing and commissioning.
- Engineer Directed: Include in bid one added site visits and 4 hours of field balancing work (each visit), plus report amendment time, to provide added balancing as directed by the Engineer. Such work may occur during the project's construction period or during the warranty period and is solely at the Engineer's discretion.
- G . Commissioning: See Division 01 and Section 20 08 00 for commissioning efforts required by the Balancing Contractor.

#### PART 2 - PRODUCTS

#### 2.1 GENERAL INSTRUMENTATION

- A . General: Balancing equipment shall comply with Associated Air Balance Council recommendations for field measurement instrumentation.
- B. Calibration: All measuring instruments shall be accurately calibrated and maintained in good working order. Calibration dates and certifications shall be available at Engineer's request.
- C . Instruments: Shall be capable of:
  - 1. Air velocity instruments, direct reading in feet per minute with 2% accuracy.
  - 2. Static pressure instruments, direct reading in inches water gauge with 2% accuracy.
  - 3. Tachometers, direct reading in revolutions per minute with 1/2% accuracy; or revolution counter accurate with 2 counts per 1.000.
  - 4. Thermometers, direct reading in degrees Fahrenheit with 1/10 of a degree accuracy.
  - 5. Pressure gauges, direct reading in feet of water or psig with 1/2% accuracy.
  - 6. Water flow instruments, direct reading in feet of water or psig with 1/2% accuracy suitable for readout of balancing valve provided.
- D. Potable Water: Instruments used in contact with potable water shall be cleaned and disinfected before use with a chlorine solution.

# **PART 3 - EXECUTION**

#### 3.1 GENERAL

A. Workmanship: All measurements and adjustments shall be in accordance with AABC-NS, NEEB-PS, and ACGIH-IV and recognized best balancing procedures. Measurements and adjustments of equipment shall be executed in a manner consistent with the manufacturer's recommendations.

#### B. Flow Rates:

- General: All air and water systems shall be completely balanced and adjusted to provide the flow rates indicated (within tolerances indicated in this specification Section), and to produce an even heating and cooling effect and control response and to produce even water circulation.
- Balancer Determined: Where flow rates have not been indicated the balancer shall determine such flow rates using acceptable practices in accordance with AABC-NS,

NEEB-PS, and ASHRAE standards and submit the proposed flow rates to the Engineer for review.

- 3. Confirmation: Prior to beginning balancing confirm any flow rate changes since design with the submittals and flow rates indicated therein, and with the Engineer to confirm changes made since design. Assume that new flow rates will be issued.
- C . Controls: Consult and coordinate with the Control Contractor for the adjustment and setting of all control devices to allow for the balancing work, and for proper system operation and proper flow rates. Set all controls and valves as required to maintain design flow rates and temperatures as shown on the drawings. Make measurements and provide data to the Control Contractor to allow for proper control of items.
- D. Comfort Adjustments: Make final adjustments for flow rates in order to optimize each space's comfort, including such considerations as temperature, drafts, noise, pressurization, and air changes. Where variances are made from design values, state reasons in report (e.g., "too noisy", "too drafty," etc.). All such variances are subject to approval by the Architect/Engineer.
- E . Deficiency Reports: Submit deficiency reports where the work does not allow balancing to occur or balancing issues develop. Indicate date, system and equipment involved, location, description of deficiency, and related information to allow for diagnosing the problem. Provide suggestions for resolution where possible.

#### 3.2 AIR BALANCING

- A. Pre-check of System: Prior to beginning balancing, perform, as a minimum, the following:
  - Verify that clean filters have been installed, that system is free from debris, and that all inlets/outlets are not obstructed.
  - 2. Check all fans and equipment to verify that proper start-up and system preparation has been done by the installing contractor.
  - 3. Check all door/window and similar building opening status to insure building is ready and proper pressurization can be obtained.
  - 4. Open all dampers to full flow position, check positions and operation of all motorized dampers to allow full system flows.
  - 5. Review controls and sequences of operation.
- B. Tolerances: All air flow rates (supply, return, and exhaust) shall be adjusted to within plus 5 percent and minus 5 percent of the values shown in the contract documents, except that relative space-to-space pressure relationships shall always be maintained (e.g., restrooms shall be negative relative to other areas, general offices shall be positive, etc.).
- C . Draft and Noise Adjustments: All diffusers, grilles, and registers shall be adjusted to minimize drafts and to eliminate objectionable noise.
- D. Filters: Air balancing shall be done with new, clean air filters installed. Adjust air deliveries so that design quantities will be obtained when filters are half dirty. This condition shall be simulated by covering a portion of the filter area.
- E. Fan Speeds and Drives:
  - Adjust fan speeds and fan drives (adjustable sheaves) as required to produce design flow rates.

2. Adjust belts for proper tension.

- F. Marking: Upon completion of flow readings and adjustments permanently mark the balanced position of all balancing valves by stamping the indicator plate of the valve.
- G. Duct Traverse: Rectangular duct traverses shall measure the center of equal areas in the air flow stream, with centers not more than 6 inches apart. Round duct traverses shall measure at least 20 locations, with locations being the centers of equal annular area. Reference ACGIH Industrial Ventilation Manual.
- H. One Open Run: Balance each branch run so that there is at least one wide open run; balance branches relative to one another so that at least one branch damper is wide open (except that where unique conditions exist, and the Engineer gives prior approval, one open damper on runs or branches is not required).
- I. Data: Data to be measured/recorded and provided in report for all air handling systems and equipment:
  - 1. Floor plans clearly showing and identifying all diffusers, grilles, OA louvers, ducts and all other items where air flow rates were measured.
  - 2. Identify manufacturer, model number, size, and type of all air inlets/outlets.
  - 3. Initial, trial, and final air flow measurements for all diffusers, grilles, OA louvers, ducts, and all other items where air flow rates were measured.
  - 4. Design air flow rates and percentage final air flow rates are of design values.
  - 5. Final damper (or other balance device) final position (as a percentage of full open).
  - 6. The connected voltage and corresponding nameplate full load amps, and the initial and final amperages of all fan motors.
  - 7. Initial and final RPMs of all fans.
  - 8. Static pressures on inlet and outlet of all fans.
  - 9. Fan initial and final CFMs.
  - 10. Outdoor air CFMs (record minimum and maximum values).
  - 11. Entering and leaving air temperatures across coils with coils operating at 100% capacity.
  - 12. Static pressure drop across each filter bank and coil.
  - 13. Final position of any speed controls (as percent of full).
  - 14. In addition to data noted elsewhere, provide the following for all equipment which are part of balanced systems:
    - a. Equipment name and number (as used on drawings).
    - b. Service.
    - c. Equipment manufacturer and model number.
    - d. Sheave and belt sizes (where applicable).
    - e. Filters sizes and quantities (where applicable).
    - f. Motor manufacturer and complete nameplate data.
    - g. Design operating conditions.
    - h. Actual operating conditions (flows, pressure drops, rpm, etc.).

J. Main Duct Airflows: Air flow measurements in main ducts shall be made with a duct traverse using a pitot tube and micromanometer. Summation of air terminal outlets and inlets is not sufficient. Quantity of duct leakage (difference between main duct airflow and sum of air inlets/outlets) shall be indicated.

#### 3.3 WATER BALANCING - PLUMBING

- A. Pre-check of System: Prior to beginning balancing, perform, as a minimum, the following:
  - 1. Verify that all strainers have been cleaned.
  - 2. Examine fluid in system to verify system condition; balancing is to occur before system disinfection but with system in adequate clean condition.
  - 3. Check for proper rotation and operation of all pumps.
  - Verify that expansion tanks are not air bound and properly charged and that system is full of fluid.
  - 5. Remove air from the circulating system by opening all fixture valves to full flow position allowing system to flow.
  - 6. Check equipment for proper start-up and system operation.
  - 7. Review controls and sequences of operation.
- B. Tolerances: All water flow rates shall be adjusted to within plus 10 percent and minus 10 percent of the values shown in the contract documents (or as determined by the balancer where not indicated).
- C . Domestic Hot Water Systems: Balance domestic hot water system to provide even flow distribution to allow hot water to reach all fixtures. Use only clean instruments on system and perform balance prior to sterilizing of system. Where flow rates are not indicated, proportion pump water flow rate based on the linear footage of system served.
- D . Marking: Upon completion of flow readings and adjustments permanently mark all settings of balancing valves.
- E. Data to be measured/recorded and provided in report:
  - 1. Floor plans or schematics showing and identifying all valves, coils, pumps and other items where temperatures, pressure drops, or water flow rates were measured.
  - 2. Identify manufacturer, model number, size and type for all balancing devices.
  - 3. Initial, trial, and final water flow measurements (pressure drops, temperatures, and GPMs) for all items where measurements were made.
  - 4. Design water flow rates, and percentage final water flows are of design values.
  - 5. The connected voltage and corresponding nameplate full load amps, and the initial and final amperages of all pump motors.
  - 6. Pump operating suction and discharge pressures and final total developed head.
  - 7. Pump initial and final GPMs.
  - 8. Final position of all valves (percent open or setting position on valve).
  - 9. Final position of any speed controls (as percent of full).
  - 10. In addition to data noted elsewhere, provide the following for all equipment which are part of balanced systems:

- Equipment name and number (as used on drawings).
- b. Service.
- c. Equipment manufacturers and model number.
- Equipment capacities.
- e. Motor manufacturer and complete nameplate data.
- f. Design operating conditions.
- g. Actual operating conditions (flows, pressure drops, etc.).

#### 3.4 BALANCING REPORT

- A . General: A balancing report shall be submitted as specified herein, documenting all balancing procedures and measurements.
- B. Report Organization: The report shall be divided into logical sections consistent with the building or system layout (i.e. by floors, building wings, air handling units, or other convenient way). Tabulate data separately for each system. Describe balancing method used for each system.
- C . Preliminary Report: Two preliminary review copies of the balancing report shall be submitted to the Architect/Engineer when the balancing work is 90% complete (or as near 90% complete as possible due to uncompleted work of other trades). In addition to containing all the information required of the final report, the preliminary report shall contain a list of all the work required of other trades in order to allow the balancing work to be completed. The Architect/Engineer will review the preliminary report and inform the Contractor of any additional items or revisions required for the final report. Preliminary reports may be omitted where the Architect/Engineer grants approval.
- D . Final Report: Shall be included in the Operation and Maintenance Manual. Submit reports to Contractor for inclusion in Manuals (or, when manuals have been already sent to Engineer, send report to Engineer who will insert report into Manual). Provide number of reports as required to match quantity of O&M Manuals, but in no case less than five.
- E . Format: 8-1/2" x 11" size, neat, clean copies, drawings accordion folded. Report shall be typed, shall have a title page, table of contents, and divider sheets with identification tabs between sections. Information shall be placed in a three hole notebook, with the front cover labeled with the name of the Job, Owner, Architect/Engineer, Balancing Contractor, and Report Date.
- F. Electronic Copy: Provide copy of reports in \*.pdf format; submit final report with closeout documents per Divisions 00 and 01. Provide two CD's with each having an electronic copy of the report in pdf file format. Label CD neatly same report labeling. Provide electronic pdf files to others for inclusion in electronic record documents.
- G. General Balancing Information Required:
  - 1. At the beginning of the report, include a summary of problems encountered, deviations from design, remaining problems, recommendations, and comments.
  - 2. List of instruments used in making the measurements and instrument calibration data.
  - 3. Names of personnel performing measurements.
  - 4. Explanation of procedures used in making measurements and balancing each system.

- 5. List of all correction factors used for all diffusers, grilles, valves, venturi meters, and any other correction factors used.
- 6. Areas where difficulties were encountered in obtaining design flow rates, or where unstable operating conditions may exist.
- 7. Note any parts of the system where objectionable drafts or noises may be present and efforts made to eliminate same and why they may still be present.
- 8. Note where variances from design values occur; explain why.
- 9. All specified measurements, balancing data, any additional recorded data, and observations.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

#### 1.2 WORK INCLUDED

- A. Duct Insulation.
- B. Pipe Insulation.
- C. Equipment and Specialties Insulation.
- D. Acoustical Wrap.

#### 1.3 DEFINITIONS

- A. R: Thermal resistance of insulation, in units of hr-sf-deg F/Btu.
- B. Rainleader Piping: Any piping or conduit that is used to carry rain water, including overflow drain piping, that is located within the building or enclosed by any building construction.
- C . Subject to Damage: Items installed exposed less than 8 feet above the walking surface (i.e. floor, platform, roof, grade, etc.) adjacent to the item.
- D. Cold Surfaces: Surfaces that will have operating temperatures below the temperature of the surrounding air by at least 5 deg F or more; includes chilled water piping, cooling condensate piping, air conditioning ductwork, outdoor air ductwork, and similar systems. Surfaces shall be considered a cold surface unless specifically indicated otherwise.

# 1.4 QUALITY ASSURANCE

A . All insulation and materials shall have a fire hazard rating not to exceed 25 for flame spread and 50 for smoke development, as tested by ASTM E 84, NFPA 255, and UL 723.

#### 1.5 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Product Data: Provide product data on all insulation materials to be used. Indicate thicknesses to be used.

# 1.6 GENERAL REQUIREMENTS

A . Code Compliance: Contractor shall insulate all systems with the materials and thicknesses as required by code, but in no case shall the insulation be less than that specified herein. In some cases the specified insulation exceeds code, and shall be provided as specified. Not all systems requiring insulation by code are specified, but shall be provided with insulation where required by code.

- B. Insulation at Hangers: Insulation shall be continuous through hangers on all insulated systems (except ductwork). Inserts at hangers are specified in Section 20 05 29 and are considered as part of the hanger and support system. Inserts are required to be installed at the time of pipe installation and are intended to be installed by the Contractor installing the pipe hangers/supports. See Section 20 05 29.
- C . All adhesives, sealants, mastics and similar materials shall be low-VOC type, and comply with USGBC LEED requirements.

#### 1.7 REFERENCES

- A . ASTM A 653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
- B. ASTM B 209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C . ASTM C 411: Standard Test method for Hot-Surface Performance of High Temperature Thermal Insulation.
- D. ASTM C 547: Standard Specification for Mineral Fiber Pipe Insulation.
- E . ASTM C 1136: Standard Specifications for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- F . ASTM C 1290: Standard Specification For Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
- G. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. NCIIS: National Commercial & Industrial Insulation Standards, published by Midwest Insulation Contractors Association, 5th Edition.
- I. NFPA 255: Standard Method of Test of Surface Burning Characteristics of Building Materials.
- J. UL 723: Tests for Surface Burning of Building Materials.
- K . USGBC LEED: US Green Building Council, LEED Reference Guide for Green Building Design and Construction.

## **PART 2 - PRODUCTS**

# 2.1 ACCEPTABLE MANUFACTURERS

- A . Products shall comply with Section 20 05 00, Paragraph Part 2.01, Acceptable Manufacturers.
- B. Insulation: Johns Manville, Armacell, Owens-Corning, Knauf, Rubatex, Aeroflex, Pittsburgh Corning, GLT, Halstead, Gilsulate, Manson.
- C . Accessories: Johns Manville, Armacell, Owens-Corning, Knauf, Rubatex, Aeroflex, Pittsburgh Corning, GLT, Halstead, Duro Dyne, Gustin Bacon, Childers, RPR, Tee Cee, Lewco Specialty Products, JPS, Buckaroos, Manson.

D. Acoustical Wrap: Kinetics Noise Control.

# 2.2 DUCT INSULATION

#### A. Flexible Glass Fiber:

- Type: Flexible blanket type, constructed of inorganic glass fibers bonded by a thermosetting resin, complying with ASTM C 1290, Type III. Johns Manville "Microlite" (or approved).
- 2. Jacket: FSK type, vapor proof, consisting of an aluminum foil cover reinforced with glass fiber mesh, and laminated to kraft. Water vapor permeance shall not exceed 0.05 perms. Provide with joint sealing tape, minimum 2 inches wide, constructed of jacket material with adhesive to seal all joints.
- 3. Thermal Conductivity: Shall not exceed 0.27 Btu-in/hr-sq ft-deg F at 75 deg F.
- Operating Limits: 40 degrees F to 250 deg F.

## B. Rigid Glass Fiber:

- 1. Type: Rigid board type, constructed of inorganic glass fibers bonded by a thermosetting resin, complying with ASTM C 612, Type 1A and 1B. Johns Manville "800 series Spin-Glas".
- 2. Jacket: FSK type, vapor proof, consisting of an aluminum foil cover reinforced with glass fiber mesh, and laminated to kraft. Water vapor permeance shall not exceed 0.05 perms. Provide with joint sealing tape constructed of jacket material with adhesive to seal all joints.
- 3. Thermal Conductivity: Shall not exceed 0.23 Btu-in/hr-sq ft-deg F at 75 deg F.
- 4. Operating Temperature Limits: 40 deg F to 450 deg F.
- C . Corner Angles: 0.016 inch thick aluminum, alloy 3003 or 5005, with factory applied Kraft backing, complying with ASTM B 209.
- D. Weather Barrier Mastic: Water based vinyl-acrylic mastic for outdoor weather protection of thermal insulation; fire resistant, UV deterioration resistant. Childers "Vi-cryl" (or approved equal).
- E . Glass Fiber Mesh: Open weave glass fiber reinforcing mesh for use with insulation coatings to bridge gaps and add strength to the coating. Minimum 5 strands x 5 strands per square inch. Non-combustible Childers "Chil-Glas" (or approved equal).

## F. Metal Jacket:

- 1. Steel: Minimum 24 gauge galvanized steel complying with ASTM A 653. Provide with longitudinal slip joints and 2-inch laps.
- 2. Aluminum: Minimum 0.020-inch thick aluminum, alloy 3003 or 5005, complying with ASTM B 209. Provide with longitudinal slip joints and 2-inch laps.
- G . PVC Jacket: UV resistant polyvinyl chloride covering, minimum 20 mil thick, with joints secured and sealed with "Perma-Weld" Adhesive. Johns Manville "Zeston 300" (or approved).

#### H. Duct Insulation Types:

- 1. Aboveground-Inside Buildings:
  - a. Exposed-Subject to Damage:
    - 1) Rectangular Ducts: Rigid glass fiber with metal corner angles.

- 2) Round/Oval Ducts: Flexible glass fiber with PVC or metal jacket.
- b. Exposed Not Subject to Damage: Flexible glass fiber.
- c. Concealed: Flexible glass fiber.

#### I. Duct Insulation Thickness:

- 1. General: Provide insulation densities and thicknesses to achieve the R values cited below. R values are for the insulation only, in their installed thickness, considering installed duct wrap stretch and in accordance with code.
- Lining: Where ducts have internal lining, the insulating properties of the lining may be credited toward meeting the required insulation R value; use R-3.65 per inch of installed liner.
- 3. Supply Air Ductwork:
  - a. Inside Building and Within Building's Thermal Envelope: R-3.3 (except where ran exposed in conditioned spaces, no insulation is required).
  - b. Inside Building But Not Within Building's Thermal Envelope: R-7.3.

#### 4. Return Air Ductwork:

- a. Inside Building and Within Building's Thermal Envelope: No insulation required; except where duct contains air that may vary by 10 deg F or more from the space the duct passes through, R-3.3 insulation shall be provided.
- b. Inside Building But Not Within Building's Thermal Envelope: R-7.3.
- 5. Outside Air Ductwork: Shall be insulated same as required for the building envelope; except where allowed by code to be insulated less than the building envelope, shall be R-8; insulation is not required where duct run outside the building.
- Exhaust, Relief, and Special Ductwork:
  - a. Inside Building and Within Building's Thermal Envelope:
    - 1) Temperature of Air in Duct within 10 Deg F of Temperature of Air in Spaces Duct Passes Through: No insulation required except ductwork from the system's backdraft damper (or motorized damper) to outside the building shall be insulated same as required for the building envelope.
    - 2) Temperature of Air in Duct more than 10 Deg F Different from temperature of Air in Spaces Duct Passes Through: R-8.3; except ductwork from the system's backdraft damper (or motorized damper) to outside the building shall be insulated same as required for the building envelope (but no less than R-8.3).
  - b. Inside Building But Not Within Building's Thermal Envelope: R-8.3.

#### 2.3 PIPE INSULATION

## A. Glass Fiber:

- Type: Rigid molded type, constructed of glass fibers bonded by a thermosetting resin, complying with ASTM C 547 Type I. Insulation factory molded to match pipe size applied to. Johns Manville "Micro-Lok" (or approved).
- Jacket: ASJ type, vapor proof, consisting of a white kraft paper cover reinforced with glass fiber and bonded to aluminum foil, with longitudinal self sealing closure system. Provide with butt strips constructed of jacket material with adhesive to seal all joints. Water vapor permeance shall not exceed 0.02 perms.

- 3. Thermal Conductivity: Shall not exceed 0.24 Btu-in/ hr-sq ft-deg F at 75 deg F.
- 4. Operating Temperatures: 0 deg F to 850 deg F.

#### B. Elastomeric Insulation:

- 1. Type: Flexible cellular elastomeric insulation, factory formed to match pipe sizes applied to, complying with ASTM C 534, Type 1. Armacell "AP/Armaflex SS" (or approved).
- 2. Thermal Conductivity: Shall not exceed 0.27 Btu-in/ hr-sq ft-deg F at 75 deg F.
- 3. Water Vapor Transmission: Water vapor permeance shall not exceed 0.08 perms.
- 4. Operating Temperatures: -200 deg F to 220 deg F; shall be able to withstand 250 deg F temperatures for 96 hours per ASTM C 411 without damage or deformation.
- 5. Weather Protection: Where installed outdoors provide with metal jacketing to protect from UV and weather exposure.

#### C. Cellular Glass Insulation:

- 1. Type: Rigid closed-cell glass insulation, factory formed to match pipe size applied to. Pittsburgh Corning "Foamglas" (or approved).
- 2. Jacket: Field applied heat sealable water-proof jacketing, consisting of 3 layers of a polyer modified bituminous compound separated by glass fiber reinforcement and aluminum foil. Water vapor permeance shall not exceed 0.00 perms. Pittsburgh Corning "Pittwrap" (or approved).
- 3. Thermal Conductivity: Shall not exceed 0.29 Btu-in/ hr-sq ft-deg F at 75 deg F.
- 4. Operating Temperatures: -450 deg F to 900 deg F.
- 5. Compressive Strength: 90 psi.
- D . Pipe Fittings: Shall be covered using any one of the following methods of the Contractor's choice:
  - 1. Prefabricated segments of pipe insulation of same materials and thickness as the adjoining pipe insulation, formed to match pipe fitting.
  - Pre-cut fiberglass insulation and pre-molded high impact, gloss white, UV resistant, minimum 20 mil thick, PVC covers suitable for the pipe size and insulation thickness application, PVC cover shall be Johns Manville "Zeston 2000 PVC" (or approved).
  - 3. Insulating plastic cement brought up the full height of the adjacent covering.
  - 4. Except, where colored PVC jacketing is applied to piping, fittings shall use PVC covers of the same thickness and color as the PVC jacketing specified for the piping.
- E. Metal Jacket: Aluminum roll jacketing, factory formed to match pipe size and insulation application, with smooth surface, manufactured from 3003 or 5005 aluminum alloy, H-14 temper, conforming to ASTM B 209. Shall be minimum 0.020 inches thick, with an integrally bonded interior 1 mil thick heat bonded polyethylene moisture barrier over the entire surface in contact with the insulation. Fitting covers shall be fabricated of same material as pipe runs, factory formed to match fitting.
- F. PVC Jacket: Pre-molded 30 mil thick PVC jacket; size and shape to match piping and fittings applied to. Johns Manville "Zeston Series 2000" (or approved). Provide in white color.
- G. Pipe Insulation Types:

1. Aboveground-Inside Building:

- Cooling Coil Condensate: Glass fiber or elastomeric.
- b. Refrigerant Piping: Elastomeric.
- Other Systems: Glass fiber.
- Aboveground-Outside Building: Same as specified above, with metal jacket.
- Metal and PVC Jacketing: See "Part 3 Execution".

## H. Pipe Insulation Thickness:

1. General: Provide minimum piping insulation thickness indicated, in inches.

INSULATION THICKNESS (INCHES)					
Nominal Pipe Diameter (Inches)					
Fluid Design Operating Range, deg F	<u>&lt;1</u>	1 to <1-1/2	1-1/2 to <4	4 to <8	≥8
Above 350 251 - 350 201 - 250 141 - 200	4.5 3.0 2.5 1.5	5.0 4.0 2.5 1.5	5.0 4.5 2.5 2.0	5.0 4.5 3.0 2.0	5.0 4.5 3.0 2.0
61 - 140 40 - 60 Below 40	1.0 0.5 0.5	1.0 0.5 1.0	1.5 1.0 1.0	1.5 1.0 1.0	1.5 1.0 1.5

# ......

- Varying Temperatures: Where a system operates over temperature ranges calling for different insulation thicknesses, the thicker insulation requirements shall be met.
- Condensate: Cooling system condensate piping (i.e. from a cooling coil) shall be considered to operate at 50 deg F.
- Rainleader: Rainleader piping shall be considered to operate at 55 deg F. 4.
- Refrigerant Piping for VRF systems: Refrigerant piping (both RG and RL piping) serving an evaporator (i.e. heat pump) shall be considered to operate at 40 deg F. Low pressure piping (RG piping) between the Branch Circuit Controller and Condensing unit shall be considered to operate at 40 deg F, or shall receive 1-inch thickness, whichever is greater. High pressure piping (RL piping) between the Branch Circuit Controller and Condensing unit shall be considered to operate at 40 deg F, or shall receive 1/2-inch thickness, whichever is greater.
- Outdoor Piping: Piping exposed to outside air or, located outside the building/thermal envelope, shall have insulation thickness increased by 0.5 inch from that indicated above. Elastomeric insulation may be used in lieu of fiberglass, provided the insulation is manufacturer approved for temperature of the insulated piping system and application.
- Cold Water: Cold water piping shall be considered to operate at 56 deg F (unless noted otherwise).

#### 2.4 **EQUIPMENT AND SPECIALTIES INSULATION**

A. P-traps and HW/CW Lines on ADA Compliant Sinks and Lavatories: Prefabricated insulation specially designed for p-trap application, with white elastomeric insulation, white high gloss pvc cover, and velcro closure. Provide section for insulating HW stop and CW stop and associated piping of same material. McGuire "Pro-Wrap" (or approved).

#### B. Flexible Glass Fiber:

- Type: Flexible blanket insulation, constructed of inorganic glass fibers bonded by a thermosetting resin, complying with ASTM C 553, Type III. Johns Manville "812 Spin-Glas" (or approved).
- 2. Jacket: FSK type, vapor proof, consisting of an aluminum foil cover reinforced with glass fiber mesh, and laminated to kraft. Water vapor permeance shall not exceed 0.05 perms. Provide with joint sealing tape constructed of jacket material with adhesive to seal all joints.
- 3. Thermal Conductivity: Shall not exceed 0.24 Btu-in/ hr-sq ft-deg F at 75 deg F.
- 4. Operating Temperature Limits: 40 deg F to 450 deg F.
- 5. Density: 1.5 lb/cu ft.

# C . Semi-Rigid Glass Fiber:

- Type: Semi-rigid board insulation, constructed of inorganic glass fibers bonded by a thermosetting resin.
- Jacket: ASJ type, vapor proof, consisting of a white kraft paper cover reinforced with glass fiber and bonded to aluminum foil, with longitudinal self sealing closure system. Provide with butt strips constructed of jacket material with adhesive to seal all joints. Water vapor permeance shall not exceed 0.02 perms.
- 3. Thermal Conductivity: Shall not exceed 0.29 Btu-in/hr-sq ft-deg F at 75 deg F.
- 4. Operating Temperature Limits: 0 deg F to 650 deg F.

# D. Elastomeric:

- 1. Type: Flexible cellular elastomeric insulation, complying with ASTM C 534, Type II.
- 2. Thermal Conductivity: Shall not exceed 0.30 Btu-in/ hr-sq ft-deg F at 75 deg F.
- 3. Water Vapor Transmission: Water vapor permeance shall not exceed 0.08 perms.
- 4. Operating Temperatures: -200 deg F to 220 deg F; shall be able to withstand 250 deg F temperatures for 96 hours per ASTM C 411 with damage or deformation.
- 5. Weather Protection: Where installed outdoors provide with metal jacketing to protect from UV and weather exposure.

#### E. Removable Insulation Blankets:

 Type: Flexible blanket insulation pads, for insulating valves, unions, strainers and similar items. Constructed of exterior fabric enclosure sewn around interior insulation, held in position with a closure system that allows for removal of the blanket. Contractor or factory fabricated.

# 2. Enclosure:

- Hot Applications: Silicone impregnated glass fiber cloth; chemical and oil resistant; water proof; flame and abrasion resistant; minimum 20 ounce/square yard weight; rated for 500 degrees F continuous service. Lewco Specialty Products 3000 SA-2 (or approved).
- Cold Application: Silicone impregnated glass fiber cloth; chemical and oil resistant; water proof; flame and abrasion resistant; minimum 20 ounce/square yard weight. Lewco Specialty Products 3000 SA-2 (or approved).
- 3. Insulation: Thermal insulating wool, 1-inch thick, complying with ASTM C 553. Maximum thermal conductivity 0.22 Btu-in/ hr-sq ft-deg F at 75 degrees F. Provide in

- layers to give equivalent R value to the adjacent insulated piping. Owens Corning "Fiberglas Brand TIW, Type II".
- 4. Closure System: Velcro, zipper or steel lacing. Steel lacing anchors shall have spindles and self-locking washers, fabricated of minimum 14 gauge stainless steel, with stainless steel wire ties. AGM Industries "Series NLA" (or approved). Closure shall be configured to allow for complete coverage and closure of the insulation around the object being insulated. Closure for cold surfaces (surfaces that operate below ambient air temperature) shall provide a sealed vapor barrier so that no surfaces are exposed to ambient air and so that no condensation can occur; overlap enclosure ends (or any vapor barrier penetrations, as caused by suing steel lacing anchors) with an added vapor barrier cover, minimum 2-inches past the vapor barrier penetration; with Velcro (or equivalent) closure.
- F. Corner Angles: 0.016 inch thick aluminum, alloy 3003 or 5005, with factory applied Kraft backing, complying with ASTM B 209.

#### G. Metal Jacket:

- Steel: Minimum 24 gauge galvanized steel complying with ASTM A 653. Provide with longitudinal slip joints and 2-inch laps.
- 2. Aluminum: Minimum 0.020-inch thick aluminum, alloy 3003 or 5005, complying with ASTM B 209. Provide with longitudinal slip joints and 2-inch laps.
- H. Equipment and Specialties Insulation Types and Thickness:
  - Unless a specific type of insulation is specified or noted, any of the insulation materials specified in this specification section may be used provided such application is in conformance with NCIIS.
  - Insulation Thickness: Insulation thickness shall be the same as that specified for the
    piping or ductwork connected to the item, or as specified for the system the item is
    installed in (unless noted otherwise). Insulation thickness shall in no case be less than
    1 inch thick.
  - 3. Valves:
    - a. 2 Inches and Smaller: Insulate with same material as piping system.
    - b. 2-1/2 Inches and Larger: Removable blanket insulation.
  - 4. Control Valves: Removable blanket insulation.
  - 5. All equipment and specialties where access is required shall have removable insulation blankets; other removable insulation materials per NCIIS may be used where preapproved by the Engineer. Items requiring such removable insulation include, but are not limited to, the following:
    - a. Strainers.
    - b. Pumps.
    - c. Balancing valves.
  - Roof Drains: 1 inch thick glass fiber.

# 2.5 ACCESSORIES

A . Adhesive, Caulks, Mastics, and Coatings: As recommended by insulation material manufacturer and suited for the application.

- B. Bands: 1/2-inch wide, of stainless steel, galvanized steel, or aluminum construction, to match with materials used with.
- C . Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length shall be as required for insulation thickness used with. Welded pin holding capacity 100 lb, for direct pull perpendicular to the attached surface. Style and type to suit application.
- D. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness used with. Adhesive as recommended by the anchor pin manufacturer as appropriate for surface temperatures and materials used with, and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface. Style and type to suit application.
- E. Breeching Insulation: One layer of 2-inch thick high temperature (rated for 1000 deg. F) flexible glass fiber insulation, with an exterior wrap of 1-inch thick flexible glass fiber insulation.

#### 2.6 ACOUSTICAL WRAP

- A . Type: Composite material having an outer foil faced sound barrier wrap with an internal sound decoupling insulation. Kinetics Noise Control KNM-100ALQ (or equal).
- B. Construction: Outer sound barrier material shall be flexible 1.10 inch thick, 1 lb/sf (minimum) barium sulphate loaded limp vinyl sheet, bonded to an outside layer of aluminum foil. Interior sound decoupling insulation shall be 1 inch think fiber glass batting quilted to a non woven porous scrim-coated glass cloth in a 4 inch diamond stitch pattern. Material shall be suitable for temperatures from 40 to 200 deg F.
- C. Acoustic Rating: STC (sound transmission coefficient) 28 (or better).
- D. Vibration Damping Material: Kinetics Noise Control KDD or KDC-E-162.

## **PART 3 - EXECUTION**

#### 3.1 GENERAL

- A . Pre-Insulation Review: No covering materials shall be applied until systems to be covered have had all tests satisfactorily completed, have had all required inspections, and have been satisfactorily reviewed by the Architect-Engineer. All systems shall be examined by the Contractor to confirm cleanliness and other conditions are appropriate to allow for insulation installation.
- B. Insulation Work Review: No insulated items shall be concealed in the building structure or buried until the insulation work has been satisfactorily reviewed by the Architect-Engineer, and has had all required inspections.
- C . Standards: Materials shall be installed in accordance with manufacturer's written instructions, NCIIS, and shall comply with materials and methods specified herein. The more stringent requirements govern.
- D. Joints/Seams: Joints shall be staggered on multi layer insulation. Locate seams and joints in least visible location.

- E . Insulation Protection: Insulation shall be kept clean and dry and shall be protected from dirt, damage, and moisture. Insulation that becomes dirty, damaged, or wet and cannot be restored to like new condition will be rejected, and shall immediately be removed from the jobsite.
- F. Insulation Interruptions: Insulation shall be neatly finished at all supports, protrusions and interruptions. Provide adhesive and tape seal to maintain vapor barrier integrity.
- G. Equipment and Floor Protection: Cover existing equipment and finished floors to protect such items from insulation fiber and dust. Keep all such existing areas in a "broom clean" condition at the end of each day. Take precautions in these areas to prevent glass fiber and insulation dust from entering ventilation systems or areas adjacent to the work.
- H. Glass Fiber Insulation General:
  - Finish all insulation ends with joint sealing tape or vapor barrier mastic, no raw edges allowed.
  - 2. Joints: Tightly butt adjacent insulation sections together without any voids. Provide overlap of jacket material over all joints.
- I. Items To Be Insulated: Provide insulation on all ductwork, all piping, all items installed in these duct and piping systems, all air and liquid energy conveying systems and components, all air and liquid energy storage, all equipment, and all energy consuming devices, except where such insulation has been specifically excluded.
- J. Items Excluded From Being Insulated:
  - 1. Sanitary sewer drain lines (except traps at handicap accessible fixtures).
  - 2. Stops and risers at plumbing fixtures (except at handicap accessible fixtures).
  - 3. Factory insulated water heaters (except for base on electric water heaters).
  - 4. Factory insulated tanks.
  - 5. Electric motors.
  - 6. Fans.
  - 7. Factory insulated or factory lined HVAC, AHU, and AC units.
  - 8. Pumps handling hot water.
  - 9. Relief Valves and associated drain piping.
  - 10. Hose bibbs (except where used as drains hot water systems).
  - 11. Underground cold water piping and associated underground items.

# 3.2 DUCT INSULATION INSTALLATION

- A. Types and Thickness: Insulate all ducts with insulation type and thickness (to provide the required R value) as specified in "Part 2 Products".
- B. General: Insulation shall be firmly butted at all joints. All longitudinal seams for flexible insulation shall overlap a minimum of 2 inches. All joints and seams shall be finished with appropriate joint sealing tape. Installation shall provide a continuous sealed vapor barrier over all surfaces; seal all jacket penetrations with vapor barrier mastic or vapor barrier jacket tape.

C . Attachment: For rectangular ducts over 24 inches wide, duct insulation shall be additionally secured to the bottom of the ductwork with mechanical fasteners on 18 inch centers to reduce sagging. Washers shall be applied without compressing the insulation. Protruding ends or fasteners shall be cut off flush after washers are installed. All seams, joints, penetrations, and damage to the facing shall be sealed with joint sealing tape or vapor retardant mastic or appropriate joint sealing tape.

#### 3.3 PIPE INSULATION INSTALLATION

- A. Types and Thickness: Insulate all piping with insulation type and thickness as specified in "Part 2 Products". All piping shall be insulated except where specifically excluded.
- B. General: All ends shall be firmly butted together and secured with joint sealing tape. All jacket laps and joint sealing tape shall be secured with outward clinch staples at 4 inch spacing, or by use of a suitable adhesive. Installation shall provide a continuous sealed vapor barrier over all surfaces; seal all jacket penetrations with vapor barrier mastic or vapor barrier jacket tape.
- C . Elastomeric Pipe Insulation: Install with seams and joints sealed with rubberized contact adhesive. Insulation with pre-applied adhesive is not permitted. A brush coating of adhesive shall be applied to both butt ends to be joined and to both split surfaces to be sealed. Adhesive shall be allowed to set until dry to touch but tacky under slight pressure before joining the surfaces. Insulation seals at seams and joints shall not be capable of being pulled apart one hour after application. Provide added tape wrap around insulation to ensure seam and joint closure. Insulation that can be pulled apart one hour (or more) after adhesive installation shall be replaced. Provide metal jacketing over outdoor exposed insulation.
- D . Pipe Hangers: Provide insulation tight up to pre-insulated pipe supports at pipe hangers, seal all joints with joint sealing tape. Pre-insulated pipe supports are specified in Section 20 05 29.
- E . Pipe Sleeves: Run insulation continuous full size through sleeve. Coordinate work with fire seals and confirm fire seal system is approved for use with insulated pipes; see Section 20 05 30.

#### F. Metal Jacketing:

- 1. Applications: Provide metal jacket over piping insulation for the following:
  - a. Exposed rain leaders in occupied areas; from finished floor and up 8 feet.
  - b. Outdoor exposed piping.
- Outdoor Installation: Where installed on outdoor piping locate seams on bottom side of horizontal piping. Seal all jacket seams to provide a completely weatherproof enclosure; water tight.

# 3.4 EQUIPMENT AND SPECIALTIES INSTALLATION

- A. Types and Thickness: All equipment and items installed in insulated duct and piping systems shall be insulated except where specifically noted not to be; reference paragraph 3.01. Insulation type and thickness shall be as specified in "Part 2 Products".
- B. General: Apply insulation as close as possible to equipment by grooving, scoring, and beveling as necessary. As required, secure insulation to equipment with studs, pins, clips, adhesive, wires or bands. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. Comply with NCIIS.

- C . Removable: All equipment and specialties where access is required for maintenance, repair, service, or cleaning shall have insulation installed so that it can be easily removed and reinstalled without being damaged and without requiring new insulation. Removable insulation shall completely cover the item being insulated with an overlap over adjacent insulation to cover all joints. Insulation on cold surfaces shall provide a sealed vapor barrier so that no surfaces are exposed to ambient air and so that no condensation can occur; overlap enclosure ends minimum 2-inches.
- D . ADA Compliant Lavatories and Sinks: Insulate P-trap and HW/CW supplies below lavatory and sink where exposed.
- E . Nameplates: Do not insulate over nameplates or ASME stamps; bevel and seal insulation around.
- F. Jacketing: Provide all equipment insulation with vapor retardant jackets.

#### 3.5 ACOUSTIC WRAP

- A . General: Install in accordance with manufacturers written instructions and NCIIS. Overlap all interior sound insulation joints with a minimum 2 inch overlap of the exterior sound barrier. Acoustical insulation shall not be compressed. Where installed over equipment or items requiring access, provide acoustic wrap in sections and in a manner that facilitates future removal and re-installation.
- B. Light Gauge Duct: Where the ductwork to which the wrap is to be applied is less than 20 gauge, apply vibration damping material on outside of duct before applying acoustic wrap.
- C . Insulated Items: Where installed on ducts or items that require thermal insulation, install thermal insulation over acoustic wrap.

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 WORK INCLUDED

- A. Commissioning of Mechanical Systems.
- B. Documentation.

# 1.3 ADDITIONAL SCOPE OF NOTE

A. Project is pursuing LEED Credit EA Enhanced Commissioning. Enhanced Commissioning will be completed by owner's agent. Contractor is responsible for providing access to site and support from subs to allow Enhanced Commissioning to occur.

#### 1.4 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Qualifications: Submit qualifications of the firm proposed to perform the commissioning work and for the individuals that will be assigned.
- C. Commissioning Data:
  - 1. Commissioning plan.
  - 2. Commissioning preliminary report.
  - 3. Commissioning final report.

#### 1.5 GENERAL REQUIREMENTS

- A. General: Commissioning shall be done by a Company which specializes in this work and independent and separate from the Companies installing the systems to be commissioned.
- B. Company Experience: The Company providing the commissioning work shall be experienced in commissioning HVAC control systems, and have commissioned at least five similar projects in the last three years. Company shall be certified for such work by AABC, NEBB, AEE, BCA, or ASHRAE.
- C . Individual Experience: The individuals performing the commissioning work shall have at least five years experience in commissioning, with the individual in the field in charge or the work having commissioned at least five similar projects in the last three years.
- D. Deferred Test: Tests may be deferred to allow for proper climatic or other conditions.

#### 1.6 REFERENCES

A. AABC: Associated Air Balance Council.

Tacoma Public Library – Main Branch Renovation SECTION 20 08 00 COMMISSIONING OF MECHANICAL

- B. AEE: Association of Energy Engineers.
- C . BCA: Building Commissioning Association.
- D. NEBB: National Environmental Balancing Bureau.

## PART 2 - PRODUCTS

NOT USED

#### **PART 3 - EXECUTION**

#### 3.1 GENERAL

- A. General: Provide commissioning as required by code and as specified herein.
- B. Building Occupancy: Building or portions thereof, required by code to be commissioned, shall not be considered ready for occupancy until such time that the Engineer and building official determine that the preliminary commissioning report required by this Section has been completed.

#### 3.2 HVAC SYSTEMS

- A. General: HVAC equipment and HVAC control systems shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with approved plans and specifications.
- B. Sequences: Sequences of operation shall be functionally tested to ensure they operate in accordance with approved plans and specifications.
- C . Conditions: Testing shall affirm operation during actual or simulated winter and summer design conditions and during full outside air conditions.
- D. HVAC Equipment: Equipment functional performance testing shall demonstrate the installation and operation of components, systems, and system-to-system interfacing relationships in accordance with approved plans and specifications such that operation, function, and maintenance serviceability for each of the commissioned systems is confirmed. Testing shall include all modes and sequence of operation, including under full-load, partload and the following emergency conditions:
  - 1. All modes as described in the sequence of operation.
  - 2. Redundant or automatic back-up mode.
  - 3. Performance of alarms.
  - 4. Mode of operation upon a loss of power and restoration of power.
- E . HVAC Controls: HVAC control systems shall be tested to document that control devices, components, equipment, and systems are calibrated, adjusted, and operate in accordance with approved plans and specifications. Sequence of operation shall be functionally tested to document they operate in accordance with approved plans and specifications.
- F. Economizers: Air economizers shall undergo a functional test to determine that they operate in accordance with manufacturer's specifications.

## 3.3 DOCUMENTATION

#### A. Format:

1. Hard Copy: Provide reports in 8-1/2 x 11 format, in 3 ring notebooks, with labeled cover and spine, clean legible, and logically organized with table of contents, divider tabs, and names of companies involved in the project, commissioning company name,

- commissioning personnel, and contact information. Provide 3 copies per Divisions 00 and 01.
- 2. Electronic: Provide copy in \*.pdf format; submit with closeout documents per Divisions 00 and 01.
- B. Test Plan: Prepare a written commissioning test plan and submit for approval prior to beginning commissioning work. Test plan to include:
  - 1. Equipment and systems to be tested.
  - 2. Roles and responsibilities of individuals performing the commissioning and of others involved in the project.
  - 3. Functional test procedures and forms.
  - Conditions under which the test shall be performed (for example, winter design conditions, full outside air, etc.).
  - 5. Expected systems' response or acceptance criteria for each procedure.
  - 6. Time schedule for performance of the work; including any deferred tests.
  - 7. Forms as required by the WSEC or AHJ.
- C. Preliminary Commissioning Report:
  - General: A preliminary report shall be issued to identify issues preventing the commissioning work from being completed. If all commissioning work can be fully completed and the final report completed, a preliminary report is not required.
  - Report: Compile all system and commissioning data; including all reviews, inspections, test procedures, and tests. Report shall include field notes of commissioning activities, equipment and system data, test procedures, tests performed, actual results as compared to expected (or specified) results, WSEC and any AHJ required commissioning forms (completed to the extent possible).
  - 3. Items to Complete: The preliminary report shall identify items needed in order to complete the commissioning, including:
    - a. Deficiencies found during testing required by this Section, which have not been corrected at the time of report preparation.
    - b. Deferred tests which cannot be performed at the time of report preparation due to climatic (or other) conditions.
    - c. Climate (or other) conditions required for performance of the deferred tests, and the anticipated date of each deferred test.
    - d. Proposed schedule for completion of report.
- D . Final Commissioning Report: Complete all commissioning work not previously completed and included in the preliminary report. Provide a complete final report with all systems and commissioning data; including test plan, all reviews, inspections, test procedures, tests, and results. Final report shall include all documentation required for the preliminary report and documentation regarding resolution of previous cited deficiencies.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 WORK INCLUDED

- A. Domestic Water Piping.
- B. Valves.
- C. Water Hammer Arrestors.
- D. Trap Primers.
- E. Backflow Preventers.
- F. Domestic Water Expansion Tanks.
- G. Water Service Connections.
- H. Testing and Inspection.
- I. Flushing and Disinfection.

# 1.3 DEFINITIONS

A . "Lead-Free" means not containing more than 0.2% lead in solder and flux; and not more than a weighted average of 0.25% lead in wetted surfaces of pipes, pipe and plumbing fittings and fixtures.

## 1.4 SUBMITTALS

- A. General: Submittals shall comply with Section 20 05 00.
- B. Product Data: Submit manufacturer's product information on all items to be used.
- C . System Tests and Inspections: Submit documentation showing systems have satisfactorily passed all pressure tests and code inspections.
- D . Cleaning and Disinfection: Submit documentation regarding completion of flushing, disinfection, bacteriological tests, and Health Department's acceptance of tests and system.

# 1.5 GENERAL REQUIREMENTS

A . ANSI/NSF Compliance: All items in contact with potable water shall be lead free in accordance with ANSI/NSF 61. Plastic piping system components shall comply with ANSI/NSF 14. Only lead-free solder shall be used.

B. Valves: Shall be dezincification resistant, and shall not contain more than 15% zinc in their chemical composition.

#### 1.6 REFERENCES

- A . ASME B16.3: Malleable Iron Threaded Fittings.
- B. ASME B16.15: Cast Bronze Threaded Fittings: Classes 125 and 250.
- C. ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B16.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- E. ASME B16.24: Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 400, 600, 900, 1500, and 2500.
- F. ASTM A53: Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.
- G. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM A312: Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
- I. ASTM A403: Wrought Austenitic Stainless Steel Piping Fittings.
- J. ASTM A530: General Requirements for Specialized Carbon and Alloy Steel Pipe.
- K . ASTM A774: As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.
- L. ASTM A 778: Welded, Un-annealed Austenitic Stainless Steel Tubular Products.
- M . ASTM B16.18: Seamless Copper Water Tube.
- N. ASTM B32: Solder Metal.
- O. ASTM D1784: Chlorinated Poly (Vinyl Chloride) CPVC Compounds.
- P. ASTM F437: Threaded Chlorinated Poly (Vinyl Chloride) CPVC Plastic Pipe Fittings, Schedule 80.
- Q. ASTM F439: Socket-Type Chlorinated Poly (Vinyl Chloride) CPVC Plastic Pipe Fitting.
- R. ASTM F441: Chlorinated Poly (Vinyl Chloride) CPVC Plastic Pipe.
- S. ASTM F493: Solvent Cement for Chlorinated Poly (Vinyl Chloride) CPVC Pipe and Fittings.
- T. ASTM F876: Standard Specification for Cross-linked Polyethylene (PEX) Tubing.
- U. ASTM F877: Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot and Cold Water Distribution Systems.
- V . ASTM F1960: Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing.
- W . AWS A5.8: Filler Metals for Brazing and Braze Welding.

- X. AWWA B300: Hypochlorites.
- Y. AWWA B301: Liquid Chlorine.
- Z. AWWA M20: Water Chlorination and Chlorination Practices and Principles, 2nd edition.
- AA . ANSI/NSF Standard 14 Plastics Piping System Components and Related Materials.
- BB . ANSI/NSF Standard 61 Drinking Water System Components Health Effects.

#### PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, 2.01, Acceptable Manufacturers.
- B. Pipe and Fittings: Domestic Manufacturers only.
- C. PEX Tubing and Fittings: Uponor/Wirsbo, Viega, Vanguard, Zurn, Watts.
- D. Press-Fit Fittings: Nibco, Viega.
- E . Valves: Conbraco/Apollo, Nibco, Stockham, Walworth, Milwaukee, Kitz, Red-White, Watts, Hammond, ThermOmega Tech.
- F. Pressure Reducing Valves: Conbraco/Apollo, Watts, Cla-Val, Bell & Gossett, Zurn/Wilkins.
- G. Thermostatic Mixing Valves: MCC Powers, Leonard, Symmons, Lawler.
- H. Backflow Preventers: Conbraco/Apollo, Febco, Watts, Ames, Zurn/Wilkins.
- I. Balancing Valves: Bell & Gossett, Taco, Armstrong, Red-White.
- J. Additional manufacturers are as listed for each individual item.

## 2.2 PIPE AND FITTINGS - MATERIALS

- A. Copper Pipe and Fittings:
  - 1. Pipe: Seamless copper water tube, hard temper (unless noted otherwise), type K or L as indicated, per ASTM B88.
  - 2. Fittings:
    - Solder-Joint: Wrought copper and bronze fittings per ASME B 16.22 and cast copper alloy fittings per ASME B16.18, cast bronze threaded fittings per ASME B16.15.
    - b. Flanged: Cast bronze fittings per ASME B16.24.
    - c. Solder Material: 95/5 tin-antimony solder per ASTM B32 or "Silvabrite 100" (95.5 tin/4 copper/0.5 silver) solder; lead free.
    - d. Brazing Material: AWS A5.8, BCuP-5.
    - e. Press-Fit Fittings.
- B. Galvanized Steel Pipe and Fittings:

- 1. Pipe: Seamless hot-dip galvanized steel pipe, per ASTM A 53, Type E, Grade B. Schedule 40 unless indicated otherwise.
- 2. Fittings: Galvanized, malleable-iron, threaded, per ASME B16.3.

#### C. C. Stainless Steel Pipe and Fittings:

- 1. Pipe: Seamless or welded stainless steel per ASTM A778 or A312, type 304L or 316L, tolerances per ASTM A 530. Schedule 40 unless indicated otherwise.
- 2. Fittings:
  - a. Threaded: Constructed of same material as piping, per ASTM A774 or A403, suitable for 150 psi swp.
  - Welded: Constructed of same material as piping, weld fittings, per ASTM A774 or A403, suitable for 150 psi swp.
  - c. Flanged: Constructed of same material as piping, 150 pound class.

## D. PEX Pipe and Fittings:

- Pipe: Cross-linked polyethylene (PEX), manufactured per ASTM F876 and F877.
  Color shall be blue for cold water systems, and red for hot water and hot water recirculation systems. Piping used underground shall be continuous with no joints or fittings and be rated for underground use by the piping manufacturer.
- 2. Fittings: Pipe manufacturers standard methods, manufactured in accordance with recognized standards.
- 3. Ratings: Minimum pressure rating of 100 psi at 180 deg F, and 80 psi at 200 deg F in accordance with the Plastic Pipe Institute standards.
- 4. Firestop Penetrations: Piping system manufacturer (or fire seal manufacturers) shall have listed methods (acceptable to the AHJ) for piping penetrations through rated building elements (for the type of elements penetrated on this project).
- 5. Ultraviolet (UV) Light Exposure: Piping shall be meet or exceed a 60 day exposure to UV light in accordance with ASTM F876. Piping which may be exposed to UV light after installation shall have an insulation jacket with UV protection (or equivalent method) approved by the piping manufacturer to protect the pipe from UV exposure.
- 6. Chlorine Resistance: Piping and system components used shall be rated for use with 100% chlorine at 140 deg F in accordance with ASTM F876 per PEX 5006.
- 7. Intermediate Support (Contractor Option): Galvanized steel channel, sized and shaped to match PEX pipe and to allow for increased spacing between supports. Minimum 23 gauge. Subject to AHJ approval. Manufactured by pipe manufacturer support is used with.

#### 2.3 PIPE AND FITTINGS - APPLICATIONS

- A. Domestic Water Piping Above Ground: Type L or K copper with flanged, soldered, or press-fit joints or stainless steel; except where run exposed in finished areas shall be stainless steel, or be chrome plated copper, or be copper piping with a chrome plated sleeve.
- B. Domestic Water Piping Below Ground: Type K copper tubing with silver brazed joints; except that piping within the building footprint serving individual fixtures may be type L (soft or hard temper) copper or PEX.

C . Trap Primer Piping: Type L or K "soft" or "hard" (bending temper) copper, with compression fittings or soldered joints or PEX.

#### 2.4 VALVES

#### A. Ball Valves:

 2 Inches and Smaller: 600 psi non-shock cold working pressure, 100 psi at 300 deg F, bronze body, full port, 2 piece construction, anti-blowout stem, reinforced PTFE seats, stainless steel or chrome plated brass or silicon bronze ball, lever handle, solder or threaded connections. Provide with extended lever handle where valve is installed in systems with insulation thickness greater than 0.5 inch. Nibco S-585-66-LF, T-585-66-LF (or approved).

#### B. Check Valves:

- 1. 2 Inches and Smaller:
  - Horizontal: 125 psi-swp bronze body horizontal swing check valve, regarding type, y-pattern, renewable seat and disc, solder or threaded connection. Nibco S-413-LF or T-413-LF (or approved).
  - Vertical: 125 psi-swp bronze body vertical inline check valve, stainless steel or bronze disk holder, Buna-N disk, stainless steel spring actuated, solder or threaded connection. Nibco S-480-LF or T-480-LF (or approved).
- C . Balancing Valves Manual: Calibrated balance valve, ball or globe type, bronze body, with brass readout valves with integral EPT insert and check valve to minimize fluid loss during balancing. Valve shall have calibrated nameplate and memory stop. Rated for 200 psig working pressure at 250 degrees F. Valve shall be same size as pipe installed in. Bell & Gossett "Circuit Setter" (or approved).
- D. Drain Valves: Bronze ball valve, minimum 125 psi-swp, anti-blowout stem, stainless steel or chrome plated brass ball, reinforced TFE seat, solder or threaded inlet connection, male 3/4 inch hose thread outlet connection, with brass cap and chain. Nibco S-585-70-HC, T-585-70-HC (or approved).

# E . Pressure Reducing Valves:

- 2 Inches and Smaller: Bronze body construction, renewable nickel alloy or stainless steel seat, lead free, with integral strainer and union inlet connections. Adjustable range 25 to 75 lbs, suitable for inlet pressures up to 300 psi. Watts Series LFU5B (or approved).
- F. Pressure Relief Valves: ASME rated pressure relief valve, bronze body, stainless steel spring, set for pressure indicated or as required to protect system from over pressure. Valve shall have minimum 400,000 BTU/HR relief capability (at set pressure) and no smaller than 3/4-inch connection sizes.

# 2.5 ACCESSORIES

- A . Water Hammer Arrestors: All metal, factory pre-charged with inert gas, sealed internal bellows; 125 psi working pressure. All wetted parts shall be type 300 stainless steel, brass or copper. PDI (Plumbing and Drainage Institute) sizes as indicated. Where not sized, provide sizes in accordance with PDI standards. Zurn "Shoktrol", Wade "Shokstop", or J.R. Smith "Hydrotrol".
- B. Trap Primer Valve:

1. Pressure Drop Type: Activated by drop-in water pressure. Constructed of corrosion resistant brass with integral backflow preventor, vacuum breaker ports, distribution manifold to suit number of drains served, adjustable to line pressure for water delivery. Precision Plumbing Products Model P-1 and P-2 (or approved).

## 2.6 BACKFLOW PREVENTERS

# A. Reduced Pressure Type:

- General: Washington State approved, with air gap drain fitting and resilient seated full flow shutoff valves and test cocks. Same size as connecting pipe. Configuration to suit application. Conforming to AWWA C511.
- 2. 2 Inches and Smaller: Bronze body, stainless steel springs, bronze ball valves, 175 psi working pressure, threaded end connections.
- 3. 2-1/2 Inches and Larger: Ductile iron body, internal and external epoxy coating per AWWA C550, OS & Y gate isolation valves, bronze trim, stainless steel springs, 175 psig working pressure, Class 125 flanged end connections (grooved connections allowed where mechanically coupled piping systems are allowed).
- 4. Discharge: Discharge from intermediate relief valve assembly shall not exceed 190 gpm for 2-inch and smaller backflow preventers, and not exceed 560 gpm for larger backflow preventers (rated at 75 psig inlet pressure).

## 2.7 DOMESTIC WATER EXPANSION TANK

- A. Type: Diaphragm thermal expansion absorber. Amtrol "ST" Series (or approved).
- B. Construction: Welded steel construction, with polypropylene liner, butyl/EPDM diaphragm, stainless steel air charging valve, 175 psig working pressure, configuration/connections to suit installation, NSF 61 approved, and ASME certified.
- C . Capacity: As indicated on plans; where not indicated provide 4.0 gallon tank volume (minimum).

# **PART 3 - EXECUTION**

### 3.1 GENERAL

## A. Workmanship:

- Installation of all items shall comply with code, best professional practices, manufacturers written installation instructions, and to allow for proper functioning of items being connected to.
- 2. Install all piping parallel to the closest wall and in a neat, workmanlike manner. Horizontal exposed straight runs of piping shall not deviate from straight by more than 1/4-inch in ten feet. Vertical piping shall not deviate from plumb by more than 1/8-inch in ten feet.
- 3. Do not run any piping above electrical panels (and similar electrical equipment). Provide offsets around such panels as necessary.
- B. Complete System: Provide all piping as indicated and as required to allow supply connections to each fixture and equipment item requiring water supply. Provide offsets as required to accommodate building construction and access requirements per Section 20 05

- 00. For multistory buildings include costs to offset vertical piping at each floor level since structural member locations will not be the same on each floor.
- C . Coordination: Coordinate installation of items with all trades that are affected by the work to avoid conflicts.
- D. Expansion and Contraction: Install piping to accommodate system expansion and contraction; provide necessary offsets, expansion devices, anchors, guides and related accessories. See Section 20 05 29.
- E. Openings for Piping: See Section 20 05 30 for sleeves and seals; provide openings in building construction sized to accommodate required sleeve size. Where sleeves are not required provide openings sized as follows:
  - 1. Belowground Penetrations: Inside diameter of opening shall be at least 2-inch larger than the outside diameter of the pipe or pipe covering (for covered piping systems), and so as to allow free movement of piping.
  - 2. Aboveground Penetrations: Inside diameter of opening shall be at least 1-inch larger than the outside diameter of the pipe or pipe covering (for covered piping systems), and so as to allow free movement of piping.
  - 3. Large Movement: Provide larger sleeves where a larger space around pipe exterior is required by code, where specifically noted, where pipe movement will occur (i.e. expansion/contraction or seismic), at expansive soils, other unusual conditions are present, and where required to accommodate large piping movement.
- F. Hot Water Adjustment: Adjust the hot water circulation system for uniform circulation throughout the system; provide balancing of system where hot water circulation system has multiple branches with balancing valves (see balancing specification Section). Install, set, and adjust and all system components for proper operation.

# 3.2 PIPE AND FITTINGS

- A. Concealed: All piping in finished areas shall be installed concealed unless specifically noted otherwise. Provide escutcheons where piping is allowed to be exposed and pipe passes through building elements (i.e. walls, floors, ceilings, etc.).
- B. Non-Obstructing: Install piping at such heights and in such a manner so as not to obstruct any portion of windows doorways, passageways, or access to any items requiring routine service, maintenance, or inspection. Offset or reroute piping as required to clear any interferences which may occur.
- C . Drawing Review: Consult all drawings for location of pipe spaces, ducts, electrical equipment, ceiling heights, door openings, window openings, and other details and report discrepancies or possible conflicts to Architect/Engineer before installing pipe.
- D . Insulation: Allow sufficient clearances for installation of pipe insulation in thickness specified. If interferences occur, reroute piping to accommodate insulation.
- E. Drainage: Slope all piping to low points to allow the system to be drained. Provide added drain valves where system cannot be drained through fixtures.
- F. Preparation for Joining: Prior to the joining of any section of pipe to a pipe run, the section shall be thoroughly cleaned inside and out, the ends shall be reamed to remove any cutting burrs and piping prepared as recommended by piping and fitting manufacturer.

- G . Threaded Connections: Cut piping carefully, ream, thread and work into place without springing. Use TFE tape or lead and graphite lubricant (on male threads only).
- H. Soldered Connections: Polish contact surfaces of fittings and pipes with emery cloth before fluxing male and female surfaces of joints. Steel wool and sandpaper not permitted for polishing.
- I. Unions: Install unions in pipe connections to valves, coils, and any other equipment where it may be necessary to disconnect the equipment or piping for repairs or maintenance; and as indicated. Where flanged connections occur at equipment additional unions are not required unless indicated otherwise.
- J . Insulating Unions: Install dielectric insulating connectors between all connections of copper piping and steel piping of steel equipment. Where flanged connections occur use insulating type flanges.

# K. PEX Tubing:

- Minimum Bend Radius (cold bending): No less than six times the outside diameter.
   Use a bend support as supplied by the PEX tubing manufacturer for tubing with a bend radius less than stated.
- 2. Install tubing in accordance with the tubing manufacturer's recommendations and as indicated in the installation handbook.
- 3. Do not install PEX tubing within 6 inches of gas appliance vents or within 12 inches of any recessed light fixtures.
- 4. Do not solder within 18 inches of PEX tubing in the same waterline. Make sweat connections prior to making PEX connections.
- 5. Do not expose PEX tubing to direct sunlight for more than 30 days.
- 6. Ensure no glues, solvents, sealants or chemicals come in contact with the tubing without prior permission from the tubing manufacturer.
- 7. Use grommets or sleeves at the penetration for PEX tubing passing through metal studs.
- 8. Protect PEX tubing with sleeves where abrasion may occur.
- 9. Use strike protectors where PEX tubing penetrates a stud or joist and has the potential for being struck with a screw or nail.
- 10. Use tubing manufacturer supplied bend supports where bends are less than six times the outside tubing diameter.
- 11. Maximum horizontal supports are installed no more than 32 inches between hangers in accordance with model plumbing codes and the installation handbook.
- 12. PEX riser installations require epoxy-coated riser clamps installed at the base of the ceiling per floor.
- 13. A mid-story support is required for riser applications.
- 14. Pressurize tubing with air in accordance with applicable codes or in the absence of applicable codes to a pressure of 25 psi above normal working pressure of the system.
- 15. Comply with safety precautions when pressure testing, including use of compressed air, where applicable. Do not use water to pressurize the system if ambient air temperature has the possibility of dropping below 32 deg F.
- 16. At locations where the piping may be exposed to UV light, piping system shall be completely covered and protected to prevent such exposure.

- L . Plastic Pipe with Solvent Joints:
  - 1. Solvent Joints: The outside of the pipe shall be chamfered to a minimum of 1/16 inch at approximately 22 degrees. Chemicals used must penetrate the surface of both pipe and fitting which will result in complete fusion at the joint. Use solvent and cement only as recommended by the pipe manufacturer.
  - Plastic to Metal Connections: Work the metal connection first. Use a non-hardening compound on threaded connections. Use only light wrench pressure. Connections between metal and plastic are to be threaded utilizing female threaded adapters only, not male adapters.

## 3.3 VALVES

- A. Type: Ball type only.
- B. General: Provide isolation valves as shown on the drawings. In addition to those shown, provide added valves to allow for the isolation of each group of fixtures, all water heaters, and all individual equipment items (e.g. dishwashers, heat exchangers, etc.).
- C . Installation: Install valves so as to be easily accessible and oriented to permit ease of operation. Valve stem shall be directed toward operator in either the vertical or horizontal direction. Provide access doors for valves not otherwise accessible.
- D. Pressure Reducing Valves: Provide with by-pass line, isolation valves, unions (on valves with threaded connections), and pressure gauges. Set initial pressure and adjust as required so that all fixtures/devices served have sufficient water pressure.
- E . Drain Valves: Provide drain valves at the base of all risers (except not required where risers can be drained through plumbing fixtures or equipment drains). Provide drain valves at piping low points where the piping cannot be drained through fixtures, hose bibs, or equipment drains.
- F. Balancing Valves: Provide balancing valves in hot water circulation piping where indicated and where required to allow for equal distribution of hot water circulation flows.

# 3.4 ACCESSORIES

- A . Water Hammer Arrestors: Install per manufacturer's instructions, just upstream of last fixture on branch line. Provide water hammer arrestors on branch water lines serving fixtures with flush valves, washer machines, solenoid valves, and similar quick-acting valves. Water hammer arrestors are typically not shown on the plans, but shall be provided per this paragraph. Provide ball isolation valve in piping to arrestor. Where access cannot be provided at water line location, the water hammer arrestor piping may be extended vertically and the water hammer arrestor located above ceiling outside of plumbing chase.
- B. Trap Primers: Provide trap primers to all vented floor drains, floor receptors, and where required by the code. Install with an isolation valve in the branch line to the trap primer valve.
- C . Access Doors: Provide access doors to all valves, water hammer arrestors, trap primers, backflow preventers, and any other piping accessories which would otherwise be inaccessible. See Section 20 05 19 for access door specifications.

D. Backflow Preventers:

- 1. General: Provide backflow preventers as indicated in the Contract Documents and as required by code. Backflow preventers with threaded connections shall be installed with unions for ease of removal. Install to be accessible for testing and service. Pipe air gap drains to nearest floor drain or point of drainage.
- 2. Inspection: Arrange and pay for inspection of backflow preventers as required by the local AHJ and obtain installation acceptance from the AHJ.
- 3. Certification: Following inspection arrange and pay for testing of backflow preventers by certified individuals in accordance with applicable portions of the Washington Administrative Code, other applicable regulations as set forth by the Washington State Department of Social and Health Services, and as required by the AHJ.
- E. Domestic Water Expansion Tanks: Provide isolation valve for servicing expansion tank. All isolation valves between expansion tank and water heater shall be labeled, "Expansion Tank Service Valve: Must Be Open When System Is Operating."

#### 3.5 WATER SERVICE CONNECTIONS

- A. Provide connection to water main outside the building as shown on the drawings.
- B. Provide sleeve in floor for entrance of service main into building, seal watertight; anchor service main firmly to building. See Section 20 05 30 for sleeves and seals.

#### 3.6 TESTING AND INSPECTION

- A . All piping shall be tested, inspected, and approved by the local authority having jurisdiction prior to being concealed or covered.
- B. Testing shall be witnessed by the plumbing inspector and the Architect/Engineer (at his option). Notify Architect/Engineer minimum 72 hours prior to date of testing, and mutually agreed upon times arranged.
- C . Piping shall be hydrostatically tested for a period of 2 hours (or as required by local authority having jurisdiction), during which time no drop in pressure or leakage shall occur.
- D . Test pressure shall be not less than 150 percent of the maximum to which the pipe will ordinarily be subjected; but in no case less than 75 psig.
- E . Any leaks or defective piping disclosed by testing and inspection shall be repaired with new materials and the system re-tested.
- F . Provide documentation to the Engineer indicating that the system has been completely pressure tested, and all portions inspected and accepted by the local authority having jurisdiction.

### 3.7 FLUSHING AND DISINFECTION

A. System Flushing: After tests are completed, all water piping shall be flushed. In general, sufficient water shall be used to produce a minimum water velocity of 2.5 feet per second through piping being flushed. Flushing shall be continued until discharge water shows no discoloration. System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced in line. System valves and fixture faucets shall be opened and reclosed to completely flush system. After flushing and cleaning, systems shall be prepared for disinfection service by immediately filling water piping with clean, fresh potable water.

Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building during this process shall be repaired by the Contractor.

#### B. Disinfection:

- Upon completion of the job and prior to final acceptance, the plumbing system shall be disinfected with Chlorine solution. Review procedures and disinfection with the authority having jurisdiction to insure that all work complies with code requirements. Verify any deviations from specified procedures with the Architect/Engineer prior to proceeding. The chlorinating material shall be either liquid chlorine conforming to AWWA B301 or hypochlorite conforming to AWWA B300 (or as otherwise required by the authority having jurisdiction). Water chlorination procedure shall be in accordance with AWWA M20 (or procedure acceptable to AHJ and to the Architect/Engineer). The chlorinating material shall provide a dosage of not less than 50 parts per million and shall be introduced into the system in an approved manner. The treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria.
- 2. The retention time shall be at least 24 hours and shall produce not less than 10 ppm of chlorine at the extreme end of the system at the end of the retention period. All valves in the system being sterilized shall be opened and closed several times during the contact period. The system shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period all valves and faucets shall be opened and closed several times.
- C . Bacteriological Tests: The Contractor shall employ an approved agency to take test samples at several points of the system (i.e. end of each wing, each floor of building, etc.) in properly sterilized containers and arrange with the Health Department (or a test agency acceptable to the Health Department) having jurisdiction to test the samples. Test for coliform and other items as required by the AHJ. Should the samples not test satisfactory, the system shall be re-flushed and disinfected again until satisfactory samples are obtained.
- D. Submittal: Submit documentation stating that flushing and disinfection has been completed, copies of the bacteriological test results, and certification from the Health Department having jurisdiction stating that system has been found acceptable.

END OF SECTION

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

### 1.2 WORK INCLUDED

A. Domestic Circulators.

#### 1.3 SUBMITTALS

- A. General: All submittals shall comply with Section 20 05 00.
- B. Product Data: Provide product information and performance data for all pumps.
- C . Performance Data: Submit performance data, including pump curves, showing pump performance as head vs. GPM, BHP and NPSH vs. GPM, with system operating point clearly marked. (NPSH vs. GPM not required for pumps 1 HP and less.)

# 1.4 QUALITY CONTROL

- A. Manufacturer: Manufacturer shall be ISO-9001 approved.
- B. General: Provide quality assurance checks specified in Section 20 05 00 prior to ordering materials.

# **PART 2 - PRODUCTS**

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Domestic Circulators and Wet Rotor Circulators: Bell & Gossett, Armstrong, Grundfos, Taco.

# 2.2 GENERAL

- A. Balancing: All rotating parts shall have been statically and dynamically balanced at the factory.
- B . Alignment: Pump and motors shall be factory aligned, and have alignment checked and reset once installed in place.
- C . RPM: Pumps and motors shall operate at maximum of 1750 rpm unless indicated otherwise.
- D . Pump Capacity: Shall be no less than the values listed on the Mechanical Equipment Schedule on the drawings.

- E . Pump Types: The type of each pump is indicated on the Mechanical Equipment Schedule under the "Type" column, and corresponds to the types specified herein.
- F. Motors: Shall comply with Section 20 05 00. Motors shall be of sufficient size so as to be non-overloading at any point on the operating curve and shall be no smaller than the size shown on the drawings. Motors shall be of drip-proof construction (unless indicated otherwise), resilient mounted with oil lubricated journal or ball bearings, and have built-in thermal overload protectors. Motors shall be for use with the voltage and phase as scheduled on the drawings.
- G . Domestic Water Applications: Pumps used on domestic water systems shall be of all-bronze construction, and NSF certified for domestic water use.
- H. Testing: All pumps shall be factory tested per the Hydraulic Institute standards and be thoroughly cleaned.
- I. Finish: Pumps shall have minimum one coat high grade machinery enamel finish, factory applied, manufacturer's standard color.
- J . Nameplate: Pumps shall have stamped metal nameplates identifying: manufacturer, model number, capacity (gpm and head), and date of manufacturer.
- K . Variable Speed Application: Pumps used with variable speed drives shall have motors that are compatible with the variable frequency drive unit and shall have suitable couplings and accessories to suit variable speed duty.

# 2.3 DOMESTIC CIRCULATORS

- A . Type: Centrifugal, single stage, close coupled, in-line pump for domestic water circulation. Bell & Gossett Series PL (or approved).
- B . Operating Range: Pump shall be rated for continuous operation at 150 psi working pressure and 225 deg F.
- C . Construction: Bronze body, mechanical carbon/silicon carbide seal system, stainless steel face plate, and permanently lubricated sealed bearings.

# **PART 3 - EXECUTION**

# 3.1 INSTALLATION

- A. General: Install pumps at locations shown on the drawings and in accordance with manufacturers instructions. Locate for ease of access.
- B. Connections: Decrease from line size to pump inlet size with long radius reducing elbows and minimum 5-pipe diameter straight pipe into pump. Where reducers (in the horizontal) are used on pumps, they shall be the eccentric type installed with taper on the bottom.
- C . Provide suction diffusers where indicated on the plans.
- D. Provide flexible connectors in piping to base mounted pumps.
- E. Check motor alignment after pump installation, re-align as necessary.
- F. Grout in base of base mounted pumps after pumps have been set.

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G . Start-Up: Check pump operation to ensure that pump operates with correct sequence, that specified flows are provided and that no unused conditions exist (i.e.) motor overloading or pump cavitation. Notify the Architect/Engineer of any unusual conditions or performance other than as specified.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

# 1.2 WORK INCLUDED

- A. Soil, Waste and Vent Piping.
- B. Condensate, Overflow, Miscellaneous Drains.
- C. Cleanouts.
- D. Testing and Inspection.
- E. Accessories.

# 1.3 SUBMITTALS

- A. General: Submittals shall comply with Section 20 05 00.
- B. Product Data: Submit product information on all items to be used.

# 1.4 REFERENCES

- A . ASME B 16.4: Gray Iron Threaded Fittings.
- B. ASME B 16.12: Cast Iron Threaded Drainage Fittings.
- C. ASME B 16.15: Cast Bronze Threaded Fitting Classes 125 and 250.
- D. ASME B 16.18: Cast Copper Alloy Solder Joint Pressure Fittings.
- E. ASME B 16.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- F. ASME B 16.23: Cast Copper Alloy Solder Drainage Fittings.
- G . ASME B 16.29: Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings (DWV).
- H. ASTM A 53: Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- I. ASTM A 74: Cast Iron Soil Pipe and Fittings.
- J . ASTM A 888: Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

K . ASTM B 32: Solder Metal.

- L. ASTM B 88: Seamless Copper Water Tube.
- M. ASTM B 306: Copper Drainage Tube (DWV).
- N . ASTM C 564: Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- O. ASTM C 1277: Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.
- P. ASTM D 1785: Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- Q . ASTM D 2235: Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- R . ASTM D 2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- S . ASTM D 2447: Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.
- T. ASTM D 2466: Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- U. ASTM D 2564: Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- V. ASTM D 2657: Heat Fusion Joining or Polyolefin Pipe and Fittings.
- W . ASTM D 2661: Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
- X. ASTM D 2665: Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- Y. ASTM D 2751: Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- Z . ASTM D 2843: Density of Smoke from the Burning or Decomposition of Plastics.
- AA . ASTM D 3034: Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- BB . ASTM D 3212: Joints for Drains and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- CC . ASTM D 3311: Drain, Waste, and Vent (DWV) Plastic Fittings Patterns.
- DD . ASTM D 4101: Polypropylene Injection and Extrusion Materials.
- EE . ASTM F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- FF . ASTM F 1412: Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems.
- GG .AWWA C509: Resilient-Seated Gate Valves for Water Supply Service.
- HH . AWWA C515: Standard for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
- II. CISPI 301: Hubless Iron Soil Pipe and Fittings for Sanitary and Drain, Waste, and Vent Piping Applications.

JJ . CISPI 310: Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

## **PART 2 - PRODUCTS**

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, 2.01, Acceptable Manufacturers.
- B. Pipe and Fittings: Domestic Manufacturers only.
- C . No Hub Couplings: ANACO, Mission Rubber, Tyler, MG Coupling, Fernco, Clamp-All, Mifab. Ideal-Tridon.
- D. Cleanouts: Josam, Zurn, J.R. Smith, Wade.

# 2.2 PIPE AND FITTINGS - MATERIALS

- A . No-Hub Cast Iron Pipe and Fittings:
  - Pipe and Fittings: Service weight no-hub cast iron pipe and cast iron fittings, per CISPI 301 and ASTM A 888, for use with mechanical no-hub couplings. Pipe and fittings shall be marked with the Cast Iron Soil Pipe Institute trademark and be NSF listed.
  - 2. Couplings: Per CISPI 310 or ASTM C 1277, with a cast iron or stainless shield, and neoprene gasket per ASTM C 564.
- B. Hub and Spigot Cast Iron Pipe and Fittings: Service weight hub and spigot cast iron pipe and cast iron fittings per ASTM A 74, for use with compression gaskets. Gaskets shall conform to ASTM C 564.
- C . Copper DWV Pipe and Fittings: Copper drainage tube per ASTM B 306. Wrought copper and wrought copper alloy solder joint fittings per ASME B 16.29; or cast copper alloy solder joint fittings per ASME B 16.23.
- D. Galvanized Steel DWV Pipe and Fittings: Schedule 40 galvanized steel pipe per ASTM A 53, Grade B, Type 5. Cast iron drainage fittings, threaded, per ASME B 16.12; and cast iron screwed fittings per ASME B 16.4.
- E. Polypropylene Pipe and Fittings: Polypropylene acid resistant and flame retardant pipe manufactured from resins conforming to ASTM D 4101, and conforming to dimensional tolerance of ASTM D 2447. Smoke density rating shall be less than 50%when tested per ASTM D 2843. Fittings shall conform to ASTM F 1412, with mechanically coupled joints or socket fusion joints. Mechanical couplings shall have 300 series stainless steel outer bands, and cadmium plated steel bolts and nuts. Socket fusion joints shall conform to ASTM D 2657.
- F. Copper Pipe and Fittings: Seamless copper water tube, tube L or M, per ASTM B 88. Solder joint wrought copper and bronze fittings per ASME B 16.22 cast copper alloy fittings per ASME B 16.18, and cast bronze threaded fittings per ASME B 16.15 with 95/5 tin-antimony solder per ASTM B 32.
- G . PVC DWV Pipe and Fittings: Polyvinyl chloride drain pipe, solid wall pipe per ASTM D 1785 and ASTM D 2665 with solvent cement joints. Foam (i.e. cellular) core pipe NOT allowed. Polyvinyl chloride DWV fittings conforming to ASTM D 2665 or ASDTM F 1866, with solvent cement joints. Solvent cement shall comply with ASTM D 2564.

# 2.3 PIPE AND FITTINGS – APPLICATION

#### A. Waste and Vent:

- 1. Piping 2-1/2 Inches and Smaller Located Above Ground: Galvanized steel DWV, nohub cast iron, copper DWV, PVC DWV, or ABS DWV.
- 2. Piping 3 Inches and Larger Located Above Ground: No-hub cast iron, bell and spigot cast iron, copper DWV.
- 3. All Piping Located Below Ground: No-hub cast iron, bell and spigot cast iron, copper DWV, PVC DWV, or ABS DWV.
- 4. High Temperature: Waste piping serving fixtures that may receive waste greater than 120 degree F. shall be no-hub cast iron, bell and spigot cast iron, or copper DWV for minimum 40 feet downstream of fixture (i.e. dishwasher, three compartment sink, drains/receptors serving water heater and boiler, and similar items).
- 5. Piping Exposed to Temperatures Above 130 deg F: Galvanized steel DWV or no-hub cast iron.
- 6. No-Hub Couplings: Couplings on below ground piping shall be the heavy duty type.
- B. Cooling Condensate Drains: See Section 23 21 28.
- C . Pressurized (Pumped) Drains: Galvanized Steel DWV, copper DWV, copper, PVC DWV, or PVC.
- D. Miscellaneous Drains: Copper DWV, copper, PVC DWV, or PVC; except that for corrosive fluids (or corrosive fluid venting) applications use the same materials as specified for the acid waste (or vent) systems, or use PVC.
- E . Piping Exposed in Finished Areas: Chrome or nickel plated brass; piping 2 inches and larger may be provided with chrome or nickel plated brass sleeves to conceal pipe and fittings.

#### 2.4 CLEANOUTS

# A. General:

- 1. All cleanouts shall have cast iron bodies with bronze countersunk rectangular slotted plugs, lubricated with a non-hardening teflon base thread lubricant and having a gasket seal.
- 2. Cleanouts located in waterproof membrane floors shall be provided with an integral cast flange and flashing device.
- 3. All cleanouts shall be the same size as the pipe which they are intended to serve (but not larger than 4-inch).
- 4. Pipe fittings for cleanouts which turn through walls or up through floors shall use long sweep ells or a "Y" and 1/8 bend.
- 5. All cleanouts and access covers shall be provided with vandal proof screws.

## B. Floor Cleanouts:

- Areas With Floor Tile (or Linoleum): J.R. Smith No. 4140 Series adjustable floor cleanout with round heavy duty nickel bronze top with tile recess.
- 2. Areas With Bare Concrete Floors: J.R. Smith No. 4100 Series adjustable floor cleanout with round heavy duty nickel bronze top.

- 3. Areas With Terrazzo (and Similar Poured Floors): J.R. Smith No. 4180 Series adjustable floor level cleanout with round heavy duty nickel bronze top with terrazzo recess.
- 4. Areas With Carpet: J.R. Smith 4020-X Series adjustable floor level cleanout with round heavy duty nickel bronze top and carpet clamp.
- C . Wall Cleanouts: Cast iron ferrule with cast bronze taper threaded plug, with plug tapped 1/4-inch, 20 thread, to accept access cover screw; with stainless steel access cover and vandal proof screw.

# 2.5 ACCESSORIES

# A. Vent Flashing:

- General: Style and type to suit roofing system, match vent pipe size, and provide waterproof building penetration. Provide with adequate base size for proper flashing into roof system.
- 2. EPDM or compression molded rubber; suitable for temperatures from -60 deg F to 270 deg F; resistant to ozone and UV light. Flashing shall have aluminum or galvanized steel base for flashing or attachment to roof (style to suit roof type). Provide stainless steel clamp.
- 2.5 lb sheet lead, extending as a sleeve all around vent pipe with base extended out minimum 10 inches all around; top counter-flashing overlap 2" and turned down inside vent pipe.
- B. PVC and ABS Expansion Coupling: Coupling constructed of PVC and rubber for use in PVC and ABS piping to accommodate up to 0.75-inch expansion/contraction; held in place with stainless steel bands; shall comply with ICC and IAPMO standards. ProVent "Ez Flex".

# **PART 3 - EXECUTION**

#### 3.1 GENERAL

- A . Installation of all items shall comply with code, best professional practices, manufacturers written installation instructions, and to allow for proper functioning of items being connected to.
- B. Provide all piping as indicated and as required to allow complete and proper waste, drain, and vent connections to each fixture and equipment item requiring connection. Provide offsets as required to accommodate building construction and access requirements per Section 20 05 00. For multistory buildings include costs to offset vertical piping through each floor level since structural member locations will not be the same on each floor.
- C. Coordinate installation of items with all trades that are affected by the work to avoid conflicts.
- D. The work of this section shall include all waste (sanitary sewer), drain, and vent lines inside of the building and 5-feet outside of the building (unless indicated otherwise), to the point of and including connections to outside sanitary sewer lines or sanitary sewer manholes.
- E . Consult manufacturers data and architectural drawings for information on plumbing fixtures before beginning rough-in.
- F. Verify points of connection, invert elevations, and grade requirements before beginning installation or ordering materials.

- G . Stub all piping for all items requiring connections through wall or floor; cap and protect until connection to items is complete.
- H . Vents extending through roof shall terminate at least 10 inches above roofing; and not less than 10 feet from and 3 feet above any building opening. Provide vent flashing at each vent through roof; utilize water-proof method as required to best suit roofing material and roofing system manufacturer.
- I. Trap all fixtures and equipment items as required by governing code; provide proper venting for each trap.
- J. Provide drain piping for all drip pans, unit condensate drains, unit P-traps, etc. Run piping to nearest point of drainage, or as shown on drawings. Where routing is not shown, route to nearest point of proper drainage.
- K . Provide piping connections to equipment furnished by others in accordance with Section 20 05 00.
- L . All excavation, trenching and backfilling shall comply with code and pipe manufacturers recommendations. Below ground plastic pipe installation shall comply with ASTM D 2321 and shall exceed those standards as specified.

## 3.2 PIPE AND FITTINGS

- A. All piping in finished areas shall be installed concealed unless specifically noted otherwise.
- B. Install piping so as not to obstruct access to any items requiring routine service, maintenance, or inspection. Offset or reroute piping as required to clear any interferences which may occur. Prior to running any piping, confirm with Architect/Engineer (unless is clearly noted to be ran exposed). Install exposed piping so as not to obstruct any portion of windows, doors, doorways, passageways, or items requiring service or access.
- C . Consult all drawings for location of pipe spaces, ducts, electrical equipment, structural elements, ceiling heights, door items requiring access, openings, window openings, and other details and report discrepancies or possible conflicts to Architect/Engineer before installing pipe.
- D. Install all horizontal soil or waste lines with a slope of 1/4-inch per foot unless noted otherwise. Coordinate with AHJ if written approval is required for exceptions to 1/4-inch per foot slope.
- E. Make all changes of direction and junctions with Y fittings and 1/8 bends; use sanitary tee fittings in vertical pipe only.
- F. Provide escutcheons where exposed pipe passes through walls, floors, or ceilings.
- G . Install all piping parallel to the closest wall and in a neat, workmanlike manner. Horizontal straight runs of piping shall not deviate from straight by more than 1/4-inch in ten feet. Vertical piping shall not deviate from plumb by more than 1/8-inch in ten feet.
- H . Do not run any piping above electrical panels (and similar electrical equipment). Provide offsets around such panels as necessary. Such offsets are typically not shown on the plans, but are required per this paragraph.

- I. Prior to the joining of any section of pipe to a pipe run, the section shall be thoroughly cleaned inside and out, the ends shall be reamed to remove any cutting burrs and piping prepared as recommended by piping and fitting manufacturer.
- J . Threaded Connections: Cut piping carefully, ream, thread and work into place without springing. Use TFE tape or lead and graphite lubricant (on male threads only).
- K . Soldered Connections: Polish contact surfaces of fittings and pipes with emery cloth before fluxing male and female surfaces of joints. Steel wool and sandpaper not permitted for polishing.

# L. PVC and ABS Pipe:

- Solvent Joints: The outside of the PVC pipe shall be chamfered to a minimum of 1/16inch at approximately 22 degrees. Chemicals used must penetrate the surface of both
  pipe and fitting which will result in complete fusion at the joint. Use solvent and cement
  only as recommended by the pipe manufacturer.
- Plastic to Metal Connections: Work the metal connection first. Use a non-hardening compound on threaded connections. Use only light wrench pressure. Connections between metal and plastic are to be threaded utilizing female threaded adapters only, not male adapters.
- Expansion/Contraction: Provide offsets and expansion couplings to accommodate system expansion/contraction and for changes in building due to building shrinkage or other shifts. For wood framed construction of four stories or more; provide expansion couplings at each floor in waste and vent pipe risers.

# 3.3 INSTALLATION OF CLEANOUTS

- A. General: Install cleanouts in all soil and waste piping:
  - As shown on drawings.
  - At no more than 100 foot intervals on horizontal runs (whether shown on drawings or not).
  - 3. At the end of all piping runs.
  - 4. At the base of all vertical risers.
  - 5. At all changes of direction for a run of 10 feet or over.
  - 6. Where needed to correct possible stoppage.
  - 7. As required by Code.

# B. Elevations:

- 1. Floor cleanouts shall be installed so as to be flush with the finished floor; where recessed cleanout covers are used the recess shall be filled flush with material to match the surrounding finished floor.
- 2. Wall cleanouts in finished areas shall all be installed at the same height for a uniform appearance throughout the facility. Heights shall be selected so as not to interfere with base molding or other trim work; verify with other trades.
- C . Clearances and Access: Install cleanouts so as to assure proper clearances as required by governing code. Where cleanouts occur in concealed spaces provided extensions to floors above or to walls to allow access. Provide wall access covers or access doors for all wall cleanouts. See Section 20 05 19 for access doors.

D. Outside Building: All cleanouts located outside shall be provided with an access housing located in a 24" x 24" x 6" thick concrete pad, flush with (or up to 1/4" above) the adjacent finished grade. The pipe and cleanout shall be independent of this access housing and pad.

#### 3.4 TESTING AND INSPECTION

- A. All piping shall be tested, inspected and approved prior to being concealed or covered.
- B. Testing shall be by water or air, and comply with code.
- C . Testing shall be witnessed by the code official, the Owner's representative (at their option), and the Engineer (at their option). Prior to beginning testing confirm with the Owner and Engineer their level of involvement in the testing process and extent of witnessing; where they will be witnessing the testing notify them at least 72 hours in advance of the test and confirm their availability; coordinate and reschedule as necessary and arrange mutually agreed upon times for the tests and witnessing to occur.

## D. Water Testing:

- 1. Fill system with water so that there is no less than 10 feet of head above the highest system section being tested.
- 2. System shall hold pressure for a period of at least 15 minutes with no leakage before the inspection starts.
- 3. The system shall be inspected and shall hold tight with no leakage at all points.

## E. Air Testing:

- 1. Pressurize system with air so that there is no less than 5 psig of air pressure in the system.
- 2. System shall hold pressure for a period of at least 15 minutes without the introduction of additional air before the inspection starts.
- 3. The system shall be inspected and shall hold tight with no leakage at all points.
- F . All leaks shall be eliminated and the system re-tested before proceeding with work or concealing pipe.
- G . All repairs to piping shall be with new material and no caulking of screwed joints or holes is allowed.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 WORK INCLUDED

A. Sewage Pumps.

#### 1.3 SUBMITTALS

- A. All submittals shall comply with Section 20 05 00.
- B. Provide product information and performance data for all pumps.
- C . Performance data shall include pump curves, showing pump performance as head vs. GPM, BHP and NPSH vs. GPM, with system operating point clearly marked. (NPSH vs. GPM not required for pumps 1 HP and less.)

## 1.4 QUALITY CONTROL

- A. Manufacturer shall be IS0-9001 approved.
- B. Provide quality assurance checks specified in Section 20 05 00 prior to ordering materials.

# PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Pumps: Marley, Hydromatic, Paco, Zoeller, Liberty, Stancor, Bell&Gossett, Gould.

## 2.2 GENERAL

- A . Balancing: All rotating parts shall have been statically and dynamically balanced at the factory.
- B . Alignment: Pump and motors shall be factory aligned, and have alignment checked and reset once installed in place.
- C. RPM: Pumps and motors shall operate at 1750 rpm unless indicated otherwise.
- D . Pump Capacity: Shall be no less than the values listed on the Mechanical Equipment Schedule on the drawings.
- E. Pump Types: The type of each pump is indicated on the Mechanical Equipment Schedule under the "Type" column, and corresponds to the types specified herein.

- F. Motors: Shall comply with Section 20 05 00. Motors shall be of sufficient size so as to be non-overloading at any point on the operating curve and shall be no smaller than the size shown on the drawings. Motors shall be of drip-proof construction (unless indicated otherwise), resilient mounted with oil lubricated journal or ball bearings, and have built-in thermal overload protectors. Motors shall be for use with the voltage and phase as scheduled on the drawings.
- G . Testing: All pumps shall be factory tested per the Hydraulic Institute standards and be thoroughly cleaned.
- H. Finish: Pumps shall have minimum one coat high grade machinery enamel finish, factory applied, manufacturer's standard color.
- I. Nameplate: Pumps shall have stamped metal nameplates identifying: manufacturer, model number, capacity (gpm and head), and date of manufacturer.
- J . Variable Speed Application: Pumps used with variable speed drives shall have motors that are compatible with the variable frequency drive unit and shall have suitable couplings and accessories to suit variable speed duty.

## 2.3 GRINDER PUMP ASSEMBLY

A . TYPE: Duplex grinder pump assembly, complete with two pumps, basin, and controls.

## B. PUMP:

- 1. Type: Grinder type sump pump, submerged type, electric motor driven, completely enclosed, with capacity as shown on drawings.
- 2. Casing: Watertight, cast iron construction, with epoxy coated surface. All external nuts and bolts shall be high grade bronze or stainless steel.
- 3. Impeller: Bronze or stainless steel vane type, non-over loading.
- 4. Grinder Cutters: Constructed of 416 stainless steel, with two stage cutting.
- 5. Base: Pump shall have support feet to allow intake of fluid and keep intake clear.
- 6. Motor: Completely submersible type, oil filled, with automatic reset thermal overload.
- 7. Explosion Proof: Pump and motor assembly shall be explosion proof.
- C. VALVING AND PIPING: Provide assembly with:
  - 1. Pump discharge check valve (each pump).
  - 2. Pump discharge isolation valve (each pump).
  - 3. Pump discharge piping, from each pump, and interconnected to a common discharge.
  - 4. Valve extensions (to allow valve operation near top of basin).
  - 5. Piping shall be minimum schedule 80 PVC or schedule 40 stainless steel.
- D. PUMP REMOVAL SYSTEM: Provide rail system and hoisting cables (or chains) to allow removal of a pump from system basin while the other pump stays in operation. System shall allow for full pump removal and reinstallation from the top of the basin without a person having to enter the basin. System components shall be of stainless steel construction.

E. LEVEL CONTROLS AND ELECTRICAL:

- Level Controls: Diaphragm type or wide-angle type level switches sealed in watertight housing and designed for over 1,000,000 cycles of operation, with flexible cord and provisions for height adjustment. Provide quantity of switches to accomplish sequence of operation specified.
- 2. Sequence of Operation: Controls shall allow for lead pump to be turned on at preset water level and to be off at set low water level. Lag pump shall turn on at preset higher water level and be off at set low water level (same low level as lead pump). Alternator shall alternate which pump is lead and which pump is lag each pumping cycle. Provide level switch for high water level alarm to activate alarm bell and light when high water level is reached.
- 3. Electrical: Provide level controls wired to NEMA 4 junction box in basin, with all wires installed and sealed in a manner consistent with the NEMA type junction box used and so as to provide same level of protection. Provide NEMA 4X control panel, UL listed, housing all wiring, relays, individual pump motor starters, alternators, transformer and other devices to provide sequence of operation specified. Provide run indicating lights for each pump and hand-off-auto switch for each pump. Provide alarm bell, alarm light, alarm silence push button, and test lights for high water alarm. Control panel shall have lock or pad-locking provision.

## **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Install pumps at locations shown on the drawings.
- B. Check pump operation to ensure that specified flows are provided, without motor unloading or pump cavitation. Notify the Architect/Engineer of any unusual conditions or performance other than as specified.
- C . Provide check and isolation valves in discharge lines from each sump pump.
- D. Sump Pump Controls/Electrical: Mount sump pump control cabinet at locations shown on drawings. Control wiring from control cabinet to pump junction box shall be by the Division 25 contractor. Power junction box shall be by Division 26 contractor. All other wiring/connections and wiring/connections from pump junction box to pump and level switches shall be provided as part of the pump package.
- E. Check and adjust sump pump level controls for proper operation and pump sequencing.
- F. Existing Sumps: Provide repairs to existing sumps and covers as noted on the drawings.

END OF SECTION

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

#### 1.2 WORK INCLUDED

A. Water Heaters.

#### 1.3 REFERENCES

- A . Boiler Code: State of Washington Boilers and Unfired Pressure Vessel Laws, Chapter 70.79 RCW, Chapter 296-104 WAC.
- B. NSF 61: Drinking Water System Components Health Effects.

## 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for all items to be used.
- B. Manufacturer's Instructions: Submit manufacturer's installation instructions for water heaters.

#### 1.5 GENERAL REQUIREMENTS

- A . NSF: Manufacturers shall fabricate and label equipment components that will be in contact with potable water per NSF 61.
- B . Quality Assurance: Provide quality assurance checks specified in Section 20 05 00 prior to ordering products.
- C . Code Compliance: Water heater shall comply with code. Provide water heater with all proper ratings, accessories and features as needed to comply; including but not limited to: unit efficiency, insulation levels, modular demand response communications port (e.g. ANSI/CTA-2045 or as enforced by the AHJ), safety devices, controls, heat traps, labeling, etc.
- D. Temperature Settings: Water heaters shall be able to be set at a leaving (or system) water temperature over a range. Low setting shall be at least 90 degrees F or 10 degrees F lower than the system water temperature indicated on the plans (whichever is lower). High setting shall be at least 20 degrees higher than the system water temperature indicated on the plans.

# **PART 2 - PRODUCTS**

# 2.1 ACCEPTABLE MANUFACTURERS

A . Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Water Heaters – Tank Type: A.O. Smith, Rheem, Bradford-White, State, PVI.

## 2.2 WATER HEATERS

- A . Type: Tank type electric water heater, constructed in accordance with ASME code, UL listed, and NSF approved. A.O. Smith DSE series (or approved).
- B. Capacity: Shall have capacity as indicated on the drawings.
- C . Tank and Insulation: Tank shall be of steel construction, constructed and stamped in accordance with ASME code for a minimum working pressure of 125 psi at maximum water heater operating temperature. All internal tank surfaces shall be glass coated; glass coating shall be an alkaline borosilicate composition, fused to tank by firing at a high temperature. Tank shall be insulated with foam to comply with local code requirements and no less than ASHRAE 90.1 (latest edition) for insulating rating and tank heat loss. Tank and insulation shall be fully enclosed within a steel enclosure having a baked on enamel finish and hinged access door to access unit controls and wiring.
- D. Cathodic Protection: Tank shall be cathodically protected with an extruded magnesium rod, full size of unit, selected by manufacture to suit typical water conditions at the installation general location and adequate to last the tank warranty period. Rod shall be removable through top of tank.
- E . Immersion Heaters: Minimum of three elements per immersion heater, incoloy sheathed, flange mounted and with factory wired terminal leads.
- F . Accessories: Water heater shall have brass drain valve with 3/4-inch hose thread male outlet and an ASME rated pressure and temperature relief valve.
- G . Electrical and Controls: Water heater shall be rated for use with electrical power of the voltage and phase as scheduled. Water heater shall have necessary contactors, controls, and safeties to control water heater temperature to within 5 degrees of value set. Contactors shall be magnetic type, rated for minimum 100,000 cycles. Unit shall have element fusing as required by local code and the NEC. Water heater control circuit shall be 120 or 24 volt, and unit shall have an integral control circuit transformer with fusing. Thermostat shall be the immersion type, shall control water heater temperature and be able to be set over a range. Water heater shall have a manual reset high limit to stop water heater operation at a high unsafe temperature. All wiring shall be color coded and labeled for ease of service.
- H. Warranty: Tank shall be warranted to be free from defects for three years.

## **PART 3 - EXECUTION**

# 3.1 INSTALLATION

- A. General: Comply with Section 20 05 00. In accordance with manufacturer's written installation instructions, code, applicable standards, and best construction practices.
- B. Coordination: Coordinate the work with all trades that may be affected by the work to avoid conflicts and to allow for an organized and efficient installation of all systems.
- C . Connections: Connect and install all items shipped loose with equipment and as needed for proper system operation. Provide and connect all utilities and services to equipment as required for proper equipment and system operation.

- D. Protection, Operation and Maintenance: Comply with Section 20 05 00. Protect water heaters against use and damage during construction; provide guards and/or boxing as required.
- E. Relief Valves: Pipe all pressure relief valves to proper point of drainage.
- F. Vacuum Breakers: Provide vacuum breakers on water heaters where water heaters serve fixtures located below the water heater height.
- G. Clearances: Provide as required for maintenance or as required by Code; whichever is greater. Water heater sizes exceeding any of the following shall have minimum 18" clearance all around (or as required by Boiler Code for boilers; whichever is greater): 120 gallons, 160 psi, or 200,000 BTU/hr input.
- H. Anchorage: Provide seismic strapping and anchorage of water heater to building structure.
- I. Inspection: Inspect water heaters and connecting systems to confirm water heaters and system are ready for start-up and operation. As a minimum, check for: proper voltage and phase, correct gas pressure and regulator setting (for gas fired units), correct electrical connections, complete control connections, relief valve correctly sized and discharge piped, drain provisions installed, valving to water heater accessible and ready to be set in operating positions, and other items as listed by the manufacturer are properly provided and connected.
- J. Start-Up and Adjustment: Put water heater into service following manufacturer start-up procedures. Adjust water heaters for proper operation; set thermostats for required supply temperature. Check operation of water heater by flowing water and confirming proper operation.

**END OF SECTION** 

## **PART 1 - GENERAL**

# 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 WORK INCLUDED

- A. Plumbing Fixtures and Trim.
- B. Installation/Connection of Equipment Specified Elsewhere.
- C. Adjustment and Cleaning.

# 1.3 DEFINITIONS

- A . "Plumbing Brass" means "P-traps, stops, strainers, tailpieces, flanges, and other brass fittings and accessories NOT including faucets or stops."
- B. "Trim" includes all plumbing brass items, faucets, and any fixture accessories.
- C . "Accessible" refers to the American's with Disabilities Act, and infers that these fixtures will meet Federal and local code requirements.
- D. "Lead-Free" means not containing more than 0.2% lead in solder and flux; and not more than a weighted average of 0.25% lead in wetted surfaces of pipes, pipe and plumbing fittings and fixtures.

# 1.4 REFERENCES

- A. UPC: Uniform Plumbing Code.
- B. NSF/ANSI Standard 61: Drinking Water System Components Health Effects.

## 1.5 SUBMITTALS

- A. General: All submittals shall comply with Section 20 05 00.
- B. Product Data: Submit product data for all plumbing fixtures, plumbing trim, and water heaters.

# 1.6 GENERAL REQUIREMENTS

A . Fixture Quality: Provide new fixtures and fittings, approved, free from flaws and blemishes with finished surfaces clear, smooth and bright. Visible parts of fixture brass and accessories, and all items located in accessible cabinet spaces, shall be heavily chrome plated. All stops, P-traps and items exposed to view shall be chrome plated (except where specifically noted otherwise).

- B. Code Compliance: All products and connections shall be in compliance with code, local Utilities Department standards, and Health Department requirements.
- C . Off-The-Floor Mounted Fixtures Movement:
  - 1. General: Off-the-floor (i.e. wall) mounted fixtures shall be supported, anchored, and braced in a manner so that the fixture does not move more than the values indicated below with the imposed forces as indicated; nor shall the fixture or associated fittings leak or suffer damage of any kind. Deflection shall be measured at the front most part of the fixture (i.e. the point on the fixture furthest away from the wall containing the fixture supports), with the load imposed at the same location as the measured deflection. Deflection shall not be exceeded in any direction with the force imposed in any direction.
  - 2. Water Closets: 1/16-inch with a 300 pound force.
  - 3. Other Fixtures: 1/16-inch with a 150 pound force.
- D. Spare Parts: Provide two spare stop valves.

## 1.7 QUALITY ASSURANCE

A . General: Provide quality assurance checks specified in Section 20 05 00 prior to submitting product data. By submitting products for Engineer's review, the Contractor is confirming that such checks have been performed and that the products are suitable for the intended installation and use.

# B. Fixtures:

- Types: Verify specified fixture types with the Architectural and Plumbing drawings to confirm the requirements are consistent (e.g. fixtures are wall mounted versus floor mounted type, locations of ADA fixtures match, etc.). Where conflicts occur clearly identify the issue on the fixture submittal along with a proposed resolution; or resolve prior to making the submittal by the project RFI process.
- 2. Space Verification: Prior to ordering any fixtures or making submittals, Contractor shall check the drawings and verify that all fixtures will fit the space available (i.e. fixtures fit any cabinets fixtures are to be installed in; fixtures have adequate access clearances for proper use; etc.).
- C . Lead-Free Requirement: All items in contact with potable water shall be lead free. Fixtures used to dispense potable water for drinking shall meet the requirements of NSF/ANSI 61.

## PART 2 - PRODUCTS

# 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Water Closets: Kohler, American Standard, Eljer, Mansfield.
- C . Vitreous china (other than water closets) and enameled cast iron fixtures: American Standard; Kohler, Eljer, Mansfield.

D. Water Closet Seats: Church; Beneke; Olsonite; Kohler; Bemis.

- E. Carriers: Josam; J.R. Smith; Wade; Zurn.
- F. Stainless Steel Sinks: Just; Elkay, Franke.
- G. Service Sinks: Fiat; Stern and Williams; Swan; Kohler; Mustee.
- H. Plumbing Brass: McGuire; American Standard; Brasscraft; Dearborn Brass; Chicago Faucet; Crane; Eljer; Frost; Kohler; Speakman; Symmons; T & S Brass; Elkay; ProFlo.
- I. Faucets: Chicago Faucet (no substitutions).
- J. Stops: McGuire; Brasscraft; ProFlo; Chicago Faucet.
- K. Flush Valves: Sloan, Zurn.
- L . Hot Water Temperature Limiting Valve: Symmons, Watts, Chicago Faucet, Acorn Controls, Leonard, Cash Acme.

#### 2.2 PLUMBING FIXTURES

## A. General:

- 1. Plumbing Fixtures are listed below by reference numbers, corresponding to the reference number adjoining these items on the drawings.
- 2. All vitreous china and enameled cast iron fixtures shall be finished white unless specifically noted otherwise.
- 3. All stainless steel sinks shall be sound deadened, and shall have faucet ledge (except where noted specifically without ledge).
- 4. In interests of Owner's Standardization, fixtures of similar type shall be product of one manufacturer; trim of similar type shall be product of one manufacturer.

#### B. Water Closets:

# P-1A Water Closet - Wall Hung - ADA:

Water Closet: Kohler "Kingston-Lite", No. K-4325, vitreous china, elongated bowl, wall mounted, siphon jet action bowl with 1-1/2" top spud, and 1.28 gallon flush.

Flush Valve: Sloan "Ecos" 8111-1.28/1.1 chrome-plated low consumption dual flush battery operated sensor operated flush valve with vacuum breaker, quiet-action, and screw driver stop.

Seat: Kohler "Lustra", No. K-4670-SC, white plastic elongated seat, open-front and stainless steel self-sustaining check hinge.

ADA: Configure and install for ADA access. Verify with Architectural drawings for mounting heights and off-center stall dimensions. Provide with flush valve so that handle is on wide side of stall.

#### P-1B Water Closet - Wall Hung:

Same as P-1A fixture, except that fixture shall be mounted for normal use.

#### C. Lavatories:

# P-3A Lavatory - Wall Hung - ADA:

Lavatory: Kohler "Greenwich", No. K-2032, 20" x 18", vitreous china lavatory with 4" faucet centers, overflow for use with concealed arm carrier.

Plumbing Brass: Kohler No. K-7129 lavatory drain with perforated grate and 1-1/4" tailpiece; Kohler No. 9000 1-1/4" cast brass "P" trap with cleanout; stops and risers per "Specialties" in this specification section.

Faucet: Sloan Optima Model ETF-600 infrared sensor, 8" centers, 0.35 GPM flow, with 115 volt/ 1 phase hardwired power.

Cover: TrueBro Model Series 2018 ADA-compliant, high-impact UV-protected vinyl cover, custom factory pre-cut to fit lavatory.

#### D. Sinks:

#### P-5A Sink:

Sink: Elkay No. LRAD 3319, dual compartment ADA, multi-hole drill, 18 gauge, type 304, stainless steel, 19" front to back x 33" left to right x 6-1/2" deep self–rimming sink with rear faucet ledge.

Plumbing Brass: Elkay stainless steel cup strainer with 1-1/2" tailpiece and 1-1/2" cast brass "P" trap; stops and risers per "Specialties" in this specifications section.

Faucet: Chicago Faucet No. 1100-HA8XKABCP top mount sink faucet on 8" centers, with No. 1000 handles, ceramic cartridges, No. HA8 swing spout, and 0.5 gpm aerator.

# P-5B Sink:

Sink: Just Manufacturing or Advanced Tabco custom 16 gauge all stainless construction Steel Sink with integrated table and lower shelf. Overall length shall be 96" long x 30" deep x 34" high

Plumbing Brass: Elkay stainless steel cup strainers with 1-1/2" tailpieces and 1-1/2" cast brass "P" trap with cleanout; stops and risers per "Specialties" in this specifications section.

Faucet: Chicago Faucet No. 1100-HA8XKABCP top mount sink faucet on 8" centers, with No. 1000 handles, ceramic cartridges, No. HA8 swing spout, and 0.5 gpm aerator. Provide with vacuum breaker.

### E. Service Sinks:

# P-6A Service Sink - Floor Mount:

Sink: Swan No. MS-2424 molded fiberglass sink basin, 24" x 24" x 10" high, color white, with minimum 30" long heavy duty reinforced 5/8" diameter flexible hose for connection to 3/4" hose thread, spring loaded stainless steel hose bracket, vinyl rim guards.

Plumbing Brass: Combination dome strainer and lint bucket of minimum 16 gauge 302 stainless steel, with stainless steel screws and 3" drain connection.

Faucet: Chicago Faucet No. 897-RCF combination service sink fitting with 3/4" hose thread on spout, No. 369 handles, wall brace, pail hook, No. R-1/2" flanged female adjustable arms, integral stops, ceramic cartridges, polished chrome-plated.

# P-6B Service Sink - Wall Hung:

Sink: Kohler "Bannon" No. K-6714 with wall hanger, acid enamel finish, manufacturer's stainless steel rim guards, outlet strainer, and adjustable cast iron trap.

Faucet: Chicago Faucet No. 897XP-CCP combination service sink fitting with 3/4" hose thread on spout, No. 369 handles, wall brace, pail hook, No. R-1/2" flanged female adjustable arms, integral stops, ceramic cartridges, polished chrome-plated.

#### F. Floor Drains:

## P-11A Floor Drain:

J.R. Smith No. 2010-A cast iron body floor drain, with nickel bronze adjustable strainer head, round nickel bronze grate, vandal proof screws, reversible flashing collar, and trap primer connection. Provide with wide flange round strainer, minimum 4-inches wide and 3/16-inch thick where drain is used with waterproof membranes installed on top of the floor; J.R. Smith DX2010-A. Size drain outlet to match pipe size shown on drawings.

# G. Water Fittings:

# P-12A Valve Box:

Guy Gray Model BIM875 stainless steel rough-in box with angle valve (1/2-inch inlet, 1/4-inch compression outlet).

# 2.3 OFF-THE-FLOOR FIXTURE SUPPORTS (CARRIERS)

- A . General: Type to suit fixture and building construction, with added anchors, bracing, wall backing and accessories to comply with maximum specified fixture movement. Concealed in wall. Provide with all hardware and accessories for proper fixture support to suit the application. See Section 20 05 29 for hangers and supports.
- B. Water Closets: Cast iron or steel construction, adjustable to support fixture, with positive sealing gasket fabricated of closed cell neoprene. Shall be capable of supporting 700 lb load test per ANSI A112.19.2; Provide with rear anchoring lug on single units to comply. J.R. Smith 100, 200 and 300 series with added anchors and accessories to comply with maximum specified fixture movement.
- C . Lavatories: Steel construction, with 1-inch x 3-inch rectangular steel uprights welded to 4-inch square steel base plates for floor anchoring, and arms for lavatory support. J.R. Smith Figure 700 and 710 with added anchors, bracing, wall backing and accessories to comply with maximum specified fixture movement.

- D. Other Fixtures: Manufacturers' standard carrier to suite fixture and application, steel construction with anchors, bracing, wall backing and accessories to comply with maximum specified fixture movement.
- E . Non-Standard Fixtures: For fixtures that standard carriers are not manufactured for provide 3/16" thick steel back plate for block walls and wood stud walls; or a 2" x 2" x 1/4" angle welded to at least four studs for metal stud walls, with through bolts and fasteners to support fixture and comply with maximum specified fixture movement.

## 2.4 SPECIALTIES

- A . General: Unless indicated otherwise, the following fittings and materials (i.e. specialties) shall be used.
- B. Fixture Traps: 17 gage seamless chrome plated cast brass tubing, with 2 inch minimum seal, cast brass slip nuts, size as required by Uniform Plumbing Code (unless a larger size is indicated), and configured to suit the application. Provide with cleanout where indicated or required by code.
- C . Exposed Piping and Fittings: In finished areas and in accessible cabinets, provide piping with chrome plating or sleeved with chromed sleeves or of stainless steel construction/finish; all chrome to have a bright polished finish. No exposed copper allowed (includes accessible cabinet areas).
- D. Stops: Quarter turn ball valve type, chrome plated, UPC compliant, with low lead brass body, rated for minimum 125 psi operating pressure and temperature of water used with plus 20 deg F. Size and configuration to suit application. Provide with loose key where installed in areas with public access.
- E . Risers: Flexible braided steel type; rated for 125 psig.
- F. Escutcheons: See Section 20 05 19.
- G . Refrigerator Valve Box: 20 gauge hot dipped galvanized steel box with 18 gauge face plate, 1/2" inlet x 1/4" outlet compression angle valve. Guy Gray Model BIM875.
- H. Hot Water Temperature Limiting Valve: Thermostatic water temperature mixing valve with integral checks, complying with ASSE 1070 and UPC Chapter 4. Brass body with brass and stainless steel internal components. Leonard "ECO-Mix" 270 or Symmons "Maxline" Model 5-210.
- I. Sealant: See Section 20 05 30. Sealant at fixtures shall be the silicone type, color to match fixture.

# PART 3 - EXECUTION

## 3.1 INSTALLATION OF FIXTURES

- A . General: All fixtures shall be completely connected to piping as needed to make a complete and operable installation.
- B . Fixture Locations: Mounting heights and locations of fixtures shall be as shown on the Architectural drawings and in accordance with Contract Document requirements. Locations

shall be verified and coordinated with the various trades affected by the installation of these fixtures. When none indicated or shown, obtain mounting location and heights from the Architect/Engineer prior to installation. Floor drains shall be installed in proper locations and coordinated with floor slopes so that drains are set at low points to allow for floor drainage. Floor receptors (or floor sinks) shall be set flush with floors to allow drains to serve as both indirect drain receptors and as floor drains (unless noted otherwise or required to be elevated by code).

- C . Rough-In: Determine rough-in location of fixture utilities to suit fixture location, fixture dimensions, elements of construction (i.e. beams, studs, electrical, ducts, etc.), access requirements, casework dimensions, items which may drain/connect to fixture, use of fixture, and related considerations. The fixture rough-in locations indicated on the plans is schematic, and is not to be used for final rough-in purposes. Coordinate fixture locations with other systems so that either conflicting items are relocated or fixture locations are adjusted to suit.
- D . Offsets: Provide offsets in piping to fixtures to accommodate building systems. Such offsets shall include off-setting waste piping into cabinet bases (in kick space where possible) to accommodate beams located directly below walls behind fixtures.
- E . Carriers: All off-the-floor (i.e. wall) mounted fixtures shall be installed with supporting carriers and additional anchors, bracing and supports to transmit fixture loads to the floor and building structure without exceeding the maximum specified fixture movement. Prior to concealing carrier and associated supports review adequacy of support system with Architect/Engineer.
- F . Fixture Sealant: Where fixtures abut to walls, floors, and cabinets seal all joints with a uniform fillet bead of sealant. Provide at other locations as recommended by fixture manufacturer.
- G . Protection: Protect fixtures against use and damage until project substantial completion; provide guards and/or boxing to protect.
- H. Water Closet Lavatory Transformers: Provide low voltage wiring from transformer to sensor flush valve / faucet. See plan for transformer locations.

## 3.2 INSTALLATION OF SPECIALTIES

- A. Escutcheons: Provide escutcheons at each point where an exposed pipe or other fitting passes through walls, floors, backs of cabinets, or ceilings.
- B. Stops: Provide stops in water connections to all fixtures/equipment, except where a stop valve is integral to the fixture (e.g. flush valves) and in water connections to all items not served by another valve.
- C . Hot Water Temperature Limiting Valve: Install on all lavatories, hand wash sinks, bathtubs, showers, whirlpools, bidets and at fixtures required by Code (reference UPC Chapter 4); set for 115 deg F maximum delivery temperature. Test and adjust for proper operation and submit written report documenting work performed.

# 3.3 ADJUSTMENT AND CLEANING

- A . Cleaning: After completion of installation remove all labels and thoroughly clean all fixtures, trim and fittings.
- B. Adjustment: Adjust all flush valves, fixture stops, faucets, valves, and associated plumbing items as necessary for the proper operation of all fixtures and equipment.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

# 1.2 WORK INCLUDED

- A. Cooling Coil Condensate Drains.
- B. Overflow, Miscellaneous Drains.
- C . Fabricated P-Traps.
- D. Testing and Inspection.

# 1.3 SUBMITTALS

- A. Submittals shall comply with Section 20 05 00.
- B. Submit product information on all items to be used.

# 1.4 REFERENCES

- A. ASME B 16.15: Cast Bronze Threaded Fitting Classes 125 and 250.
- B. ASME B 16.18: Cast Copper Alloy Solder Joint Pressure Fittings.
- C. ASME B 16.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B 16.23: Cast Copper Alloy Solder Drainage Fittings.
- E . ASME B 16.29: Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings (DWV).
- F. ASTM B 32: Solder Metal.
- G . ASTM B 88: Seamless Copper Water Tube.
- H. ASTM B 306: Copper Drainage Tube (DWV).
- I. ASTM D 1785: Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- J. ASTM D 2466: Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- K. ASTM D 2564: Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- L. ASTM D 2665: Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

# **PART 2 - PRODUCTS**

## 2.1 ACCEPTABLE MANUFACTURERS

Products shall comply with Section 20 05 00, 2.01, Acceptable Manufacturers.

- A . Pipe and Fittings: Domestic Manufacturers only; Mueller, Cerro, Tyler, US Pipe, Charlotte Pipe and Foundry, Pacific States Pipe, Atlantic States, Spears Manufacturing, Cresline Northwest.
- B. Fabricated P-Trap: Rectorseal.
- C. Condensate Pumps: Little Giant.

# 2.2 PIPE AND FITTINGS - MATERIALS

- A. Copper DWV Pipe and Fittings: Copper drainage tube per ASTM B 306. Wrought copper and wrought copper alloy solder joint fittings per ASME B 16.29; or cast copper alloy solder joint fittings per ASME B 16.23.
- B. Copper Pipe and Fittings: Seamless copper water tube, tube L or M, per ASTM B 88. Solder joint wrought copper and bronze fittings per ASME B 16.22 cast copper alloy fittings per ASME B 16.18, and cast bronze threaded fittings per ASME B 16.15 with 95/5 tin-antimony solder per ASTM B 32.
- C. PVC DWV Pipe and Fittings: Polyvinyl chloride drain waste and vent pipe and fittings per ASTM D 2665, with solvent cement joints. Solvent cement shall comply with ASTM D 2564.
- D . PVC Pipe and Fittings: Polyvinyl chloride pipe, schedule 40, per ASTM D 1785. Solvent cement socket type fittings per ASTM D 2466. Solvent cement shall comply with ASTM D 2564.

# 2.3 PIPE AND FITTINGS - APPLICATION

- A. Cooling Condensate Drains: Copper DWV, copper, PVC DWV, or PVC.
- B. Miscellaneous Drains: Copper DWV, copper, PVC DWV, or PVC. Except that handling acidic or corrosive fluids shall be PVC.

#### 2.4 FABRICATED P-TRAPS

- A . Type: Factory fabricated p-trap with dual cleanouts and clear trap, for cooling coil condensate. Rectorseal "EZ Trap" (or approved).
- B. Construction: Fabricated of schedule 40 PVC, with transparent plastic trap portion. Portion connection to HVAC unit (or coil) drain shall consist of a PVC cross, with top and side cleanouts having caps with integral retaining strap and ring. Outlet portion shall consist of PVC tee fitting, with top portion able to serve as vent.
- C . Size: 3/4-inch unless indicated otherwise. Trap heights shall be sized to suit HVAC unit static pressures, unit configuration (i.e. blow through or draw through), and be consistent with HVAC unit manufacturers installation recommendations.
- D . Cleaning Brush: Provide with bristled flexible shaft cleaning brush, sized for cleaning of ptrap.

# 2.5 CONDENSATE PUMP

- A . Type: Automatic condensate pump with integral tank; for pumping cooling coil condensate, combustion condensate and similar fluids. Little Giant VCMA, VCMX or VCL series (or approved).
- B. Capacity: Pump shall be rated to pump minimum of 1.4 gallons per hour per ton of unit cooling capacity served (e.g. 10 ton unit shall have a 1.4 x 10 = 14 gph capacity) at 15 feet of head (unless a different capacity is indicated). Pumps serving combustion condensate shall have a capacity of 25 gph per 1000 MBH of equipment capacity at 15 feet of head (unless a different capacity is indicated). Tank shall be 1/2 gallon capacity (unless indicated otherwise). Unit shall be rated for continuous operation.
- C . Construction: Tank body and pump shall be constructed of oil resistant polypropylene or ABS, with discharge check valve, and float for pump on/off control, factory wired.
- D. Accessories: Provide with overflow safety switch for wiring to low voltage controls to stop HVAC unit on high condensate (or to indicate an alarm).
- E . Electrical: Provide with integral electric motor, having thermal overload protection, for use with 115 volt or 230 volt (as required to suit available power) AC single phase power, with minimum 6-foot 3-prong grounded plug.

## **PART 3 - EXECUTION**

## 3.1 GENERAL

- A . Installation of all items shall comply with code, best professional practices, and manufacturers written installation instructions.
- B. Provide all piping as indicated and as required for all drip pans, unit condensate drains, unit p-traps, and miscellaneous drains and vent connections to all items requiring such drains (i.e. HVAC units, furnaces, boilers, AC units, etc.).
- C. Coordinate installation of items with all trades that are affected by the work to avoid conflicts.
- D. Consult manufacturers data and drawings for information on equipment before beginning drain rough-in.
- E . Verify points of connection, elevations, and grade requirements before beginning installation or ordering materials.
- F. Trap all equipment items as required by code; provide proper venting for each trap as indicated and as required by code.
- G . Run piping to nearest point of drainage, or as shown on drawings. Where routing is not shown, route to nearest point of proper drainage.

# 3.2 PIPE AND FITTINGS

- A. All piping in finished areas shall be installed concealed unless specifically noted otherwise.
- B. Install piping so as not to obstruct access to any items requiring routine service, maintenance, or inspection. Offset or reroute piping as required to clear any interferences which may occur. Prior to running any exposed piping, confirm with Architect/Engineer

- (unless is clearly noted to be ran exposed). Install exposed piping so as not to obstruct any portion of windows, doors, doorways, passageways, or items requiring service or access.
- C . Consult all drawings for location or pipe spaces, ducts, electrical equipment, structural elements, ceiling heights, door items requiring access, openings, window openings, and other details and report discrepancies or possible conflicts to Architect/Engineer before installing pipe.
- D. Install all drain lines with a slope of 1/4-inch per foot unless noted otherwise. Coordinate with AHJ if written approval is required for exceptions to 1/4-inch per foot slope.
- E. Provide escutcheons where exposed pipe passes through walls, floors, or ceilings.
- F. Install all piping parallel to equipment and nearby walls and in a neat, workmanlike manner. Horizontal straight runs of piping shall not deviate from straight by more than 1/4-inch in ten feet. Vertical piping shall not deviate from plumb by more than 1/8-inch in ten feet.
- G . Do not run any piping above electrical panels (and similar electrical equipment). Provide offsets around such panels as necessary. Such offsets are typically not shown on the plans, but are required per this paragraph.
- H. Prior to the joining of any section of pipe to a pipe run, the section shall be thoroughly cleaned inside and out, the ends shall be reamed to remove any cutting burrs and piping prepared as recommended by piping and fitting manufacturer.
- I. Threaded Connections: Cut piping carefully, ream, thread and work into place without springing. Use TFE tape or lead and graphite lubricant (on male threads only).
- J . Soldered Connections: Polish contact surfaces of fittings and pipes with emery cloth before fluxing male and female surfaces of joints. Steel wool and sandpaper not permitted for polishing.

# K. PVC Pipe:

- Solvent Joints: The outside of the PVC pipe shall be chamfered to a minimum of 1/16 inch at approximately 22 degrees. Chemicals used must penetrate the surface of both pipe and fitting which will result in complete fusion at the joint. Use solvent and cement only as recommended by the pipe manufacturer.
- Plastic to Metal Connections: Work the metal connection first. Use a non-hardening compound on threaded connections. Use only light wrench pressure. Connections between metal and plastic are to be threaded utilizing female threaded adapters only, not male adapters.

# 3.3 TESTING AND INSPECTION

- A. All piping shall be inspected and approved prior to being concealed or covered.
- B. Provide testing as required by code. Testing shall be by water and shall comply with governing code. Testing shall be witnessed by the plumbing inspector and the Engineer's representative (at his option).
- C . All leaks shall be eliminated and the system re-tested before proceeding with additional work or concealing pipe.

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D . All repairs to piping shall be with new pipe and fitting material's; no caulking of screwed joints or holes is allowed.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

#### 1.2 WORK INCLUDED

A. Refrigerant Piping and Accessories

#### 1.3 SUBMITTALS

A. Product Data: Submit complete product information on all products to be used.

#### 1.4 GENERAL REQUIREMENTS

A . Refrigerant Pipe Sizing: Refrigerant pipe sizes shown on the drawings are preliminary only. Due to the use of proprietary selection criteria by equipment manufacturers verify and finalize all required pipe sizes with the equipment manufacturer (or manufacturer's representative) prior to bidding. Verify with the equipment manufacturer (or manufacturer's representative) the need for any accumulators, solenoid valves, and similar accessories and size/select such devices prior to bidding. Include costs in bid for required pipe sizes and all accessories.

# 1.5 REFERENCES

- A . ASME B16.22: Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- B. ASME B16.26: Standard for Cast Copper Alloy Fittings for Flared Copper Tubes.
- C . ASTM B280: Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

# PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

- A . Products shall comply with Section 20 05 00, See Section 20 05 00, paragraph 2.01 for Acceptable Manufacturer requirements.
- B. Refrigerant Piping and Accessories: Mueller, Sporlan, Nibco, Elkhart, Parker, Emerson, Henry.

## 2.2 REFRIGERANT PIPING AND ACCESSORIES

A . Piping: Hard drawn ACR copper tubing per ASTM B280, Type L. Soft copper tubing may only be used on runs less than 50-feet or where necessary (i.e. when routing through sleeves, or similar poor access areas).

B. Fitting: Silver brazed joints and wrought copper fittings per ASME B16.22. Long radius elbows only. Flared fittings (at equipment connections only) shall comply with ASME B16.26.

## 2.3 ACCESSORIES

- A . Sight Glass: Sight glass shall allow visual inspection of refrigerant flow and indicate refrigerant moisture content. Shall be double port type, solder end connections, for use with type of refrigerant of system being installed in, same size as tubing installed in. Henry type 3103 or equal.
- B. Isolation Valves: Brass ball valve, full port, rated for 700 psig and -40 deg F to 300 deg F. Compatible with refrigerant used with, UL listed, with rupture proof encapsulated stem, extended copper connections for ease in brazing. Provide in configuration (i.e. angle, straight, with access port) as required to suit application.
- C . Filter/Drier: Sealed canister type, with molded blended desiccant core, for filtering refrigerant system moisture, debris and acids. Suitable for refrigerant and system type used with. Size for maximum 1 psi pressure drop. Sporlan "Catch-All" (or approved).

# **PART 3 - EXECUTION**

# 3.1 GENERAL

- A. General: Comply with Section 20 05 00. Install in accordance with Manufacturer's written instructions, code, applicable standards and best construction practices.
- B. Location Verification: Install piping in locations as indicated in accordance with the Contract Documents. Prior to selecting installation locations, confirm that: unit location matches ductwork for the area the unit is intended to serve; installed duct locations match unit; manufacturer's pre-installation checks have been completed; proper unit clearances and access will be provided; no adverse conditions will affect unit operation at the proposed location and arrangement present; and installation has been coordinated with other trades.
- C . Complete Connections: Connect and install all items shipped loose with units; provide and connect all utilities and accessories as required for proper unit operation.
- D. Pipe Sizing: Review selected pipe routing, pipe lengths, elevation changes, and fittings with equipment manufacturer (or manufacturer's representative) prior to installing and confirm final pipe sizing any required accessories. Provide accumulators, solenoid valves, and similar accessories recommended by the equipment manufacturer (or manufacturer's representative) to maintain equipment full capacity.

#### 3.2 INSTALLATION

# A. General:

- All piping in finished areas shall be installed concealed unless specifically noted otherwise.
- Install piping at such heights and in such a manner so as not to obstruct any portion of windows doorways, passageways, or access to any items requiring routine service, maintenance, or inspection. Offset of reroute piping as required to clear any interferences which may occur.

- 3. Install all piping parallel to the closest wall and in a neat, workmanlike manner. Horizontal exposed straight runs of piping shall not deviate from straight by more than 1/4-inch in ten feet. Vertical piping shall not deviate from plumb by more than 1/8-inch in ten feet.
- B. Insulation: Allow sufficient clearances for installation of pipe insulation in thickness specified. If interferences occur, reroute piping to accommodate insulation.
- C . Escutcheons: Provide escutcheons where exposed pipe passes through walls, floors, or ceilings.
- D. Electrical Items: Do not run any piping above electrical panels (and similar electrical equipment). Provide offsets around such panels as necessary. Such offsets are typically not shown on the plans, and are required per this paragraph.
- E . Joints: Prior to the joining of any section of pipe to a pipe run, the section shall be thoroughly cleaned inside and out, the ends shall be reamed to remove any cutting burrs and piping prepared as recommended by pipe and fitting manufacturer.
- F. Brazing: Piping joints shall be silver brazed. Bleed dry nitrogen through piping during brazing to minimize oxidation. Keep all open ends of piping capped when not being worked. Soft copper shall have long radius bends; install without kinks or excess bends. Piping shall be routed concealed, except where routed outdoors and where noted. Piping shall be ran plumb and square to building walls, and in a neat professional manner. Provide sight glass in refrigerant liquid piping at outdoor unit.
- G. Refrigerant Valves: Provide isolation valves on refrigerant piping connections at the outdoor unit (unless unit has integral service valves). Provide valve with access port on larger volume systems to aid in system vacuum testing (or as required for other purposes).
- H . Refrigerant Charge: Units shall be checked for proper refrigerant charge and oil level and charged to proper levels after all leak testing and evacuation work has been completed. Refrigerant to be added to the system shall be delivered to the site in factory charged containers and charged into the system through a filter/drier.

# 3.3 REFRIGERANT LEAK TESTING AND EVACUATION

- A. Notification/Witnessing: Prior to beginning any testing, notify the Architect/Engineer when the testing will occur. The Architect/Engineer will witness (at his discretion) various parts of the test. Failure to notify the Architect/Engineer will be cause to re-test all piping in the presence of a representative of the Architect/Engineer.
- B. Test Preparation: Disconnect and isolate from the system any components that may be damaged by the test pressure.
- C . Testing: Connect oil-pumped, dry nitrogen to the system through a pressure reducing gauge manifold. Charge enough nitrogen into the system to raise the pressure to 50 psig. Let stand for 2 hours and check for signs of leakage. If no leakage is noted, slowly increase pressure to 300 psig (or as required by local code, whichever is higher). Tap all brazed connections with a rubber or rawhide mallet sufficiently hard to start any leak that might subsequently open from thermal expansion/contraction or vibration. Check the manifold gauge for any drop in pressure. Let the system stand pressurized for 24 hours. Re-check the manifold gauge. If no change in pressure is noted (after adjusting for temperature) the system may be considered free of leaks.

- D. Leak Repair: If leakage is suspected or apparent, check joints with a glycerin soap solution or other means to locate the leaks. Repair any leaks found by completely disassembling the connection, cleaning the fitting and remaking the connection. Re-test the system after repairs are made both with pressure (300 psi for 24 hours) and at the leak location with a glycerin soap solution or other means of determining leaks.
- E . System Evacuation: When the system has been proven free of leaks with the above methods, the system shall be completely evacuated of all air and moisture. Connect a vacuum pump to the system and pump the system down to 500 microns and let stand for a minimum of 2 hours. If the vacuum reading remains unchanged, the system may be charged with refrigerant.
- F. System Charging: After satisfactory pressure testing and vacuum evacuation, fully charge the system with refrigerant. Any final connections that were not subject to the full test pressure (e.g. connections at unit, etc.) shall be carefully checked with a halide or electronic leak detector after the system has been charged.
- G. Start-Up: See equipment specification Section for equipment start-up and related work.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

# 1.2 WORK INCLUDED

- A. Environmental Ductwork Systems.
- B. Flexible Duct.
- C. Acoustical Duct Lining.
- D. Preparation of Duct for Service.
- E. Duct Pressure Testing.

# 1.3 DEFINITIONS

- A. Duct Sizes: All duct dimensions shown are inside clear dimensions. Where inside duct lining is specified or indicated, duct dimensions are to the inside face of lining.
- B. Environmental Ductwork Systems: Ductwork systems that are not covered by Section 23 35 00 Special Exhaust Systems.

# 1.4 QUALITY ASSURANCE

- A. All work and materials shall comply with SMACNA-DCS, NAIMA-DLS, ASHRAE-F, IBC, IMC, NFPA-90A, NFPA-90B, and code. The most restrictive criteria governs.
- B . Leakage Criteria: Duct system shall be constructed and sealed so that leakage does not exceed the following:
  - 1. Variable-Air-Volume (VAV) Systems Supply Duct: Fan to VAV boxes 3% of system maximum airflow; VAV box to connection to air outlets 5% of VAV maximum airflow; or as required by code (whichever is more stringent).
  - 2. Other Systems Supply Duct: From fan to connection to air outlet 5%.
  - 3. All Systems Return Duct: 5%.
  - 4. All Systems Exhaust Duct: 5%.
- C . Fabrication Proximity: The Contractor performing the work of this section shall have fabricating facilities located within 100 miles of the project site.
- D . Drawing Review: Prior to beginning any work review all drawings, duct routing, duct connections, equipment configuration, equipment connection locations, and other work details to discover conflicts in anticipated duct arrangement and improper or incomplete connections. Review shall include the following: supply ducts not connected into return (or exhaust) ducts, ducts not crossed and improperly connected in shafts, air outlets/inlets connected to ducts, unit configuration compatible with planned duct connections, louver

locations match architectural plans. Submit resolutions of such possible conflicts as submittals with shop drawings of proposed solutions; written description in lieu of shop drawings is acceptable for minor issues.

#### 1.5 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Product Data: Submit product data for duct lining, flexible duct, and factory fabricated items.
- C . Shop Drawings: Submit shop drawings for all HVAC ductwork which is to be installed differently than as shown on the drawings.
- D. Conflict Resolution: Submit additional shop drawings showing proposed resolution of conflicts after review of documents and again after review of actual field conditions.

## 1.6 DUCT PRESSURE CLASS

- A . Constant Volume Systems: Ductwork shall be constructed to the pressure class corresponding to the static pressure indicated for the fan which serves the duct system or 2-inch pressure class (plus or minus as appropriate), whichever is higher; unless noted otherwise.
- B. Variable-Air-Volume (VAV) System:
  - 1. Ductwork upstream of VAV boxes shall be constructed 3-inch pressure class.
  - Ductwork downstream of VAV boxes shall be constructed to 1-inch pressure class standards.

## 1.7 REFERENCES

- A . ADC-FLEX: Air Diffusion Council Flexible Duct Performance and Installation Standards.
- B. ASHRAE-F: ASHRAE Handbook of Fundamentals.
- C . ASTM A 653: Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
- D . ASTM A 924: General Requirements for Steel Sheet Metallic-Coated by the Hot-Dip Process.
- E. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. IMC: International Mechanical Code.
- G. NAIMA-DLS: North American Insulation Manufacturers Association Fibrous Duct Liner Standards, 1st Edition.
- H. NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems.
- I. NFPA 90B: Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- J. SMACNA-DCS: SMACNA HVAC Duct Construction Standards, 3<sup>rd</sup> Edition.
- K. UL 181: Underwriter Laboratories Factory-Made Air Ducts and Air Connectors.

- L. UL 181A: Underwriter Laboratories Closure Systems for Use with Rigid Air Ducts.
- M . UL 181B: Underwriter Laboratories Closure Systems for Use with Flexible Air Ducts and Air Connectors.

#### 1.8 PRE-INSTALLATION CONFERENCE

- A . General: A pre-installation conference shall be held prior to the Contractor installing any of the materials of this section. The conference shall occur after all submittals have been satisfactorily reviewed by the Architect/Engineer and returned to the Contractor, and approximately 14 days prior to the proposed system installation date and prior to the fabrication of any system piping components. The purpose of this conference is to review the Contractors installation methods, materials, schedule, coordination with all other trades, and related construction/design issues to allow for efficient and proper construction. The Architect/Engineer and Owner will highlight various items of concern, typical problems encountered on similar projects, coordination issues, and related items.
- B. Attendance: The pre-installation conference shall be attended by the General Contractor, the Contractor doing the work of this Section, other contractor trades as appropriate to the proper coordination of the work of this section, the Owner's Representatives (at their option), the Engineer, and the Architect.
- C . Coordination: The Contractor shall notify the Architect of the Contractor's readiness to hold the pre-installation conference at least 14 days prior to the proposed meeting time, and mutually agreed upon meeting times arranged.

# **PART 2 - PRODUCTS**

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Sheet Metal: All domestic manufacturers.
- C . Spin-in Fittings and ATTO: Sheet Metal Connectors Inc., United McGill, Royal Metal Products, Airflow Products Inc.
- D. Gasketing: Preson, Insulfab, Duraco.
- E. Duct Sealant and Tape: Carlisle (Hardcast), Ductmate, Benjamin Foster, Grace Construction Products, United McGill, Polymer Adhesives Sealant Systems, RCD Corporation, Nashua, 3M.
- F. Flexible Duct: Flexible Technology Inc., JP Lamborn Co.; Hart & Cooley, Thermaflex.
- G. Acoustical Duct Lining: Johns-Manville.

## 2.2 GENERAL MATERIALS

- A. Ducts: Construct of galvanized sheet steel, suitable for lock forming without flaking or cracking, conforming to ASTM A653 and A924, having a zinc coating of 0.90 ounces total per square foot for both sides of a sheet, corresponding to coating G90.
- B. Fasteners: Steel construction, electroplated zinc coated, having strength properties adequate for the application, compatible with materials being joined, and in accordance with

- SMACNA-DCS. Where exposed to corrosive conditions shall be of Type 304 or 316 stainless steel. Type to meet duct pressure class and duct leakage requirements. Where used for the support and anchorage of ducts shall comply with Section 20 05 29, with independent test reports regarding strength.
- C . Spin-in Fittings: Factory fabricated of galvanized steel with die-formed mounting groove and damper with raised damper quadrant where ducts are to be insulated. Collar length for flexible duct attachment shall be at least 2" long.
- D. Air-Tight Take-Off Fittings (ATTO): Factory fabricated branch duct connector, of galvanized steel. Flange shall be 1-1/2" wide with 1/8" self-adhesive gasket and pre-drilled fastener holes. Collar length for flexible duct attachment shall be at least 2" long. Where used on round duct mains, shall be saddle type appropriately sized for main duct diameter.

#### E. Draw Bands:

- 1. Metal: Worm gear type clamp, constructed of galvanized steel, stainless steel, or aluminum; minimum 1/2-inch wide band; suitable for 200 pound loading.
- 2. Non-Metal: Nylon "zip-tie" with self-locking ability, designed for flexible duct usage, minimum 1/4 inch wide, rated for 175 pound load, suitable for temperatures from 0 to 185 deg F; listed per UL181B and labeled "UL181B-C".
- F. Gasketing: Vinyl nitrile, vinyl neoprene, or neoprene nitrile PVC blend; designed for HVAC use with size to suit the application having minimum 1.5-inch width at equipment roof curb applications. Fire hazard rating not to exceed 25 for flame spread and 50 for smoke development per ASTM E 84.
- G. Duct Sealant/Mastic: Water based duct sealant, listed per UL 181B-M and UL 181A-M, suitable for indoor and outdoor use. Fire resistant with a flame spread rating of 5 or less, and a smoke developed rating of 0. Sealant shall be resistant to ultraviolet radiation and ozone. Fiberglass mesh shall be minimum 0.006-inches thick, with minimum 9 x 9 weaves per inch, and 2-inch width; for use with mastic in sealing ductwork. Sealant system shall be suitable for duct system pressure class and materials used with. Carlisle Hardcast "Versa-Grip 181".
- H. Foil Tape: Foil back adhesive tape, listed per UL181A-P and UL181B-FX, with listing labeled on tape outer foil face. Minimum 3-inch width for metal-to-metal applications; minimum 2-inch width for flexible duct applications. 3M No. 3340 or Nashua No. 324A.

# 2.3 DUCT FABRICATION

- A. Duct Gauge and Reinforcement: Shall be as shown in SMACNA-DCS according to the pressure classification of the system and the duct dimensions; with heavier gauge duct used as required to minimize duct reinforcement to suit space available and other project constraints. In no case shall ducts be constructed of less than 26 gauge material.
- B . Joints and Seams: Construct in accordance with SMACNA -DCS, code requirements, and these specifications (more stringent governs). Ducts shall be constructed and sealed so that the leakage criteria is not exceeded. Round ducts shall be the spiral seam type; except that branch ducts to individual air inlets/outlets less than 16" diameter may be of other types as allowed by SMACNA-DCS. Coordinate joint spacing with duct reinforcement requirements so that transverse joints having the required stiffness may be incorporated in the reinforcement spacing schedule. Round duct transverse joints shall be made with beaded sleeve joints or flanged connections in accordance with SMACNA-DCS; except that branch ducts to individual air inlets/outlets less than 16" diameter may use other joining methods as are allowed by SMACNA-DCS.

- C . Elbows and Tees: Shall be long-radius type with a center-line radius not less than 1-1/2 times the width or diameter of the duct. Where space does not permit the use of long-radius elbows, short-radius or square elbows with turning vanes may be used. Elbows in round duct systems with duct pressure class above 2-inches shall be stamped type, welded segmented type, or standing seam segmented type.
- D. Transitions: Increase duct sizes gradually. Transitions for diverging air flow shall be made with each side pitched out not more than 22.5 degrees. Transitions for converging air flow shall be made with each side pitched in not more than 30 degrees. Except that eccentric transitions for round to flat oval may have up to a 45 degree pitch.
- E. Branch Connections: Shall comply with SMACNA-DCS, and as required herein.
  - Rectangular-to-Rectangular: Rectangular take-off with 45 degree angle on "inside" of take-off, minimum 4" length. Reference SMANCA-DCS Figure 4-6. Close corner openings.
  - 2. Rectangular-to-Round:
    - a. Serving Individual Air Inlet/Outlet: Spin-in type connector or air-tight take-off (unless a different fitting type is specifically noted).
    - b. Serving Branch Duct: Rectangular to round transition, with maximum degree pitch as specified for transitions. Rectangular end size shall have free area no less than round end. Rectangular connection to rectangular main shall be made as specified for "Rectangular-to-Rectangular" connections.
    - Serving Individual VAV Terminal Unit: Conical type connector, with connector 2" larger on one end and maximum 15 degree pitch on sides.

## 3. Round-to-Round:

- a. Serving Individual VAV Terminal Unit: Conical type connector (or conical tee fitting), with connection at the main duct 2" larger than the end serving the VAV terminal unit, and a maximum 15 degree pitch on sides; or "Lo-Loss" tee fitting, equivalent to that manufactured by United McGill.
- b. Other Connections: Air-tight take-off or constructed in accordance with SMACNA-DCS and recognized professional practices.
- 4. Other Connections: In accordance with SMACNA-DCS and recognized professional practices.

## F. Ductmate Systems:

- 1. Rectangular Duct: Transverse duct joints may be made with Ductmate System, or approved equal. System shall consist of companion flanges of 20 gauge galvanized steel with an integral polymer mastic seal; corner pieces of 12 gauge G90 galvanized steel; 20 gauge G90 galvanized cleats; closed cell, high density gasket type; and galvanized carriage bolts with hex nuts. The flanges shall be securely fastened to the duct walls using self-drilling screws, rivets or spot welding. Fastener spacing shall be as recommended by the manufacturer for the size of duct and the pressure class. The raw duct ends shall be properly seated in the integral mastic seal. A continuous strip of gasket tape, size 1/4" x 3/4", shall be installed between the mating flanges of the companion angles at each transverse joint; and the joint shall be made up using 3/8-inch diameter x 1-inch long plated bolts and nuts. Galvanized drive-on or snap-on cleats shall be used at spacing recommended by the manufacturer.
- Round Duct: Transverse duct joints may be made with Ductmate "Spiralmate" system, or approved equal. System shall consist of galvanized steel round connector flanges (fitting inside each duct section to be joined) and an exterior galvanized steel closure

ring with tightening bolt to form an airtight duct connection and join flanges together. Duct connector flanges shall have non-hardening integral mastic to seal between flanges and duct, and a neoprene gasket to seal flange faces.

#### G. Lined Ductwork:

- Rectangular Ducts: Contractor Fabricated ductwork with interior duct lining. Duct fabrication and liner installation shall comply with NAIMA-DLS. Lining material shall comply with paragraph titled "Duct Lining" in this specification section.
- 2. Round and Oval Ducts: Shall consist of acoustic insulation in between a perforated interior duct liner and solid exterior duct. Acoustic insulation shall be 1-inch thick, except where noted to be greater. Duct sections shall connect by mechanical means to maintain positive concentricity of liner with duct. All fittings and transitions shall have perforated inner liner (except where noted otherwise). Lining material shall comply with paragraph titled "Duct Lining" in this specification section. United McGill "Acousti-k27" (or approved).

## 2.4 FLEXIBLE DUCT

- A. Type: Factory insulated fully lined flexible duct.
- B. Construction: Double-ply neoprene coated polyester fabric hose, reinforced with a steel wire helix. Black color. Fire hazard rating not to exceed 25 for flame spread and 50 for smoke development, as tested by ASTM E84.
- C . Thermal Characteristics: Certified thermal resistance "R" of 4.2 Hr-SF-deg F/Btu, rated in accordance with ADC-FLEX. Except where duct is installed in an unconditioned area (and where required by code) provide certified thermal resistance "R" of 8 Hr-SF-deg F/Btu, rated in accordance with ADC-FLEX.
- D . Working Pressure: As required to suit maximum pressure to be encountered on system, but no less than 4-inch wc positive, 0.5-inch wc negative.
- E . Length: Shall not exceed 8 feet where used on duct systems with a pressure class of 2-inches and less; maximum 5 feet length on higher pressure class systems.
- F. Code Compliance: Comply with code and applicable standards; including NFPA 90A, NFPA 90. Shall be UL listed and labeled as a Class 1 connector per UL 181.

# 2.5 DUCT LINING

- A . Material: Flexible, inorganic glass fiber material, bonded with thermosetting resin, maximum thermal conductivity of 0.24 Btu-inch/hr-sq. ft.-degree F at 75 degrees F, coated to prevent erosion, conforming to NAIMA-DLS and exceeding that standard as specified herein. Suitable for air temperatures to 250 degrees F, and duct velocities to 6000 feet per minute. Surface shall be coated with an acrylic coating having anti-microbial agents and factory applied edge coating. Johns-Manville "Permacote Linacoustic" (or approved).
- B. Thickness: Lining shall be 1-inch thick except where noted otherwise.
- C . Adhesives and Fasteners: Shall conform to NAIMA-DLS, and as suitable for the duct liner material and ductwork.
- D . Fungi and Bacteria Resistance: Conform to ASTM C 1338 and ASTM G21 for fungi resistance and ASTM G 22 for bacteria resistance.

# **PART 3 - EXECUTION**

## 3.1 DUCTWORK INSTALLATION

- A . General: Install all ductwork with all accessories and connections to provide complete and operable duct systems, in accordance with plans and specifications. See Section 20 05 29 for hangers and supports. Provide quality assurance review of all drawings prior to beginning work (see paragraph titled Quality Assurance, this specification Section and see Section 20 05 00). Provide duct and plenum sizes and locations as shown on the drawings; except as adjusted for field conditions and work of other trades, and with prior approval of the Engineer. See Section 20 05 00 for offsets and transitions to be included in project.
- B. Coordination: The Contractor shall fully coordinate the work of all trades to avoid interferences and conflicts. Due to the extremely tight spaces in portions of the building, the Contractor shall coordinate duct reinforcement spacing and supports with other trades as necessary to avoid interferences. In addition, the Contractor shall select duct gauge and reinforcement types to avoid interferences. Changes required due to lack of coordination between trades, improper spacing or selection of hangers, or improper duct gauge and reinforcement selection, shall be done at no additional cost to the owner.
- C . Field Measurements: Prior to fabricating any duct materials, the Contractor shall field measure all areas where ducts will be installed to verify room available and all offsets and fittings required. Field verify connection sizes and locations to equipment, louvers, and similar items.
- D. Workmanship: All work shall comply with code, SMACNA-DCS, and other applicable standards. Ducts shall be installed level (unless noted otherwise) and in neat lines with the building construction using best professional practices.

# E. Exposed Ducts:

- 1. All ducts are to be installed concealed unless indicated otherwise. Ducts that are exposed shall be carefully fabricated, stored, and installed for best appearance. All dents, dings, scratches and other damage shall be repaired for a high quality finished look; all dirt, debris, labels, stickers, lettering, and marks removed; and the duct completely cleaned. Any sealant shall be cleaned to form a straight and even seam adjacent to joints, have no overlap onto duct areas not needing sealant, and have all excess sealant removed (mask off adjacent areas as necessary).
- 2. Outdoor exposed ducts shall have "hat" type channels installed over all joints (top and sides) to prevent entry of water.
- F . Flexible Duct: May only be used where specifically shown on the plans. Attach flexible duct inner core to sheet metal duct (or connector) with draw band. For insulated type, pull insulation and outer jacket completely over the inner core (at the connection to the sheet metal duct) with outer jacket covering the inner core and tucked back at its end to provide a continuous vapor barrier cover; install draw band to secure the outer jacket and insulation. Use metal type draw bands on duct systems where duct pressure class exceeds 3-inches or where temperature or other conditions do not allow the non-metal type and where indicated; use type of metal suitable for the conditions without corrosion or other deterioration. Install flexible duct with a centerline turning radius not less than one duct diameter. Where this turning radius cannot be maintained with the flexible duct use sheet metal elbows or (at air inlets/outlets) provide a plenum having a side connection.
- G . Spin-in Fittings/ATTO's: May be used for branch ducts to individual outlets only. Apply a bead of duct sealant to all spin-in fittings where fitting seals against sheet metal duct.

# H. Sealing:

- General: Use materials listed and approved for the specific application. Foil tape may only be used at duct connections to air inlets/outlets (unless specifically noted otherwise). Clean surfaces to be sealed of moisture and all contaminants. Seal joints in accordance with SMACNA-DCS, sealant manufacturer's instructions, and UL 181.
- Ductwork: Seal to meet duct leakage criteria as follows:
  - a. Ducts Upstream of VAV Terminal Units: Seal Class A.
  - b. Ducts Downstream of VAV Terminal Units: Seal Class C.
  - c. Ducts with Pressure Class 3" and Greater: Seal Class A.
  - d. Ducts with Pressure Class 2": Seal Class B.
  - e. Ducts with Pressure Class 1" and Less: Seal Class C.
- 3. Flexible Duct: Coat connection of flexible duct to metal duct with duct sealant prior to installing the flexible duct.
- 4. Air Inlets/Outlets: Seal duct connections (including "cans" or plenums) at air inlets and air outlets with duct sealant or foil tape; except at louvers and exposed ducts only sealant shall be used.
- 5. Exterior Ductwork: Special attention and effort shall be applied to the sealing of exterior ductwork to prevent any entry of water. Sealant shall be applied to all seams and joints prior to assembly in order to provide a layer of sealant which is continuous through the joint or seam. Additional sealant shall then be applied to the exterior of the joint or seam to ensure a weathertight closure. Any leakage or damage from water leakage into duct or building shall be repaired at no additional cost to the Owner.
- I. Ductmate: All "Ductmate" and similar systems shall be installed in strict accordance with manufacturer's instructions.
- J . Underground Ductwork: Shall be fiberglass reinforced duct or minimum 20 gauge galvanized steel encased in 4 inch thick concrete. Fiberglass duct installation shall be in strict accordance with manufacturer's instructions, including but not limited to, the following: duct to be installed in a trench with provision for good drainage and an allowance for a minimum of 4-inch pea gravel or dry sand to completely encase the duct. The top of the duct shall be at least 6 inches below the bottom of the concrete slab. Field joints to be watertight. Galvanized sheetmetal may be used for custom transitions, fittings, and where indicated; and shall be encased in a minimum of 4-inch thick concrete.
- K . Protective Caps: Provide temporary sheetmetal caps or heavy visqueen covers over all open portions of ductwork to prevent debris, dirt, and dust from entering the ductwork. Such covers shall be installed at the end of each work shift, and shall remain in place until all work activities or events that may cause duct contamination will no longer occur.
- L . Alternative Duct Sizes: The Contractor, at his option, may use duct sizes other than those shown on the drawings, provided that: the Architect/Engineer gives prior approval, and the pressure drop per lineal foot of the proposed duct does not exceed that for the duct shown.
- M. Round Duct: The Contractor, at his option, may use round duct in lieu of rectangular or flat oval shown on the drawings provided that: The Architect/Engineer gives prior approval, and the pressure drop per lineal foot of the proposed duct does not exceed that for the duct shown. Shop drawing submittals are required for any contractor proposed changes from the contract drawings.

## 3.2 ACOUSTICAL DUCT LINING INSTALLATION

- A. General: Install acoustical duct lining in ducts to extent shown on drawings, covering all interior surfaces. Round ducts shall use factory fabricated double-wall ducts as specified.
- B. Installation: Installation shall comply with NAIMA-DLS and these specifications. The liner shall be cut to assure tightly butted joints.
- C . Liner Attachments: The duct liner shall be applied with a 100% coverage of adhesive. Mechanical Fasteners shall be installed flush with the liner surface, and shall be spaced in accordance NAIMA-DLS.
- D. Horizontal Duct Runs: Tops of ducts over 12" wide and sides of duct over 16" high shall have liner additionally secured with mechanical fasteners.
- E . Vertical Duct Runs: Any side of duct over 12" in size shall have liner additionally secured with mechanical fasteners.
- F. Exposed Edges: All joints, exposed edges and any damaged areas of the liner, shall be heavily coated with fire resistant adhesive/mastic.
- G . Metal Nosing: Install metal nosings on the leading edges of the liner in ducts where the velocity exceeds 4000 feet per minute.

# 3.3 PREPARATION FOR SERVICE

- A . Cleaning: All ducts shall be wiped or blown clean of all dust and debris prior to the installation of grilles or diffusers. Notify the Engineer to allow for an inspection prior to installing grilles or diffusers.
- B. Contaminated Ducts: Where ducts have been contaminated by dirt or debris during the construction process, the affected duct systems shall be cleaned by an independent firm specializing in the vacuum cleaning of ductwork. All costs associated with such cleaning shall be the responsibility of the Contractor.

# 3.4 DUCT PRESSURE TESTING

- A . Tested Systems: All supply air duct systems shall be tested.
- B. Duct Pressure Class > 2-inches:
  - 1. Cap all outlets temporarily to isolate the portion of the system being tested.
  - 2. Use portable blower with volume adjustment and a calibrated orifice for determining cfm of air being added to ductwork. Maintain duct system rated pressure in duct; examine each section at this pressure, and seal all observable leaks so that leakage during final testing will be at or below maximum permissible leakage.
  - 3. Maximum Permissible Leakage: See "Quality Assurance" paragraph, Part 1 of this specification section.
  - 4. Final test of each section shall be witnessed by the Architect/Engineer or Owner's representative. Give Architect/Engineer at least 7 days prior notice before such test.
  - Test Data: Record data of test results of final test only, including sketch or diagram of tested section, computation of total system cfm, allowable leakage and actual leakage found during test. Submit two copies to Architect/Engineer.

C . Duct Pressure Class ≤ 2-inches: Air balancers readings will be used to determine percent leakage of ductwork. Where leakage exceeds allowable by 25% or less, sealing shall be provided at all potential leak spots. Where leakage exceeds allowable by more than 25%, the system shall be re-sealed and the Sheetmetal Contractor shall pay the Balancer to remeasure and determine the new leakage rate.

## 3.5 COMMISSIONING

A . The Products referenced in this section are to be commissioned per Division 01 and Section 20 08 00 - Commissioning. The Contractor has specific responsibilities for scheduling, coordination, startup, test, development, testing and documentation. At a minimum, the Contractor shall provide a documented and signed record to verify that all equipment and systems installed under this contract have been inspected and functionally tested to verify full compliance with the contract specifications. In many cases, this shall require the Contractor to create or otherwise provide procedures and checklists for approval by the Commissioning Consultant prior to the start of functional testing. Reference Division 01 and Section 20 08 00 and coordinate all commissioning activities with the Commissioning Consultant.

**END OF SECTION** 

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 WORK INCLUDED

- A. Manual Dampers.
- B. Backdraft Dampers.
- C. Turning Vanes.
- D. Flexible Connectors.
- E. Duct Access Doors.

## 1.3 QUALITY ASSURANCE

- A. General: Comply with Section 20 05 00.
- B. Workmanship: Construction and installation of all duct accessories shall comply with applicable SMACNA-DCS, and exceed those standards as noted.
- C . Fire dampers, combination fire/smoke dampers, and smoke dampers shall be UL listed.

## 1.4 SUBMITTALS

- A. General: Submittals shall comply with Section 20 05 00.
- B. Product Data: Submit product information on all items to be used.
- C . Sound Attenuators: Submit dynamic insertion loss and pressure drop data for all sound attenuators. Submit listing of all sound attenuators by unit served, airflow application, cfm, size, velocity, and pressure drop.

## 1.5 REFERENCES

- A. AMCA 500D: Laboratory Methods for Testing Dampers for Rating.
- B . SMACNA-DCS: SMACNA HVAC Duct Construction Standards, 3<sup>rd</sup> Edition.

## PART 2 - PRODUCTS

# 2.1 ACCEPTABLE MANUFACTURERS

- A . Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B . Manual Damper Hardware: Duro-Dyne, Young Regulator Co., Ventfabrics, Krueger, Rossi.

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- C. Backdraft Dampers: Air Balance, Ruskin, Greenheck.
- D. Turning Vanes: Duro-Dyne, Aero-Dyne, Oil Capital Sheet Metal, Airsan.
- E . Flexible Connections: Ventfabrics, Duro-Dyne Elgen.
- F. Duct Access Doors: National Controlled Air, Ventfabrics, United-McGill, Kees, Ruskin, Vent Products, Duro-Dyne.
- G. Building Access Doors: J.R. Smith, Zurn, Acudor, Elmdoor, Kees, J.C. Industries, Milcor.

# 2.2 MANUAL DAMPERS

- A. Type: Manually adjustable volume dampers.
- B. Blades: Damper blades shall be fabricated of galvanized steel or stainless steel (unless a specific material is indicated), two gages heavier than duct in which installed, and in accordance with SMACNA-DCS. Maximum blade width 12 inches; fabricate multi-blade dampers with opposed blade pattern for ducts larger than 12" x 48".
- C . Regulators: Damper regulator sets shall have quadrant dial regulator with locking nut, square end bearing one side, and spring round end bearing other side (small sizes) or open end square bearing (larger sizes), axis of blade the long dimension. Multiple blade dampers shall have individual quadrants for each blade or one quadrant with interconnected blades. Regulator sets shall be Duro-Dyne model numbers (or approved equal) as follows:

Max. Blade		
<u>Dimension</u>	<u>Duro-Dyne Regulator Set</u>	Shaft Size
10" and less	KS-145, 145L	1/4"
11" to 14"	KSR-195, 195L	3/8"
15" to 23"	SRS-388, SB-138, KP105	3/8"
24" and larger	SRS-128, SB-112, KP105	1/2"

- D. Concealed Regulator: For remote damper adjustment with finished ceiling appearance. Shall consist of self-locking regulator of cast alloy construction (with serrated core, spring washer, housing, indicator, lock nut) cast into a cylindrical housing for flush ceiling installation. Housing cover shall be of steel construction, shall telescope into the regulator housing to be flush with the finished ceiling, and be secured to the housing with two screws. Provide with extension rods, linkages, miter gears, and all accessories as needed for proper damper operation. Plain Finish. Ventfabrics No. 666, 667 or Young Regulator Co. No. 301 (or approved equal).
- E . Extractor Fittings: Galvanized steel construction, 24 gauge steel blades on 2 inch centers, with worm gear operator for adjustment through face of grille. Krueger EX-88 (or approved equal).

# 2.3 MANUAL DAMPERS – CABLE OPERATED

- A . General: Cable operated system of dampers and rack and pinion type controller, made for use to allow remote damper adjustment.
- B. Round Dampers: Constructed of heavy duty galvanized steel duct with rolled-in stiffening beads for rigidity. Damper minimum 20 gauge galvanized steel blade secured with 1/2" diameter steel shaft and high strength Teflon bushings requiring no lubrication. Damper

- shall include all necessary hardware to ensure compatibility with remote cable control system. Young Regulator Model 5020-CC (or approved).
- C . Rectangular Dampers: Opposed blade type constructed of 0.050 minimum heavy duty extruded aluminum frames and blades. Damper blades to include individual blade bushings; damper blades shall rotate between a matched pair of formed and punched 306 stainless steel connecting slide rails that facilitate smooth blade movement and ensure alignment. All necessary hardware to ensure compatibility with remote cable control system shall be included. Young Regulator Model 830A-CC series (or approved).
- D. Cable Control: Cable to consist of 0.054" stainless steel cable encapsulated in 1/16" flexible galvanized spiral wire sheath. Control hardware shall be designed for use with damper to be controlled with wall mounted. Control hardware shall include 14 gauge steel rack and pinion gear drive, controls shaft shall be flatted 1/4" diameter with 265-degree rotation provided linear travel capability. Where ceiling access is indicated provide with concealed regulator assembly; wall mounted shall have exposed knob control, with position indicator. Young Regulator Model 270-275 or 270-301 or 270-700 to suit application (or approved).

# 2.4 COUNTERBALANCED BACKDRAFT DAMPERS - LOW PRESSURE DROP

- A . Type: Airflow and gravity operated backdraft dampers with adjustable counterbalance weight. Ruskin CBD6.
- B. Frame: Shall be constructed of minimum 18 gauge galvanized steel or stainless steel or minimum 0.125-inch thick 6063T5 extruded aluminum (unless a specific material is indicated).
- C . Blades: Shall be constructed of minimum 0.07-inch thick extruded aluminum, or formed stainless steel (unless a specific material is indicated), with extruded vinyl edge seals. Seals shall prevent any noise due to damper opening/closing. Bearings shall be synthetic polycarbonate or acetal or zytel type. Damper linkage shall be with aluminum or galvanized steel tiebar. Counterbalance weights shall be attached to blades, be of galvanized steel construction, and be adjustable.
- D. Configuration: Horizontal or vertical airflow as indicated on plans.

### E. Performance:

- 1. General: Dampers shall be tested in accordance with AMCA standards.
- Temperature Rating: -40 to 200 degrees F.
- 3. Closed Position: Withstand maximum back pressure of 16 inches w.g.
- 4. Open Position: Withstand maximum air velocity of 2,500 feet per minute.
- Operation of Blades: Start to open at 0.02 inch w.g.; fully open at 0.05 inch w.g.
- 6. Pressure Drop: Maximum 0.025 inch w.g. at 700 feeet per minute, maximum 0.15 inch w.g. at 1,500 feet per minute.
- 7. Dampers used to prevent the entry of outdoor air shall have air leakage no greater than 20 cfm/sf at 1-in w.g. where not less than 24-inches in any dimension, and no greater than 40 cfm/sf where less than 24 inches in any dimension; as tested in accordance with AMCA 500D.
- F. Depth of Operation: Depth required to operate shall not exceed 10-inches.

# 2.5 TURNING VANES

- A . Type: Galvanized steel turning vanes to guide airflow through duct elbows to minimize pressure drop.
- B. Construction: Turning vanes shall comply with SMACNA-DCS. Vanes shall be fabricated of minimum 26 gauge galvanized steel; rails shall be fabricated of minimum 24 gauge galvanized steel. For duct widths less than 12 inches, vanes may be single wall construction; for widths 12" and greater, vanes shall be double wall "airfoil" type.
- C . Spacing: Turning vanes shall be equally spaced in accordance with SMACNA-DCS, parallel to each other, and securely attached to runners.
- D. Unequal Elbows: For elbows where the inlet and outlet dimensions are not the same, modify vane shape or angle to provide optimum turning.

# 2.6 FLEXIBLE CONNECTORS

A . Type: Flexible fabric type connectors, to provide vibration isolation at equipment duct connections and to allow for movement in duct systems.

# B . Fabric:

- Width: Minimum 3" wide except at equipment 3 hp or larger with external vibration isolators fabric shall be minimum 6" wide.
- 2. Indoor Applications: Flexible woven glass fiber fabric with neoprene coating, minimum 22 oz/sq. yard, 500 lbs x 450 lbs tensile strength. Suitable for temperatures from -40 to 200 deg F.
- 3. Outdoor Applications and Where Exposed to Chemicals: Flexible woven glass fiber fabric with hypalon coating, ozone resistant, 24 oz/sq. yard, 225 lbs x 300 lbs tensile strength. Suitable for temperatures from -40 to 250 deg F.
- 4. High Temperature Applications: Fiberglass/satin weave with Teflon coating; temperature rating of minimum 500 deg F and to suit application, 400 lbs x 300 lbs tensile strength.
- C . Metal Collars: Minimum 24 gauge galvanized steel 3" wide metal edge connectors, each side of fabric, connected to fabric by folded over metal seam. Fabricate of same material as ducts connected to.
- D. Fire/Smoke Rating: Flame spread rating not over 25, and smoke developed rating not higher than 50; complying with IMC requirements and NFPA standards.

#### 2.7 DUCT ACCESS DOORS

A. Construction: Access doors shall be of double wall construction, made with minimum 24 gage galvanized steel, tight fitting, with sealing gasket, and cam locks (or may be hinged type with latches).

## B. Size:

 General: Access doors shall be of sufficient size so that items concealed in duct can be serviced and inspected, and shall be adequately sized to allow complete removal of the item being served (where removal cannot be made without disturbing fixed ductwork).

- 2. Minimum size: Doors shall be minimum 14" x 14". Where duct size will not accommodate this size door, the doors shall be made as large as practicable.
- 3. Large Sizes: Doors larger than 14" x 14" shall have a minimum of 4 cam locks (or where hinged type is used, have a minimum of two (2) latches).
- C . Insulation: Doors in insulated ducts shall be insulated type, with minimum 1 inch thick fiberglass insulation.
- D. Round Ducts: Access doors on round ducts shall use either lined rectangular tap off with rectangular access door or curved insulated access door (for insulated duct); or curved type un-insulated access door (for un-insulated duct).

# 2.8 BUILDING ACCESS DOORS

- A. Type: Hinged lockable steel access doors, for wall or ceiling installation.
- B. Construction: Minimum 16 gauge frame and 14 gauge door, concealed hinge, cam and cylinder lock, anchoring provisions, and 1" wide frame to conceal rough building opening. Provide of 18-8 stainless steel construction with No. 4 finish where used in restrooms, locker rooms, kitchens, and similar "wet" areas. Provide of steel construction with prime coated finish in other areas.
- C . Size: Size shall be 12" x 12" (unless indicated otherwise) but shall be large enough to allow necessary access to item being served and sized to allow removal of the item (where access door is the only means of removal without disturbing fixed construction).
- D . Fire Rating: Door shall maintain fire rating of element installed in; reference drawings for required rating.
- E. Keys: Access doors shall all be keyed alike. Provide two (2) keys for each door.

## **PART 3 - EXECUTION**

### 3.1 MANUAL DAMPERS

- A . General: Dampers shall be fabricated and installed in accordance with SMACNA-DCS requirements for volume dampers.
- B. Locations: Install dampers at locations shown on the drawings in branch ducts to all air inlets/outlets, and at all other locations as required by the Balancer to allow for the balancing of the system. Locate dampers at a point where the damper is most accessible; orient damper regulator for best access.
- C . Non Accessible Dampers: Provide flush-mounted concealed type damper quadrants for ducts concealed in walls or non-removable ceilings and where a remote damper operator has been indicated.
- D. Initial Setting: Set and lock all dampers in the full open position prior to balancing.
- E . Extractor Fittings: Provide where indicated on the plans and at wall type inlets/outlets where such outlets cannot be served by a manual damper in the branch duct.
- F. Identification: Provide orange surveyor's tape, approximately 18" long tied to each damper regulator (except not required on dampers in ducts exposed to view in finished areas).

## 3.2 BACKDRAFT DAMPERS

- A. General: Install in accordance with manufacturer's instructions.
- B. Application: Use counterbalanced type at all non-fan powered building exhausts and reliefs; all others shall be the standard type.
- C . Adjustments: Adjust counterbalanced backdraft dampers to be open at 0.07" building pressure (unless noted otherwise), or as necessary for proper space pressurization and building air balance. Coordinate work and settings with air balancer.
- D. Access Doors: Provide access doors to backdraft dampers, except that where damper is installed immediately behind a ceiling or wall grille, and is accessible by removing this grille, an access door is not required.

## 3.3 TURNING VANES

- A . General: Install turning vanes in all duct elbows and "T" fittings, and at locations shown on the drawings.
- B. Attachment: Securely attach turning vane runners to ductwork.

# 3.4 FLEXIBLE CONNECTORS

- A. General: Provide flexible connectors at all duct connections to all equipment, where ducts of dissimilar metals are connected, and where shown on the drawings. Except that flexible connectors are not required on internally spring isolated fans where the fan is located in a separate mechanical room and a flexible connector has not been shown.
- B . Round: For round ducts, the flexible material may be secured by zinc-coated, iron clinch type draw bands directly to adjoining duct; or with normal duct joining methods and using metal collars furnished with flexible connectors.
- C . Slack: Install flexible connections with sufficient slack to permit 1 inch of horizontal or vertical movement of ducts or equipment at flexible connection point without stretching the flexible material. At building expansion joints install sufficient flexible material to allow for 2 inch movement in any direction; provide two flexible connectors separated by a 12 inch section of duct.
- D . Outdoors: Where installed exposed to outside weather, provide a galvanized "hat" channel protecting top and vertical stretches of flexible connector from sunlight and weather.

# 3.5 DUCT ACCESS DOORS

- A. General: Provide duct access doors at all automatic control dampers, fire dampers, fire/smoke dampers, smoke dampers, backdraft dampers, all duct coils, thermostats, filters, control devices, and any other components in the duct system that require service or inspection. Coordinate with Division 25 to confirm quantity and location of control devices.
- B. Return and Exhaust Ducts: Provide access doors every 20 feet in return and exhaust air ductwork as required by NFPA 90.
- C . Size and Location: Access doors shall be of sufficient size and so located so that the concealed items may be serviced and inspected or completely removed and replaced.

# 3.6 BUILDING ACCESS DOORS

- A . General: Provide access doors in walls, floors, ceilings, etc. as indicated on the drawings and where needed to provide service access or maintenance to duct access doors, backdraft dampers, damper actuators, automatic dampers, coils, control devices, fans, HVAC equipment and similar items.
- B. Coordination: Consult architectural drawings and coordinate location and installation of access doors with trades which are affected by the installation.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

# 1.2 WORK INCLUDED

A. In-Line Exhaust Fans.

#### 1.3 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Product Data: Submit manufacturer's product data for all items to be used. Submit fan curves showing SP vs. CFM and BHP vs. CFM with system operating point clearly marked.

## 1.4 QUALITY ASSURANCE

A. AMCA: Fans shall bear the AMCA certified seal unless indicated otherwise.

### 1.5 GENERAL REQUIREMENTS

A . Spare Parts: Provide two complete sets of spare belts for all belt driven fans.

# 1.6 REFERENCES

- A. AMCA 99-0401: Classification of Spark Resistant Construction.
- B. AMCA 210: Laboratory Methods of Testing Fans for Ratings.
- C . IMC: International Mechanical Code.
- D . NFPA 96: Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- E. UL 762: Power Ventilators for Restaurant Exhaust Appliances.

# **PART 2 - PRODUCTS**

# 2.1 ACCEPTABLE MANUFACTURERS

- A. General: Products shall comply with Section 20 05 00. See Section 20 05 00, paragraph 2.01 for Acceptable Manufacturer requirements.
- B. Exhaust Fans: Greenheck, Twin City, Penn Barry, Cook, Carnes.
- C. Accessories: Fan manufacturers listed, NCA, Ruskin, Thybar, RPS.

# 2.2 GENERAL

- A. Guards: All belt drives shall be equipped with belt guards, or enclosed within fan casing. Guards shall be factory fabricated and furnished with equipment, and comply with OSHA and WISHA regulations. Exposed openings into fan housings shall be protected with substantial metal screens or gratings.
- B. Drives: Shall be sized for not less than 150% of the rated motor horsepower.
- C . Adjustable Sheaves: All belt drive fans shall have adjustable sheaves and adjustable supports for adjusting belt tension. Sheaves shall be selected so that they are at their midpoint at design conditions.

#### D. Motors:

- General: Comply with Section 20 05 00. Motors on belt drive fans shall have adjustable supports for adjusting belt tension. Motor speed controllers shall be VFD type except where solid state speed controllers are provided or EC motors with integral speed controller. VFD's shall be as specified in Division 25.
- 2. Fractional Horsepower Motors: Shall be the electronically commutated (EC) type with speed control where noted and where non-EC motors are not available which comply with code motor efficiency requirements. Unless noted otherwise, provide with manual speed control mounted at the motor for air balancers use. Motors shall be specifically designed for fan applications, have permanently lubricated ball bearings, speed controllable down to 20%, and have internal thermal overload protection.
- 3. Belt Drive Fans: Motors shall have adjustable supports for adjusting belt tension.
- E. Performance: Fan capacity shall not be less than the values listed on the drawings. Fan performance shall be based on laboratory tests conducted in accordance with AMCA 210.
- F. Outlets and Inlets: Fans shall be furnished with attachment angles and/or flanges as required for attaching ductwork and/or flexible connections indicated.
- G . Fan Types: The type of each fan is indicated on the Fan Schedule, under the "Type" column, and corresponds to the types specified herein.
- H. Fan Arrangement and Drive: Shall be as indicated. Select motor and drive access side to allow best access and to suit available space.
- I. Electrical: Fan disconnects and motor starters shall comply with Division 26 specifications. Disconnects furnished with fan shall come factory wired to motor or shall be field wired by Division 23.
- J . Finish: All fans shall have factory applied enamel finish (manufacturer's standard color, unless noted otherwise) over a rust inhibiting primer base coat; except a painted finish is not required on rooftop type fans of aluminum or equivalent corrosion resistant construction.

# 2.3 IN-LINE FANS

- A. Type: Square housed, in-line centrifugal fan. Greenheck SQ, BSQ (or approved).
- B. Housing: Shall be constructed of galvanized steel, minimum 20 gauge for fans with up to 14" diameter fan wheels, minimum 18 gauge 14" to 29" fan wheels, and minimum 16 gauge for 30" diameter fan wheels and larger. Housing shall be of square shape, with inlet and outlet square duct mounting collars. Housing shall have removable or hingeable access

covers providing complete access to fan internals. Housing shall be lined with minimum 1" thick 1-1/2 lb per cubic foot fiberglass duct liner.

- C . Fan Wheel: Shall be aluminum, backward inclined, non-overloading, centrifugal type; dynamically and statically balanced.
- D. Drive: Fan shall be direct or belt drive as indicated on the Fan Schedule.
  - Belt Drive: Fan bearing and drive components shall be isolated from the air stream.
     Motor shall be located outside the housing and cooled by ambient air. Provide motor
     position indicated on drawings. Wheel shaft shall be ground and polished and mounted
     in permanently lubricated, sealed ball bearing pillow blocks, with a minimum average
     bearing life over 200,000 hours. Provide with belt tensioner.
  - 2. Direct Drive: Fan wheel shall be directly connected to motor.
- E . Supports: Fans shall be provided with supports for horizontal base mounted, horizontal ceiling suspended, or vertical mounting as shown on the drawings. Provide spring type vibration isolators for horizontal suspended fans and neoprene type for base mounted units. Vibration isolators shall be sized to match fan weight.
- F. Electrical Connections: Fans shall be factory wired to an external junction box and disconnect switch. Fan shall have flexible wiring for units where fan motor swings out of way for housing access.
- G. Accessories: Provide the following accessories where indicated on the Fan Schedule.
  - 1. Inlet Vane Dampers: Shall be constructed of minimum 20 gauge steel, factory mounted in fan inlet, to provide automatic variable air volume operation. (Actuator and control specified in Division 25).
  - 2. Speed Controls: Solid state speed controller, allowing speed reduction down to 50% of maximum. Controller shall be for mounting in a standard wall box. Where motor type is not available for use with a solid state speed controller, provide with variable frequency drive.

# **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. General: Comply with Section 20 05 00. Install in accordance with manufacturer's written installation instructions, code, applicable standards and best construction practices.
- B. Locations: Install fans at locations indicated and in accordance with the Contract Documents.
- C . Speed Controls: Fans with speed controllers shall have the speed controller mounted on the fan housing unless another location is indicated on the drawings (for use by Balancer). Install VFD's at accessible locations near item served.
- D. Connections: Provide flexible connections in ductwork connections to all fans.
- E. Vibration Isolation: Install all fans with vibration isolators so that no sound or vibration is transmitted to the structure; except not required for rooftop type fans.
- F. Operation and Maintenance: See Section 20 05 00.

- G . Owner Instruction: Instruct Owner on the operation of each fan, including: system start-up, shut-down, emergency shut-down, normal control operation, safety aspects, maintenance and repair instructions.
- H . Start-Up: Prior to start-up inspect fans and installation to confirm proper installation and system is ready for start-up. Arrange other trades to be present as needed (i.e. balancer, electrician, etc.). Check fans for correct rotation, tighten belts to proper tension, adjust fan speeds to provide required performance, verify proper electrical and control connections, check vibration isolation (as applicable) for correct operation, and lubricate bearings per manufacturer's recommendations.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A . Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

# 1.2 WORK INCLUDED

- A. GRD Outlets.
- B. GRD Inlets.
- C. Louvers.
- D. Roof Vents.

## 1.3 DEFINITIONS

A. GRD's: Grilles, Registers, and Diffusers.

# 1.4 REFERENCES

- A . AHRI 885: Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
- B. AMCA 500: Laboratory Methods of Testing Louvers for Rating.
- C . ASHRAE 70: Method of Testing the Performance of Air Outlets and Air Inlets.
- D. ASHRAE-F: ASHRAE Handbook of Fundamentals.
- E. SMACNA-DCS: HVAC Duct Construction Standards, 3rd Edition.

## 1.5 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Product Data: Submit product information for all items to be used.
- C . Operation and Maintenance: Submit operation and maintenance data and submittal data for inclusion in project O&M Manuals.

# **PART 2 - PRODUCTS**

# 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B . Grilles, Registers and Diffusers: Titus, MetalAire, Krueger, Price, Tuttle & Bailey, Kees, Carnes.

- C . Grilles Type A: Kees, AJ Manufacturing.
- D. Louvers: Ruskin, Greenheck, Leader Industries, American Warming and Ventilating
- E. Door Louvers: IAC, Krueger, Titus, Price, Tuttle & Bailey, MetalAire, Ruskin.
- F. Wall and Roof Caps: Greenheck, PennBarry, Nutone, Carnes.
- G. Dryer Vent Caps: Broan, Nutone, Greenheck, PennBarry, Cook, Carnes, Columbia.
- H. Roof Hoods and Vents: PennBarry, Greenheck, Carnes, Cook "TRE" Series.

#### 2.2 GENERAL REQUIREMENTS

- A. Type: Air outlets and inlets shall be of the size, type, and with number of throws as shown on the drawings; and shall match the appearance and performance of the manufacturers' models specified and scheduled on the drawings.
- B. Performance: Air outlet and outlet performance shall be based on tests conducted in accordance with ASHRAE 70.
- C . Sound Level: Air outlets and inlets shall not exceed a sound level of NC 30 for the size indicated and airflow rate application. Sound levels shall be determined in accordance with AHRI 885 and ASHRAE-F.
- D. Finish: Grilles, Registers and Diffusers shall have factory applied finish, color as selected by Architect/Engineer, except where indicated to have a brushed aluminum finish (or other finish type). Finish shall be an anodic acrylic paint, baked on, with a pencil hardness HB to H. Pint shall pass a 90 hour ASTM B117 salt spray test, 250 hour ASTM D870 water immersion test, and an ASTM D2794 reverse impact test with at least a 50 inch-pound force applied.
- E . Frame Style: Provide air outlets and inlets with frame style to match ceiling or wall construction installed in. Where supply air outlets or inlets are installed in T-bar ceiling systems, they shall be factory installed in 2' x 2' or 2' x 4' metal panel to match ceiling layout. Where installed against gypsum board surface, brick or similar hard surface, or where exposed, provide with 1-1/4-inch wide outer border. Where space does not permit installing 2' x 2' metal panel, provide outlets or inlets with 1-1/4-inch wide outer border. Where air outlets are installed adjacent to surface mounted light fixtures, outlets shall have 4-inch deep drop frames. (See reflected ceiling plan and/or electrical lighting plan for ceiling and lighting types).
- F. Transfer Grilles: Ceiling transfer grilles shall be same as ceiling exhaust grilles (CEG) unless noted otherwise; wall transfer grilles (WTG) shall be same as wall exhaust grilles (WEG) (unless noted otherwise).
- G . Construction: Air outlets and inlets shall be of steel or aluminum construction except that:
  - 1. Where noted to be constructed of a specific material, shall be as noted.
  - In assemblies with a required fire rating and required to have fire dampers shall be of steel construction.
  - 3. In wet areas or subject to condensation (i.e., locker rooms, restrooms, kitchens, exterior soffits, etc.), where not used in fire rated assemblies, shall be of aluminum construction.

4. Air outlets and inlets in the same room, area, or within common view shall be constructed of the same material.

## 2.3 SUPPLY AIR OUTLETS

- A . Ceiling Diffuser (CD): Aluminum or steel construction, modular core, with multiple curved (or angled) discharge blades, and square neck. Cores shall consist of four separate sections which can be repositioned to allow for one, two, three or four way discharges. Cores shall be easily removed with no tools required. Krueger 1240 Series, Titus MCD, MCD-AA Series (or approved equal).
- B. Wall Supply Grille (WSG): Aluminum or steel construction, double deflection type, with horizontal face bars and vertical rear bars. Unit shall have outer frame borders 1-1/4-inch wide, with mitered corners, and perimeter gasket to prevent air leakage. Frame shall be constructed of minimum 22 gauge steel or minimum 0.032-inch thick aluminum. Deflecting bars shall be rigid extruded aluminum of semi-air-foil design, on 3/4-inch centers. Vertical and horizontal bars shall have friction pivots at each end to allow for blade angle adjustment without blade loosening or rattling. Krueger 5880H, 880H Series; Titus 300FL, 300FS Series (or approved equal).
- C . Wall Supply Grille-Type A (WSG-A): Steel construction, with 14 gauge horizontal bars at 0 degree on 1/2-inch centers, reinforced on 6-inch centers by vertical 14 gauge bars. Core shall be welded to 14 gauge frame. Provide with screw holes on maximum 8-inch centers. Kees GHD0 (or approved equal).
- D. Linear Slot Diffuser (LSD): Linear slot diffuser with plenum for T-bar ceiling. Unit shall be of zinc coated steel construction, adjustable pattern diffuser providing up to 180 degree air diffusion, flat black enamel finish, insulated with 1/2-inch thick 1-1/2 pound/cubic foot fiberglass duct liner, and round inlet for flexible duct connection. Krueger Series TBSI.
- E . Continuous Linear Slot Diffuser (CLSD): Slot diffusers shall be constructed of extruded aluminum with fully adjustable air pattern and flow control vanes that shall be capable of deflecting the air pattern from horizontal along the ceiling to straight down or at an intermediate setting. Each length of diffuser shall be capable of being installed without any visible means of fastening. Each length of diffuser shall have a self aligning device permitting long lengths to be aligned without aligning device being visibly apparent. Titus "Flow Bar" FL Series.

# 2.4 RETURN AIR INLETS

- A . Ceiling Return Grille (CRG): Aluminum construction, "cube-core" or "egg-crate" type, with 0.025-inch thick x 1/2-inch deep strips mechanically joined to form 1/2" x 1/2" x 1/2" cubes. Krueger Series EGC5. Titus Series 50F.
- B. Wall Return Grille (WRG): Shall be of aluminum or steel construction, with 35 degree angular horizontal face bars. Unit shall have outer frame border, 1/4-inch wide, gasketed to prevent air leakage and minimize smudging. Deflecting bars shall be rigid extruded aluminum of semi-air-foil design, on 3/4-inch centers. Krueger Model No. S580H or S80H. Titus Series 350RL.
- C . Wall Return Grille--Type A (WRG-A): Shall be of aluminum or steel construction, with 14 gauge, 40 degree angular horizontal face bars, on 1/2" centers and reinforced on 6" centers by 14 gauge vertical bars. Core shall be welded to 14 gauge frame. Provide with screw holes on maximum 8" centers. Type to match WSG. Kees GHD40.

# 2.5 EXHAUST AIR INLETS

- A. Ceiling Exhaust Grille (CEG): Same as CRG.
- B. Wall Exhaust Grille (WEG): Same as WRG.

#### 2.6 LOUVERS

- A . Type: High performance, 6" deep, stationary, drainable louvers. Ruskin Model ELF6375DX (or approved).
- B. Frame: 6" deep, constructed of minimum 0.090" 6063T5 extruded aluminum, with integral downspouts in jambs and mullions.
- C . Blades: Shall be constructed of minimum 0.081" 6063T5 extruded aluminum, positioned at 37.5 degree angle on approximately 5-7/8" centers, with drain gutters.
- D. Bird Screen: Shall be constructed of 3/4" mesh, 0.051" aluminum.
- E . Performance: Rated in accordance with AMCA 500. For a 48" x 48" louver, minimum free area of 57%, with pressure drop not exceeding 0.10 inches w.g. at 800 feet per minute. No measurable water penetration at velocity below 1000 feet per minute.
- F. Wind Loading: Louver shall incorporate structural supports required to withstand a wind load of 25 lb. per square foot.
- G. Finish: Kynar Finish; color as selected by Architect.

# 2.7 ROOF VENTS

- A. Type: Low silhouette roof vent, with arched top. Greenheck Model FGI, FGR (or approved).
- B. Construction: Aluminum, fabricated with arched interlocking panels, rounded edges, vertical sides, designed for mounting on factory fabricated roof curbs, with horizontal 1/2-inch mesh wire bird screen, and integral galvanized steel supports for rigidity. Roof vents used for intake shall have provision for installing 2-inch thick aluminum filters.
- C . Performance: Hood pressure drop shall not exceed 0.05 inch wc at 500 feet per minute (ducted model, with screen, no filters).
- D . Size: Roof vents shall have throat size as indicated on the plans (or size to match the connecting duct sizes indicated).
- E . Finish: Baked enamel, color as selected by Architect.
- F . Roof Curb: Shall be constructed of minimum 18 gauge galvanized steel or 0.064-inch thick aluminum, of all-welded construction, with top wooden nailer held in place by metal wraparound, and internally insulated with minimum 1/2-inch thick rigid fiberglass. Size of curb shall match roof vent. Provide curb type as required to match roof type (i.e., with built-in cant and step height to allow for roof insulation; sloped base; etc.). Greenheck Model GPR, GPS, GPF, or approved equal.

## G. Dampers:

1. General: Provide all intake roof vents with motorized dampers; provide all relief (and exhaust) roof vents with motorized dampers and backdraft dampers. Backdraft

- dampers shall be the counter balanced type (unless noted otherwise). Size shall match roof vent throat size (unless noted otherwise).
- 2. Gravity Type: Shall be as specified in Section 23 33 00.
- 3. Counter-balanced Type: Shall be as specified in Section 23 33 00.
- 4. Motorized Type: Shall be as specified in Division 25. Actuator shall be provided by Division 25; where used as relief shall have modulating control.

## 2.8 MISCELLANEOUS

- A. Goosenecks: Shall be made of minimum 18 gauge galvanized steel, in accordance with SMACNA-DCS, and as shown on the drawings.
- B. Screen: 1/2-inch mesh, constructed of either 0.051-inch aluminum wire or 19 gauge galvanized steel wire.

# **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A . General: Install air outlets and inlets in locations indicated and so as to conform with building features and coordinated with other work. See hangers and supports specification Section for supports and additional requirements.
- B. Location Verification: Verify all air inlet/outlet locations with building features and other trades prior to installing any duct systems that will connect to the air outlets/inlets. For locations where air inlet/outlet location is noted to be verified, or location is not clear, develop shop drawings showing the proposed location, or the location that best suits field conditions, and submit for review.
- C . Connections: Furnish all necessary screws, clips, duct collars, and transitions required to allow for the installation and connection of ductwork to all air outlets/inlets. Connect all ductwork to air inlets and outlets with fasteners, minimum one each side and in compliance with SMACNA-DCS. See ductwork specification Section for sealing and additional requirements.

# D. Painting:

- Paint ductwork and accessories which are visible behind air outlets and inlets flat black. Painting to include ductwork, duct liner, turning vanes, liner attachments, and all visible items (including fastening pins for duct lining).
- 2. Coordinate with the Division 09 Contractor for any necessary painting of air outlets/inlets/louvers prior to installation.
- E. Weather Exposure: All outlets and inlets exposed to the weather shall be adequately flashed and installed in a manner to assure complete weatherproofness. Sealing and caulking of all outlets and inlets exposed to the weather shall conform to Division 07 and Section 20 05 30.
- F. Screened Openings: Provide screened openings (SO) on all duct openings where indicated and where openings do not have grilles or registers.
- G . Louver Blank-Offs: Where louvers require blanking off of unused area, use minimum 22 gauge galvanized sheetmetal, painted flat black on louver side, and insulated on building

- side with 2-inch duct liner (or thermally equivalent rigid fiberglass insulation). Tape off all raw edges of liner. Where exposed to view, provide galvanized sheetmetal cover (with bent over edges) to fully cover all insulation and match louver size.
- H . Louver and Wall Caps: Slope bottom of all ducts within 18 inches of connecting to louvers and wall caps at minimum 1% slope toward bottom of louver; seal all joints within 6-inches of bottom of ductwork water tight.
- Louver Sizes: Contractor shall measure actual louver wall openings prior to ordering or fabricating louvers. Notify Architect/Engineer of any discrepancy between actual wall opening and specified opening.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

# 1.2 WORK INCLUDED

- A. Energy Recovery Ventilators.
- B. Start-up.

#### 1.3 SUBMITTALS

- A. General: Submittals shall comply with Section 20 05 00.
- B. Product Data: Submit product information on unit including fan curves, coil performance, unit construction details, wiring diagram, data showing energy recovery, filter data, and weight.
- C . Shop Drawing: Submit drawings of unit showing all dimensions, locations of unit components, and point of connection of all utilities.
- D. Operation and Maintenance: Submit Operation and Maintenance data and submittal data for inclusion in project O&M Manuals.

# 1.4 GENERAL REQUIREMENTS

- A . Standardization: All units of the same type shall be the product of the same manufacturer.
- B. Substituted Equipment: The drawings show design configuration based on a particular manufacturer's equipment (i.e. basis of design). Use of another manufacturer's equipment (i.e. substituted equipment) that is configured different from what is shown will require redesign of mechanical ductwork, piping, electrical, structural, unit support systems, and general building construction to accommodate the substituted equipment. Such redesign shall meet the requirements and have the approval of the Architect/Engineer prior to fabrication. Contractor shall submit complete shop drawings showing all alternate unit installation plans and details; shop drawings shall comply with Section 20 05 00. The redesign shall be equal or superior in all respects to the Architect/Engineer's design (as judged by the Architect/Engineer), including such aspects as equipment access, ease of maintenance, duct connection locations, unit electrical requirements, noise considerations, vibration unit performance, and similar concerns. Cost of redesign and all additional costs incurred to accommodate the substitutional equipment shall be borne by the contractor. Contractor is cautioned that certain aspects of the equipment cannot be fully evaluated until items are installed and operational, and all added costs after installation to make units equal to the basis of design shall be by the Contractor.

#### 1.5 REFERENCES

A. AMCA 230: Laboratory Methods of Testing Air Circulating Fans for Rating and Certification.

B. AHRI 1060: Standard for Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment.

#### 1.6 WARRANTY

- A. General: See Division 00 and Section 20 05 00 for basic warranty requirements.
- B. Extended Warranty: The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances or normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two years from the date of installation.

# PART 2 - PRODUCTS

# 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Energy Recovery Ventilator: RenewAire.

#### 2.2 GENERAL

- A. Guards: Exposed openings into fan housings shall be protected with substantial metal screens or gratings. Electrical components with shock potential shall be physically protected and labeled (label as to hazard and items being accessed).
- B. Fan Balancing: The shaft and fan wheel(s) shall be factory statically and dynamically balanced.
- C. Motors: Shall be UL listed and comply with Section 20 05 00. Motor efficiency shall comply with Code. Motors shall have integral thermal protection with automatic reset.
- D . Outlets and Inlets: Equipment shall be furnished with attachment angles and/or flanges to allow for attaching external ductwork.
- E . Fan Performance: Shall be based on laboratory tests conducted in accordance with AMCA 230. Fan capacity shall not be less than the values scheduled on the drawings and shall be constructed to be able to operate with total pressures 20% higher than that indicated.
- F. Controls: Coordinate with Division 25 Contractor for required interfaces between air handling equipment and building control system.
- G . Gasketing: Where units are furnished in sections, unit manufacturer shall furnish unit with gasketing to allow sealing of adjoining sections.
- H . Sound Tests: Shall be done by fan manufacturer in an AMCA certified sound testing laboratory. Sound tests shall be conducted in accordance with AMCA 300. Provide necessary testing and calculations to develop required sound data. Tested sound power levels shall not exceed specified levels by more than 3 dB in any octave band.
- I. Factory Tests: Every unit shall be factory tested prior to shipping. Tests shall include (as a minimum): Motor dielectric voltage-withstand test, unit dielectric voltage-withstand test, continuity of internal control circuits test, unit amperage test, proper fan operation.

# 2.3 ENERGY RECOVERY VENTILATOR

A. Type: Indoor energy recovery ventilator using fixed plate enthalpy heat exchanger.

#### B. General:

- 1. Unit shall be complete single package, self contained factory assembled unit, requiring only electrical, duct, and control connections to operate.
- 2. Capacity: Shall be as scheduled at the conditions noted.
- 3. Unit configuration shall be as shown on plans.

## C. Cabinet:

- 1. General: Constructed of minimum 20 gauge G-90 galvanized steel, reinforced and constructed for maximum anticipated static pressures involved, but no less than 4" w.c. with cabinet leakage less than 1% of scheduled airflow.
- Liner: Interior of cabinet shall be insulated with minimum 1-inch thick, 4 pound per cubic foot density foil scrim faced fiberglass insulation to provide a cleanable surface. Double-wall construction with foam injected insulation and interior 20 gauge G-90 galvanized steel is also acceptable.
- Access Doors: Constructed same as cabinet, size to access unit internals, with full
  perimeter gasket. Doors shall be opened by releasing multiple latches or similar
  method requiring no tools.
- D. Fan(s): Integral supply and exhaust fans, direct drive, steel or aluminum construction, multiblade centrifugal type. Motors shall be ECM type.

# E. Energy Recovery Core:

- General: Total enthalpy type, capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air. No condensate drains shall be required.
- Certifications: The energy recovery cores used in these products shall be third party Certified by AHRI 1060 for Energy Recovery Ventilators. AHRI published certifications shall confirm manufacturer's published performance for airflow, static pressure, temperature and total effectiveness, outdoor air (OACF) and exhaust air leakage (EATR). OACF shall be no more than 1.02 and EATR shall be a 0% against balanced airflow.

# F. Filters:

- General: Units shall be provided with filter racks for accommodating 2" thick disposable filters (unless noted otherwise), with minimum filter area (or sizes) as scheduled. Access to filters shall be through unit access doors requiring no tools to open.
- 2. Filter Type: Shall be pleated panel, disposable type. Filter shall have MERV 13 efficiency as evaluated by ASHRAE 52.2.

# G. Electrical:

 General: Unit shall be for use with single point electrical power connection. Unit shall be furnished with all necessary wiring, raceway, transformers, contactors, relays, motor starters, and accessories with power and controls connected to all unit devices for unit operation and with the specified sequence. Electrical shall comply with NEC and local

code requirements. Unit shall have a main fused power disconnect. Disconnects shall comply with NEC, and be accessible from outside unit enclosure.

H . Controls: Unit control shall be by Division 25 (unless otherwise noted); unit shall have limited factory controls to provide necessary safeties and to allow for control by Division 25. Division 25 shall enable unit fans when "run" terminals are connected. Unit shall be furnished with all necessary relays, starters, wiring terminal strips, timers, safety devices, etc. to allow for the sequence of operation as specified in Division 25 using the Division 25 control system. Unit wiring shall be color coded and numbered corresponding to unit's wiring diagram. Access panels to unit controls shall be hinged with latches (or equivalent device), requiring no tools to open.

# **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. General: Install the units as shown on the drawings, in accordance with manufacturer's instructions, code, and best construction practices.
- B. Access: Install to allow for maintenance access and proper clearances.
- C. Duct Connections: Provide flexible connections in ductwork connections to units.

## 3.2 START-UP

- A . Initial Checks: Prior to operating units, checks shall be made to insure that adequate voltage, duct connections, electrical connections, control connections, and other items as listed by the manufacturer are properly provided/connected and ready to ensure safe and proper unit operation.
- B. Testing and Adjustment: Operate unit to test for proper operation, including fan rotation, and correct interface to other controls.

**END OF SECTION** 

# **PART 1 - GENERAL**

### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 WORK INCLUDED

- A. VRF Split System Heat Pumps.
- B. Refrigerant Piping.
- C . System Controls and Control System Design.
- D . System Interface to Other Controls.
- E. Start-up and Commissioning.

# 1.3 QUALITY ASSURANCE

- A . Listing: Units shall be listed by an approved testing agency for the use and application intended.
- B . Ratings and Certification: Unit performances shall be tested and rated in accordance with AHRI Standards and shall be AHRI certified.
- C . Energy Efficiencies: Equipment energy efficiencies shall not be less than code requirements and shall exceed code efficiencies as indicated.

### D. Installer Qualifications:

- 1. General: The installer shall have experience installing VRF systems by the manufacturer being used for this project. Installer shall be certified by the VRF system manufacturer as a "certified installer".
- 2. Refrigeration Components: Shall be installed by a licensed refrigeration mechanic having experience with VRF systems, and the work shall be supervised by personnel trained by the VRF system manufacturer.
- Controls: Control work shall be done by individual trained and certified by the VRF manufacturer for the installation of the specified controls.

### 1.4 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Product Data: Provide complete product information submittals on all units; include performance capacities as a function of indoor and outdoor coil db/wb temperatures and indoor coil air flow rates, supplementary heater capacity, fan performance (cfm vs. esp), and information on all filters and accessories.

- C . Refrigerant Piping: Submit proposed refrigerant pipe sizes, schematic of routing, and refrigerant system accessories.
- D. Control Shop Drawings: Submit shop drawings of complete control system, including the following information: interconnect drawings showing all wiring and control connections, all control device locations, sequence of operation for all controlled systems, building floor plans with all proposed thermostat and other control device locations shown.
- E . Installer Qualifications: Submit qualifications of the personnel installing the refrigeration system components and the system controls (when requested by the Engineer).

### 1.5 GENERAL REQUIREMENTS

- A . System Type: System shall be a Variable Refrigerant Flow (VRF) heat pump system, allowing for simultaneous heating and cooling modes operation of indoor units, with indoor units operating independently of other indoor units, changeover from one mode to the other (heating to cooling, cooling to heating) with no interruption to system operation, and the recovery of energy between units in different modes. The system shall be capable of accommodating a range of the sum of all indoor unit capacity, from 50% to 150% of outdoor unit capacity.
- B. Standardization: In interests of Owner's standardization, all system heat pumps and heat pump controls shall be the product of the same manufacturer.
- C . Alternate Manufacturers: The project has been designed around equipment by the manufacturer scheduled on the drawings. Alternate manufacturers may be used (see Acceptable Manufacturers, Section 20 05 00); however, any redesign (from what is shown on the drawing) to mechanical, electrical, structural, or general construction to accommodate such an alternate manufacturer shall be provided by the Contractor. Furthermore, such redesign shall meet the requirements and have the approval of the Architect/Engineer prior to fabrication. Contractor shall submit complete shop drawings showing all alternate installation plans and details; shop drawings shall comply with Section 20 05 00. The redesign shall be equal or superior in all respects to the Architect/Engineer's design, including such aspects as equipment access, ease of maintenance, duct connection locations, unit electrical requirements, noise considerations, unit performance, and similar concerns. Cost of redesign and all additional costs incurred to accommodate the alternate heat pumps shall be borne by the Contractor.
- D. Refrigerant Pipe Sizing: Due to the use of proprietary selection criteria by the heat pump manufacturers, the heat pump supplier shall size all refrigerant piping between the indoor and outdoor units and provide such sizes to the installing Contractors prior to the bid date. The heat pump supplier shall also determine the need for any additional accumulators, solenoid valves, and similar accessories and size/select such devices and inform potential installing contractors to allow proper bids. The heat pump supplier is obligated to furnish complete heat pump units, with properly calculated pipe sizes and accessories so as to allow the unit performances as scheduled.
- E . Electrical and Controls: Component wiring shall comply with NEC and be color coded and numbered and match unit wiring diagrams. All necessary terminal blocks, fuse, wiring, junction boxes and electrical/control accessories shall be factory installed within the unit cabinet (unless noted otherwise).
- F. Manufacturer's Installation Review: Upon completion of equipment installation, a technician employed directly by the manufacturer will be on site to confirm the installation is in compliance with the manufacturer's installation recommendations and to assist with equipment start-up. Upon completion of this installation review, the technician will submit a

- written report listing any installation issues, discrepancies or concerns within 72 hours of completion of manufacturer's review. Include in bid a minimum of 8 hours of a technician's time and all associated expenses. Notify the Engineer 5 days prior to the installation review.
- G . Manufacturer's Operational Review: Prior to substantial completion, a technician employed directly by the manufacturer will be on site to confirm the system is operating and controlling in compliance with the contract documents. Upon completion of the operational review, the technician will submit a written report listing any issues, discrepancies or concerns within 72 hours of completion of manufacturer's operational review. Include in bid a minimum of 8 hours of a technician's time and all associated expenses. Notify the Engineer 5 days prior to the installation review.

### 1.6 WARRANTY

- A. General: See Division 00 and 01 for general warranty requirements.
- B. Warranty VRF System Equipment:
  - Basic: Entire heat pump (outdoor and indoor sections) shall be warranted by the
    manufacturer to be free from all manufacturing defects and capable of providing
    satisfactory operation for the project warranty period. Repair and/or replacement of
    defective items (labor and parts) during the project warranty period shall be at no
    additional cost to the Owner.
  - 2. Extended: Compressors and all coils shall be warranted by the manufacturer to be free from defects and capable of operating satisfactorily for a period of 5 years beyond the basic project warranty. Extended Warranty shall cover all warranted parts and associated shipping to the site, with repair labor by the Owner.
- C. Warranty VRF System Controls:
  - 1. Basic: System shall be warranted for the project warranty period to provide the sequence of operation and basic features specified, with the accuracy and flexibility specified. The system shall be repaired or replaced, including materials and labor, if in Owner's reasonable opinion, system is other than as warranted.
  - 2. Emergency Service: During the warranty period maintain a 24-hour emergency phone service and be able to respond by a trained and qualified Controls Engineer familiar with the installed system.
  - 3. Warranty Service Allowance: Include 8 hours of control technician/programmer's time for special service (i.e. software changes, system consultation, setting up additional trends, etc.) and other services during the warranty period as required by the Owner or Engineer. The Owner and Contractor will jointly track the amount of time used. Only time directly authorized and agreed to by the Owner may be tracked as part of this allowance. This allowance is for work outside of other required project work, and is for specific tasks assigned to the Contractor by the Owner or Engineer.
  - 4. End of Warranty Service: At the end of the warranty period, the Contractor shall provide a re-check of the entire system operation, including calibration testing of a sample number of components and providing any necessary control adjustments for proper system operation. Such work shall be for a minimum of 8 hours on site.
  - 5. Extended Warranty: Controls and control system shall be warranted for 2 years, beyond the project warranty period.

## 1.7 REFERENCES

A. AHRI 210/240: Standard for Unitary Air Conditioning and Air Source Heat Pump Equipment.

- B. AHRI 350: Standard for Sound Rating of Indoor Air Conditioning Equipment.
- C. AHRI 270: Standard for Sound Rating of Outdoor Unitary Equipment.
- D . AHRI 1060: Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment.
- E . ASME B16.22: Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- F. ASME B16.26: Standard for Cast Copper Alloy Fittings for Flared Copper Tubes.
- G . ASME B280: Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

# PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. VRF Heat Pumps: Mitsubishi, Carrier, Toshiba, Samsung, Daikin.
- C. Refrigerant Pipe and Fittings: Domestic made products only.

# 2.2 SPLIT SYSTEM HEAT PUMP - OUTDOOR UNIT

- A. Type: VRF air-to-air heat pump, outdoor section, for serving multiple indoor units.
- B. Capacity: Units shall allow the indoor units to have the minimum cooling and heating capacities scheduled on the drawings at the conditions shown; rated in accordance with AHRI standards.
- C . General: Unit shall be fully factory assembled and shall be complete with casing, coils, fans, compressor, piping, wiring, controls, and all other accessories required to be ready for field connections and operation. Unit shall be capable of operating in the cooling mode from 30 to 125 degrees F ambient, and in heating mode from 0 to 65 degrees F ambient. Unit shall be factory run-tested to verify proper heating, cooling, defrost, control, and fan operation.
- D. Unit Casing: Shall be constructed of galvanized steel, bonderized and finished with manufacturer's standard color. Casing shall be able to withstand 960 hours per ASTM B117 criteria.
- E. Compressor(s): Shall be high performance, inverter driven, modulating capacity scroll type. Compressor shall have internal overcurrent protection and thermal overload protection, high pressure safety switch, and crankcase heaters. Compressor(s) shall be mounted to avoid transmission of vibration.
- F. Refrigerant Circuit: Units shall be for use with refrigerant R-410A and shall be fully charged at the factory for the piping and indoor units used with. Unit shall include an accumulator with refrigerant level sensors and controls.
- G. Coils: Shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing, with a factory applied corrosion resistant finish and integral metal guard protector.

- H . Fan: Shall be direct drive, variable speed propeller type with a raised guard to prevent contact with moving parts. Fan motor shall have permanently lubricated bearings and inherent overcurrent protection.
- I. Electrical and Controls: Units shall be for use with power of voltage and phase as scheduled on the drawings. Unit shall have over-current protection and DC bus protection. Unit shall include all controls for units components, interconnection to other system components for automatic operation, safeties to prevent unsafe operation, to accommodate system defrost, and to allow for 8 stages of operation. Units controls shall be 24 volt.
- J . Sound: Unit shall have a sound rating not higher than 60 db(A) individually, and 64 dB(A) where twinned. In "night mode" unit shall have a sound rating not higher than 50 db(A) individually, and 53 dB(A) where twinned.

### 2.3 SPLIT SYSTEM HEAT PUMP – INDOOR - CEILING CASSETTE

- A . Type: Indoor VRF heat pump for overhead suspended installation in a ceiling (or at ceiling height).
- B. General: Unit shall be fully factory assembled and shall be complete with fan, four-way discharge outlet, evaporator coil, refrigerant metering device, heavy gauge steel chassis, refrigerant piping controls, condensate pan, drain connection, and related accessories to operate properly with VRF system.
- C . Capacity: Unit shall have minimum cooling and heating capacities as scheduled on the drawings at the conditions shown and with the outdoor unit indicated; rated in accordance with AHRI standards.
- D. Unit Casing: Fabricated of galvanized steel, with support provisions for hanging from building structure. Unit shall have bottom discharge grille, adjustable for two, three, or fourway discharge. Grille vane angles shall be adjustable via room wall thermostat. Exposed portion of unit shall have finished paint, manufacture's standard color.
- E . Refrigerant Circuit: Shall be fully factory piped and shall include an electronic linear thermostatic expansion device to allow for both heating and cooling operation. Units shall be factory charged with dehydrated air (or an inert gas).
- F. Coil: Non-ferrous construction with plate fins on copper tubing, with all joints silver brazed. Coils shall be factory tested to a minimum of 1.5 time's normal working pressure. Coil shall have corrosion resistant drain pan and drain fitting; configured to allow draining either end of unit. Unit shall have an integral condensate pump, rated for unit condensation rate and 2.5 feet of head.
- G . Fan: Direct drive, multi-speed type, statically and dynamically balanced, with permanently lubricated motor, manually adjustable guide vanes for side to side discharge, and a motorized discharge louver directing air up and down automatically. Fan speed shall be adjustable via room wall thermostat to a set level, or be able to be set to vary according to heating or cooling demand.
- H. Filter: Unit shall have an integral washable filter, easily removable.
- I. Electrical and Controls: Unit shall be for use with power of voltage and phase as scheduled on the drawings. Unit shall include all controls for unit's components, interconnection to other system components, and to provide the specified sequence of automatic operation. Unit shall include controls providing self-diagnostic checks, auto restart (on power outage or loss of control communication), test run switch, auxiliary contacts for control of an external

heat source, four digital inputs for custom control applications, and three digital outputs for custom control applications.

# J. Condensate Pump:

- Provide unit with condensate pump. Where not available internal to unit, or where
  internal pump doesn't meet the pumping capacity required, provide external type, with
  controls, and gpm capacity to suit unit maximum condensate rate, at 10 feet of head.
  Provide mounting assembly, accessories for complete connections, and an architectural
  cover to match the finish of the unit to minimize visibility.
- Provide unit with high level condensate overflow sensor. Sensor shall detect high
  condensate levels in the indoor unit and stop indoor unit operation before an overflow
  can occur. Provide mounting assembly and accessories required to install on specified
  indoor unit.

## 2.4 SPLIT SYSTEM HEAT PUMP – INDOOR – FAN COIL

- A. Type: Suspended indoor VRF heat pump, ducted, fan coil.
- B. General: Unit shall be fully factory assembled and shall be complete with fan, motor, evaporator coil, refrigerant metering device, heavy gauge steel chassis, refrigerant piping controls, condensate pan, drain connection, and related accessories to operate properly with VRF system.
- C . Capacity: Units shall have minimum cooling, heating, and airflow capacities as scheduled on the drawings at the conditions shown and with the outdoor unit indicated; rated in accordance with AHRI standards.
- D. Unit Casing: Fabricated of galvanized steel, with provisions for hanging from above. Provide with access doors for side access.
- E. Refrigerant Circuit: Shall be fully factory piped and shall include an electronic linear thermostatic expansion device to allow for both heating and cooling operation. Units shall be factory charged with dehydrated air (or an inert gas).
- F. Coil: Non-ferrous construction with plate fins on copper tubing, with all joints silver brazed. Coils shall be factory tested to a minimum of 1.5 time's normal working pressure. Coil shall have corrosion resistant drain pan and drain fitting; configured to allow draining either end of unit.
- G . Fan: Direct drive, multi-speed type, statically and dynamically balanced, with permanently lubricated motor. Air speed shall be adjustable via room wall thermostat to a set level, or set to vary according to heating or cooling demand.
- H . Filters: Unit shall have factory filter box, sized to accommodate filters (size and type) as indicated, with side or bottom access, requiring no tools to access filters. Filter MERV-8 rating shall be rated in accordance with ASHRAE 52.2.
- I. Electrical and Controls: Unit shall be for use with power of voltage and phase as scheduled on the drawings. Unit shall include all controls for unit's components, interconnection to other system components, and to provide the specified sequence of automatic operation. Unit shall include controls providing self-diagnostic checks, auto restart (on power outage or loss of control communication), test run switch, auxiliary contacts for control of an external heat source, four digital inputs for custom control applications, and three digital outputs for custom control applications.

## J. Condensate Pump:

- Provide unit with condensate pump. Where not available internal to unit, or where
  internal pump doesn't meet the pumping capacity required, provide external type, with
  controls, and gpm capacity to suit unit maximum condensate rate, at 10 feet of head.
  Provide mounting assembly, accessories for complete connections, and an architectural
  cover to match the finish of the unit to minimize visibility.
- Provide unit with high level condensate overflow sensor. Sensor shall detect high
  condensate levels in the indoor unit and stop indoor unit operation before an overflow
  can occur. Provide mounting assembly and accessories required to install on specified
  indoor unit.

## 2.5 BRANCH CIRCUIT CONTROLLER

- A. Type: Refrigerant Branch Circuit (BC) Controller controlling refrigerant flow and with controls and accessories for system heating/cooling operation.
- B. General: The BC Controller shall be fully factory assembled, and complete with all piping, valves, controls, and wiring. Unit shall be factory run tested. Provide unit size and capacity appropriate for the system and number/size of indoor units.
- C . Unit Cabinet: Fabricated of galvanized steel, sized to enclose all components. An integral condensate pan and drain connection shall be provided. Provided with factory supplied condensate pump.
- D. Refrigerant Circuit: Unit shall have multiple tow-position automatic refrigerant valves to control refrigerant flow, and each branch line shall have a service valve to allow servicing any indoor unit without interruption of service to other units. Unit shall have a liquid-gas separator a tube-in-tube heat exchanger. Linear electronic expansion valves shall be provided for control of refrigerant flow.
- E . Electrical: Unit shall be for use with power of voltage and phase as scheduled on the drawings. Unit shall include all controls for proper operation interconnection to other system components.

## 2.6 VRF SYSTEM CONTROLS

### A. General:

- 1. System shall have VRF manufacturer's controls to control all space indoor units, heat recovery unit, outdoor unit, and additional HVAC system components, as a unified system. System shall provide the sequence of operation specified.
- 2. The control system shall consist of a low voltage communication network of controllers and control devices, communicating over a high-speed communication bus, with a web-based operator interface. A web controller with a network interface shall gather data from the VRF and HVAC control system and generate web pages accessible through a conventional web browser for PC's connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
- 3. System shall be capable of email generation for remote alarm annunciation.
- 4. Provide all control system software, programming, and control devices to allow for the system operation, the specified sequence, specified features, and to allow remote access via a standard web browser. Provide graphics accessible by the web browser which display the systems in a schematic fashion with system data overlayed on the graphics. Provide all software licensing to the project Owner.

- B. EMCS Interface: System controls shall have BACnet interface for connection to a future building EMCS to allow the EMCS to monitor complete system operation and to allow enable/disable of the overall system components (i.e. placing in off or auto modes remotely).
- C . Room Thermostats: Shall provide space temperature control for indoor units, completely independent of other indoor units. Thermostats shall include: occupant setpoint adjustment of plus or minus 3 deg F, room temperature display, room setpoint display, fan speed adjust, indoor unit diagnostics, discharge vane/louver adjust (where indoor units are specified with adjustable vanes/louvers), and related features as specified with the system equipment.

## D. Master Controller:

- General: Shall provide time schedule, warm-up, optimum start, night setback, monitoring system status, unit on/off control, unit airflow control, temperature settings, and other control functions for the system and to serve as one of the users' interface. Shall allow for system programming, start-up, trouble-shooting, setup, and provide the specified sequence of operation. Wall mounted, backlit, color touch panel, with visual display of all settings, and system diagnostics.
- Communication Ports: Controller shall be equipped with two RJ-45 Ethernet ports to support interconnection with a network PC via a closed/direct Local Area Network (LAN) or to a network switch for IP communication to other controllers for display of up to two hundred indoor units.

## 3. Scheduling:

- a. Time Schedules: The Control System shall provide time clock schedule with at least 20 time schedules. Each schedule to be 8-day type, 5 entries per day. All entries to be in 12 hour AM/PM format. The complete schedule shall be displayed at one time on the master controller for easy editing. Each time program shall be able to include on/off, high/low speeds, temperature setpoints, dduty cycle commands, as required to provide the specified sequence of operation.
- b. Holiday Schedules: A minimum of 20 holiday time schedules shall be available and shall be assigned to any number of available points. Holiday schedule shall display entire year and shall also allow for an interval holiday time, program showing holiday start date to end date (example: December 24 to January 2).
- 4. Warm-up Mode: Control System shall have warm-up mode prior to occupied mode on heating to pre-warm building prior to occupancy. Time of beginning warm-up cycle shall be determined by an optimum start/stop program.
- 5. Optimum Start/Stop: Control System shall have optimum start/stop program to reduce run time of HVAC equipment. Optimum start/stop program shall consider building mass, building temperatures, outdoor air temperatures, and other system factors in determining time of system start-up or shut-down. Program shall record previous warm-up times versus actual warm-up times and shall adjust the program algorithm so that program calculated warm-up time corresponds to actual.
- 6. Standard software functions shall be available so that the user can securely log into each master controller via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics.
- E . Sub-Controllers: Controllers providing control system equipment in conjunction with the VRF system and master controller. Controller capabilities shall be as required to provide the specified sequence of operation and communicate via the VRF control system network. Controls to include inputs/outputs as required for the application for adjustment of system setpoints, control HVAC equipment (VRF and non-VRF), detect system errors, and monitor system (and equipment) status. See specified sequence of operation for requirements and specified system features.

F. Input/Output Devices: Devices with binary and analog inputs/outputs to control general HVAC equipment in conjunction with the VRF system, master controller, and sub-controllers. Device capabilities shall be as required to provide the specified sequence of operation and communicate via the VRF control system network. See specified sequence of operation for requirements and specified system features.

## G. Wiring and Conduit:

- General: As manufacturer's system requires; complying with Division 26, and in accordance with NEC.
- 2. Low Voltage: Multi-conductor, 16 AWG, twisted, stranded shielded wire; unless required otherwise by the VRF system manufacturer.
- 3. Network Wiring: CAT-5 with RJ-45 connection; unless required otherwise by the VRF system manufacturer.

### H. Labels:

- 1. General: Shall comply with Section 20 05 00.
- Control Devices: Labels on control devices shall use the same designation that
  appears on the control shop drawings and an indication as to purpose; except that
  devices in finished rooms shall be labeled as to the generic item controlled for better
  user understanding (i.e. "Room Exhaust Fan", "Hood Fan").
- Wiring: Wiring labels shall be the self-laminating or heat shrink type with numbering, lettering, or an alpha-numeric identifier indicating the wire signal/power purpose and matching the designation that is used on the control drawings
- I. Control Cabinets: Wall mounted, NEMA rated construction, type and rating to suit location environment, UL listed, minimum 14-gauge sheet metal, hinged front door with latch. Size as required to house controls. Controls/devices shall be logically assembled in cabinet, with all devices and cabinet labeled.
- J . Relays/Contactors: Shall be the single coil electrically operated, mechanically held type. Positive locking shall be obtained without the use of hooks, latches, or semi-permanent magnets. Contacts shall be doubled break silver to silver type protected by arching contact where necessary. Number of contacts and rating shall be selected for the application intended. Operating and release times shall be 100 milliseconds or less. Contactors shall be equipped with coil transient suppression devices to limit transients to 150% of rated coil voltage. Relays shall have mechanical switching to allow manual operation of relay and LED light to indicate the energized state.
- K . Miscellaneous Control Components: Complying with Section 20 05 00 and Division 26. Standard components, for use in commercial and institutional occupancies, rated and designed for the application and able to provide the specified sequence of operation.

## L. Maintenance Tool:

- 1. Tool: Hardware and software to allow system monitoring and to aid technicians in system maintenance; shall monitor system operational functions, status, and settings.
- 2. Parameters: Tool shall enable the user to monitor and record the following parameters in a centralized system.
  - a. Outdoor Unit: Operation mode (cooling only, heating only, cooling main, heating main), compressor frequency, amperages and voltages, compressor high- and

- low-side pressure, system temperatures, outdoor temperature, status of reversing valve.
- b. BC Controller: Valve on/off status, temperatures, pressures.
- c. Indoor Unit: Entering Air temperature, entering/leaving Refrigerant temperature, superheat/subcool temperatures, expansion valve position, room temperature setpoint, unit mode and status (heat, cool, dry, auto, fan).
- 3. Manual Control: The Maintenance Tool shall have be able to control the following system components manually: indoor unit, indoor unit on/off, mode (heat, cool, dry, auto, fan), room temperature setpoint, fan speed, expansion valve position, BC controller valve open/close.
- Connections: The Maintenance Tool shall be connectable to the control system communication bus and be connectable to a PC via a USB cable.
- 5. Trending: Trended data from Maintenance Tool shall be available to export to a data file for offline analysis.
- 6. Portable PC: For use with the "Maintenance Tool", provide as part of tool; with Windows operating system (latest available version), CPU, RAM, storage space, and communication ports to meet software and system requirements and allow for adequate trending and full maintenance operations. Submit PC to the Owner for Owner installation of Owner's security software prior to use.

## 2.7 REFRIGERANT PIPING AND ACCESSORIES

- A . Piping and Fittings: Rated for system pressures per VRF system manufacturer. Hard drawn ACR copper tubing per ASTM B280, Type L, with silver brazed joints and wrought copper fittings per ASME B16.22. Use only long radius elbows. Flared fittings (at equipment connections only) shall comply with ASME B16.26. Soft copper tubing may only be used on runs less than 50-feet or where necessary (i.e. when routing through sleeves, or similar poor access areas) and where acceptable to VRF system manufacturer.
- B. Isolation Valves: Brass ball valve, full port, rated for system pressures and temperatures, but no less than 700 psig and -40 deg F to 300 deg F. Compatible with refrigerant used with, UL listed, with rupture proof encapsulated stem, extended copper connections for ease in brazing. Provide in configuration (i.e. angle, straight, with access port) as required to suit application.

### **PART 3 - EXECUTION**

### 3.1 INSTALLATION

- A . General: Install system in accordance with code, manufacturers written installation instructions, and best construction practices. Set units in locations as shown on the drawings and maintenance to units.
- B. Location and Arrangement: Install all equipment at locations and as shown on the drawings. Install so as to allow maximum access to units. Prior to selecting unit final location, confirm that: Proper unit clearances and access will be provided; no adverse airflow conditions are present; confirm location and installation details with other trades. Units shall be level and aligned with building walls. Set outdoor unit on concrete pad (or roof sleepers); anchor to pad (or sleepers).
- C . Complete Connections: Connect and install all items shipped loose with units; provide and connect all utilities and accessories as required for proper unit operation.

- D. Refrigerant Piping: Shall be silver brazed. Bleed dry nitrogen through piping during brazing to minimize oxidation. Keep all open ends of piping capped when not being worked. Soft copper shall have long radius bends; install without kinks or excess bends. Piping shall be routed concealed, except where routed outdoors and where noted. Piping shall be ran plumb and square to building walls, and in a neat professional manner.
- E . Refrigerant Charge: System shall be checked for proper refrigerant charge and oil level and charged to proper levels after all leak testing and evacuation work has been completed. Refrigerant to be added to the system shall be delivered to the site in factory charged containers and charged into the system through a filter/drier.
- F. Unit Protection: Units shall be protected during construction to prevent mud, dirt, paint overspray, plaster materials, and similar debris from depositing on the unit. Units shall be clean and in new condition prior to Owner acceptance.
- G . Cleaning: Units shall be thoroughly cleaned of all debris prior to operation. Units shall be clean and in new condition prior to Owner acceptance.
- H. Operation: Units shall not be operated until all construction activities that generate dust, dirt, fumes, or odors are complete; system checkout has occurred; and the Engineer has reviewed the system and granted approval.

### 3.2 VRF SYSTEM CONTROLS

- A . General: Installation shall comply with VRF system manufacturer written instructions and recommendations. Provide all software, hardware, licensing, sensors, relays, switches, dampers, actuators, conduit, tubing, wiring, transformers, motor starters and all other devices required to provide a complete integrated VRF control system with the system features and sequence of operation specified. Control system shall be contractor designed to comply with Contract Document requirements.
- B . Room Sensors: Room sensors (i.e. thermostats) shall be mounted at an ADA accessible height (unless indicated otherwise). Thermostats shall control the equipment which affects the temperature serving the space the thermostat is located in (unless indicated otherwise). Not all room sensors are shown on the drawings and the locations shown are preliminary only. Contractor shall review all drawings, coordinate with other trades, and indicate all final proposed room sensor locations on the submittal shop drawings. Contractor is responsible for coordinating locations to avoid chalkboards, tack boards and other interferences.

#### C. Electrical Power:

- 1. General: Provide all electrical wiring and devices in accordance with codes, and Division 26 requirements.
- Sources: It shall be the responsibility of the installer of the VRF control system to
  provide power for all VRF control devices requiring power. Coordinate with the Division
  26 Contractor to arrange for necessary power circuits. System Master Controller shall
  obtain power from a UPS (uninterruptible power supply); unless the unit has an internal
  battery back-up adequate for 24 hours.
- Conduit: All wiring shall be installed in conduit and in accordance with Division 26, except that low voltage wiring within the ceiling plenum spaces may be ran without conduit provided that plenum rated cable is used. Install all conduit and wiring parallel to building lines.
- D. Equipment Interconnect Wiring: In addition to control wiring between equipment and control devices (furnished under this Section) to accomplish the specified sequence, provide added

control wiring to interconnect equipment and to interconnect equipment and associated control/safety devices. Provide as required by the equipment manufacturers to allow for proper operation of the equipment and system.

- E . Component Labeling: All control components, except regular room thermostats, shall be equipped with name plates to identify each control component. Components in finished rooms shall be labeled as to generic item controlled for better user understanding; other devices shall be labeled with the same designation which appears on the Control Diagrams. Contractor shall submit list of proposed labeling prior to installing.
- F . Complete System: Provide all devices as required to allow for automatic control with sequence of operation specified. Provide all control interconnections between indoor and outdoor units, and other equipment.
- G . Adjustability: All setpoints and differentials shall be adjustable. Setpoints indicated are initial settings.
- H . Confirm Settings: Confirm with Owner all setpoints, all time schedules, and all other adjustable programming parameters before substantial completion.
- Thermostats Setpoints: Shall be adjustable, with initial settings as follows unless indicated otherwise:

Occupied Heating 70 degrees F
Unoccupied Heating 65 degrees F
Occupied Cooling 76 degrees F
Unoccupied Cooling 85 degrees F

- J. Sequence Terminology: Wherever the control sequences refer to an article, device or piece of equipment in the singular number, such reference shall mean to include as many of such articles, devices, or equipment as are shown on the plans, required for the sequence, or required to complete the installation. Wherever the control sequence refers to an operating stage in the singular number, such reference shall mean to include as many stages as are specified for the equipment and shall mean analog (i.e. proportional) type control where specified for the equipment (reference drawings and equipment specifications).
- K . EMCS Interface: Provide interface device with proper protocol to allow communication of exchange of system data with the Division 25 EMCS.

# 3.3 VRF HEAT PUMPS - SEQUENCE OF OPERATION

- A . General: VRF controls shall provide time schedule control and heating/cooling/fan operation of indoor units, with BC and outdoor units automatically operating in response to system loads and needs using their integral controls.
- B. Occupied Mode:
  - 1. Fan: Indoor fan shall run continuously when heating or cooling is required; fan shall cycle to low speed (or as an option cycle off) when no heating or cooling is required.
  - 2. Heating: Indoor heat pump section shall operate in heating as required to satisfy the space setpoint. Airflow shall vary from minimum to maximum depending on load, and shall be programmable to remain at a fixed value instead of varying.
  - 3. Cooling: Indoor heat pump section shall operate in the cooling mode as required to satisfy the space setpoint. Airflow shall vary from minimum to maximum depending on load, and shall be programmable to remain at a fixed value instead of varying.

- C . Unoccupied Mode: Indoor fan and indoor heat pump heating/cooling shall cycle on and off as required to maintain unoccupied setpoints.
- D. Mode Control: Units' mode of operation shall be determined by time schedule and time schedule override; warm-up mode shall be initiated by optimum start controls.
- E . Outdoor unit and Refrigerant Controller: Shall operate to provide adequate and correct refrigerant flow to serve indoor units and to reject or recover heat.

# 3.4 REFRIGERANT LEAK TESTING AND EVACUATION

- A. Notification/Witnessing: Prior to beginning any testing, notify the Architect/Engineer when the testing will occur. The Architect/Engineer will witness (at his option) various parts of the test. Failure to notify the Architect/Engineer will be cause to re-test all piping in the presence of a representative of the Architect/Engineer.
- B . Disconnect and isolate from the system any components that may be damaged by the test pressure.
- C . Connect oil-pumped, dry nitrogen to the system through a pressure reducing gauge manifold. Charge enough nitrogen into the system to raise the pressure to 50 psig. Let stand for 2 hours and check for signs of leakage. If no leakage is noted, slowly increase pressure to 300 psig (or as required by local code, whichever is higher). Tap all brazed connections with a rubber or rawhide mallet sufficiently hard to start any leak that might subsequently open from thermal expansion/contraction or vibration. Check the manifold gauge for any drop in pressure. Let the system stand pressurized for 24 hours. Re-check the manifold gauge. If no change in pressure is noted (after adjusting for temperature) the system may be considered free of leaks.
- D. If leakage is suspected or apparent, check joints with a glycerin soap solution or other means to locate the leaks. Repair any leaks found by completely disassembling the connection, cleaning the fitting and remaking the connection. Re-test the system after repairs are made both with pressure (300 psi for 24 hours) and at the leak location with a glycerin soap solution or other means of determining leaks.
- E. When the system has been proven free of leaks with the above methods, the system shall be completely evacuated of all air and moisture. Connect a vacuum pump to the system and pump the system down to 500 microns and let stand for a minimum of 2 hours. If the vacuum reading remains unchanged, the system may be charged with refrigerant.
- F. After satisfactory pressure testing and vacuum evacuation, fully charge the system with refrigerant. Any final connections that were not subject to the full test pressure (e.g. connections at unit, etc.) shall be carefully checked with a halide or electronic leak detector after the system has been charged.

# 3.5 VRF MANUFACTURER PROJECT REVIEW

- A . General: VRF Manufacturer shall provide on-site review, providing: onsite technical review of the installed VRF systems, review of activities related to the installation of the VRF system, VRF system components and associated controls, review of refrigeration piping practices, review of wiring, review of system settings, review of system operation, and related work to confirm a proper installation. The work of this paragraph is in addition work specified elsewhere in the Contract Documents.
- B . Personnel: Personnel providing these field activities shall be by an employee of the VRF manufacturer whose primary job responsibilities are to provide direct technical support of

their product; sales staff or in-house support staff are not permitted to complete this scope of work. A factory certified representative may assist the VRF manufacturer's personnel in the completion of certain elements of work contained within this specification. Activities completed by a Factory Certified Representative shall be supervised onsite by the VRF manufacturer. Certified representatives shall not be used in lieu of the manufacturer's personnel.

- C . Assistance: The installing contractor shall assist the VRF manufacturer in their work, and have available onsite a technician with appropriate diagnostic tools, materials and equipment for each site visit.
- D. Quantity of Site Visits: VRF manufacturer shall provide 1 onsite visits during the course of the project's completion. The Contractor is responsible to coordinate each visit at the appropriate milestone, giving the VRF manufacturer a minimum 2-week notice prior to each visit.
- E . Site Visits: Activates to be completed during each Site-Visit are as a minimum follows:
  - 1. Provide a field report identifying any installation issues requiring attention. Report shall provide detailed information containing:
    - a. Issue reference number.
    - b. Priority Level of issue.
    - c. Equipment M# & Reference TAG#.
    - d. Status of issue.
    - e. Description of issue being identified.
    - f. Recommendation for corrective action.
    - g. Follow-up requirements, if required.

# 3.6 START-UP/TESTING AND ADJUSTMENT

- A . Initial Checks: Prior to operating units, checks shall be made to insure that adequate voltage, air flow, duct connections, electrical connections, control connections, crankcase heaters (where applicable), and other items as listed by the manufacturer are properly provided/connected and operating to insure safe and proper unit operation.
- B. Testing and Adjustment: Manufacturers representative shall provide start-up. Operate unit in various modes of operating to test for proper operation, including fan rotation, proper damper travel (where applicable), proper cooling/heating, correct interface to other controls (time clock, fans, etc.), etc. Make necessary adjustments.
- C . System Commissioning: As the systems become operational, the VRF system installer shall test and observe the operation of each and every air moving and heating/cooling unit and shall adjust all controls so that the items function according to the intent of the specifications. The VRF system installer shall commission the VRF system controls, including a point-to-point check of all devices, and provide documentation substantiating the work. This commissioning work is separate from the Section 20 08 00 commissioning, and is to occur prior to the commissioning work of Section 20 08 00.
- D . Report/Statement: After making all necessary system testing and adjusting, the Contractor shall submit a report to the Engineer indicating all testing/adjustment work done and comment on how system is operating. Such report shall be signed by the individual directly responsible for supervision of the installation of the control system. When the Contractor feels that the system is complete and ready for review by the Engineer, Contractor shall

submit a written statement (signed by same individuals as for report) stating that the system is in compliance with the project requirements and ready for review.

### 3.7 OWNER INSTRUCTION

- A. General: Comply with Section 20 05 00. After all testing and adjustments have been satisfactorily completed for the first phase of the project, the Owner shall be provided with operator instructions (including start-up, shut-down, emergency, maintenance, and repair instructions). Instruction shall be by the manufacturer's authorized service representative.
- B. Time Period: Instruction period shall be for a minimum of three separate sessions of four hours each. Training to be provided to three Owner staff members.
- C . Maintenance Tool Training: Provide training on maintenance tool for three separate four sessions over a two month period. In addition to classroom sessions, training shall be "hands-on" involving use of the tool on this project's system and demonstrating trouble-shooting and trending procedures.

## 3.8 COMMISSIONING

A . The Products referenced in this section are to be commissioned per Section 20 08 00 - Commissioning. The Contractor has specific responsibilities for scheduling, coordination, startup, test, development, testing and documentation. At a minimum, the Contractor shall provide a documented and signed record to verify that all equipment and systems installed under this contract have been inspected and functionally tested to verify full compliance with the contract specifications.

END OF SECTION

# PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 SECTION INCLUDES

- A. Control System Design.
- B. Complete Mechanical System Controls.
- C. Control Devices, Components, and Wiring.
- D. Control System Commissioning.

## 1.3 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Product Data: Submit manufacturer's product data for all items to be used. Provide a complete materials list, labeled to match labeling used on shop drawing, with manufacturer and model number. Clearly indicate specific each item's control features (e.g. range of operation, accuracy, electrical characteristics, material of construction, etc.). Provide a schedule listing all control valves, control dampers, sizes, flow rates, pressure drops, Cv's, and related data to clearly identify application.
- C . Shop Drawings: Submit shop drawings of complete control system, including the following information: interconnect drawings showing all wiring and control connections, all control device locations, sequence of operation for all controlled systems, building floor plans with all proposed thermostat and other control device locations shown.
- D. Labeling: Submit list of proposed component labeling.
- E. Commissioning Reports: Submit documentation showing commissioning work and results.

### 1.4 QUALITY ASSURANCE

- A . Listing: All network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX.
- B. Electrical Interference: All electronic equipment shall conform to the requirements of FCC 15, governing radio frequency electromagnetic interference and be so labeled.
- C . Skilled Workers: The entire control system shall be installed by skilled electricians, technicians, and programmers, all of whom are experienced, properly trained and qualified for the work they perform. Contractor shall submit evidence of workers' experience and training upon request of the Engineer.
- D. Communications Cabling: Comply with ANSI/TIA 568 series of standards, ANSI/TIA 569, 606, and 607.

# 1.5 GENERAL REQUIREMENTS

- A . Single Contractor: One single Company shall be responsible to design, furnish and install the complete Division 25 control system. Any subcontracted installation work shall be done by firms experienced and qualified in the work they perform, and subject to approval by the Engineer.
- B. Bidder Design: The control system is bidder design, subject to the requirements of the Contract Documents.
- C . Local Contractor: The Division 25 work (i.e. all control system design, programming, commissioning, and all required work) shall be done by local office personnel, with their office facilities, located within 100 miles of the project location.
- D. Qualifications: Firms performing the Division 25 work shall meet the qualifications listed below. Firms listed below have been pre-qualified as a convenience to bidders.
  - 1. Have installed control systems of the type required for this project in at least 6 projects of similar or greater complexity in the last 2 years. These similar or more complex projects shall involve integrating controls of another contractor.
  - Be qualified by the manufacturer of the system being installed to install the type of controls and of the magnitude required for this project. Such pre-qualifications shall include titles as "Authorized Control Integrator", "Independent Field Office", "Authorized Factory Representative" or similar.
  - 3. Have installed control systems similar to the type for this project in at least 6 projects in a campus setting where the work could affect the control systems in multiple buildings.
  - 4. Pre-qualified firms: Sound Energy, ATS Automation, Delta Controls, local branch office of listed control system manufacturers (see Paragraph 2.01 this Section).
- E. Licensing: Provide licensing which allows the Owner to make modifications, additions, expansion, and interconnections to all aspects of the system without limitation.

  Manufacturer's software licensing agreements shall be configured to allow the system to be "open" and non-proprietary. The Owner shall have full ownership for the system and access.
- F. Payments: The Contractor is advised that in addition to payments held out for retainage and project final completion (i.e. punchlist work) as specified elsewhere, the work of this specification Section may be limited to a maximum payment of 90% of the scheduled value of the work until all system are proven operational and have been properly checked out by the installing Contractor.
- G . All DDC Control: All controls and sequences shall be provided by the Division 25 DDC control system, unless specifically noted otherwise. Where interval timer, switch control, or a similar manual control is indicated, the control device shall provide an input to the DDC system with the DDC system providing an output for control. No line voltage controls or other controls which do not "pass through" the DDC control system are allowed, unless directly stated that is the method of control to be used; see the Control Sequences Specification Section for exceptions.
- H. Service Allowance: Include 16 hours of control labor for special work (i.e. software changes, system consultation, relocation of control devices and other services) during construction as required by the Owner or Engineer. The Engineer and Contractor will jointly track the amount of time used. Only time directly authorized and agreed to by the Engineer may be tracked as part of this allowance. This allowance is for work outside of other required project work, and is for specific tasks assigned to the Contractor by the Owner or Engineer.

## I. Existing Systems:

- Existing Controls: Existing controls are the DDC type, by Alerton installed by ATS
   Automation. New controls shall be the DDC type and shall be an extension of the
   existing system, by the same manufacturer, with the same capabilities extended to
   include new equipment. Revise and add system graphics to reflect all project work and
   to include new equipment.
- 2. Existing Controls: Existing controls are the DDC type, using a combination of Distech and Invensys controls. New controls shall be the DDC type and shall be a modification and extension of this existing system. Revise and add system graphics to reflect all project work and to include new equipment; replace system components and wiring as required to provide the specified sequence of operation.
- 3. Field Verification: See Section 20 05 00 and 20 05 03 for additional field verification requirements. Verify existing system detail; including but not limited to existing electrical wiring, existing equipment, existing components (types and locations), existing starter type/locations, graphics to interface with, existing programming, and related information in order to allow the Work to be compatible with the existing.
- 4. System Demolition and Revisions: Remove existing controls at demolished equipment and revise system as necessary so that existing items that remain continue to operate properly. Revise existing system graphics to reflect demolished system revisions. Revise existing control wiring and control components as necessary to properly reconnect to all relocated and revised equipment so that the equipment operates properly. Revise and relocate existing wiring and control component locations to suit revised area.
- Wiring and Component Reuse: Verify existing system wiring and existing components to be reused, to confirm they will operate properly with the new system. Existing components that are indicated to be reused shall be assumed to be in working condition (i.e. temperature sensors, actuators, etc.); however, Contractor shall review their operation and functionality to confirm their condition and notify the Owner of any issues or component failure.
- J . Spare Parts: Contractor shall furnish the Owner with minimum of the following spare parts, of same type as used in this project:
  - 1. Two spare VAV box terminal control unit.
  - 2. Two room temperature sensors/thermostats with occupancy override.

## K. Warranty:

- Basic: System shall be warranted to provide the sequence of operation and basic features specified, with the accuracy and flexibility specified. The system shall be repaired or replaced, including materials and labor, if in Owner's reasonable opinion, system is other than as warranted.
- 2. Emergency Service: During the warranty period maintain a 24 hour emergency phone service and be able to respond by a trained and qualified Controls Engineer familiar with the installed system. The Contractor shall be able to communicate with the system for purposes such as program algorithm alterations, operational evaluations, trouble-shooting, etc.; said response shall be within six hours, with site visits (as necessary) in no less than two weekdays.
- 3. Warranty Service Allowance: Include 16 hours of control technician/programmer's time for special service (i.e. software changes, system consultation, setting up additional trends, etc.) and other services during the warranty period as required by the Owner or Engineer. The Owner and Contractor will jointly track the amount of time used. Only time directly authorized and agreed to by the Owner may be tracked as part of this

- allowance. This allowance is for work outside of other required project work, and is for specific tasks assigned to the Contractor by the Owner or Engineer.
- 4. End of Warranty Service: At the end of the warranty period, the Contractor shall provide a re-check of the entire system operation, including calibration testing of a sample number of components and providing any necessary control adjustments for proper system operation. Such work shall be for a minimum of 8 hours on site.

5.

## 1.6 REFERENCES

- A. UL 916: Energy Management Equipment.
- B. FCC 15: Code of Federal Regulations, Title 47, Part 15, Federal Communications Commission Regulations.
- C. AMCA 500-D: Laboratory Methods of Testing Dampers for Ratings.
- D. ANSI/ASHRAE 15: Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants. ANSI/TIA-568.0-D General Telecommunications Cabling for Customer Premises
- E. ANSI/TIA 568.1-D: Commercial Building Telecommunications Infrastructure Standard
- F . ANSI/TIA 568.C.2: Balanced Twisted Pair Telecommunications Cabling and Components Standard
- G. ANSI/TIA 569-D: Telecommunications Pathways and Spaces
- H. ANSI/TIA 606-C: Administration Standard for Telecommunications Infrastructure
- ANSI/TIA 607-C: Generic Telecommunications Bonding and Grounding for Customer Premises

# **PART 2 - PRODUCTS**

## 2.1 ACCEPTABLE MANUFACTURERS

- A. General: Products shall comply with Section 20 05 00. See Section 20 05 00, paragraph 2.01 for Acceptable Manufacturer requirements.
- B. Control System Manufacturer: Alerton.
- C. Actuators: Belimo.
- D. Control Valves: Honeywell, Armstrong, Belimo, Siemens, TA Hydronics.
- E. Control Dampers: Ruskin, American Warming and Ventilating, Greenheck.
- F. Variable Frequency Drives (VFD's): ABB, Danfoss-Graham.
- G. Carbon Dioxide Sensors: Vulcan, Vaisla, Honeywell.

H. Other Control Components and Accessories: Idec, Hoffman, McDonnell, Tridelta, Veris, Kele, Edwards, Mamac, APC, Barksdale, Mark-Time, Functional Devices, and manufacturers listed for microprocessor based products.

### 2.2 BASIC SYSTEM

- A . General: The system shall be a distributed processing type direct digital control (DDC) system. System shall provide complete stand-alone temperature control/monitoring and energy management for this project, using a network of various independent controllers, sensors and associated devices interconnected in a communicating network.
- B. System Protocol: System shall utilize an open (i.e. non-proprietary) communications protocol which allows the use of control components by different manufacturers to be installed as part of the system with automatic adaption and incorporation into the system with minimal programming. System shall be a BACnet compliant type with all component communication using the protocols and standards as defined by ANSI/ASHRAE 135. LAN type shall be Contractor selected (complying with Contract Document requirements). System shall be internet accessible using standard web browsers such as Windows Explorer and be based on Tridium "Niagara AX" software utilizing JACE controllers (or other as approved by the Engineer).
- C . Version: System shall be latest version of the manufacturer's standard commercial building DDC system.
- D . Expansion: System shall have a fully modular architecture, allowing expansion through the addition of controllers, and control devices. System shall have capability to increase capacity by 100% (i.e. as many points as system currently has) without requiring software upgrades or revised licensing.
- E . Network: All controllers shall be interconnected in a communicating network to provide facility wide access to work stations and sharing of information. A Local Area Network (LAN) shall be provided to interconnect controllers for high speed data transmission. Failure of a single or multiple controllers shall not cause loss of communication between other LAN-connected controllers still active. The control system LAN shall be separate and independent from other building LAN's (except for a single data terminal connection at a single system workstation).

## F. Supports:

- 1. Electrical Components: Provide supports for items governed by the NEC and low voltage control components in accordance with the NEC, local amendments to the NEC, and Division 26. Cable supports shall use extra wide base J hooks, with plenum rated tie wraps. Staples, straps, bridle rings, and similar supports are prohibited.
- 2. Non-Electrical Components: See Divisions 20, 22, and 23.

## 2.3 SYSTEM FEATURES

- A . General: Controllers, operator workstation, control components, and accessories shall all be combined to form a complete system providing the sequences of operation/functions specified and having the features specified. System shall monitor and control all functions relating to building environment, utilities, energy usage, and mechanical systems operation. The point monitoring and controlling functions to be performed by the system shall include but not limited to the following capabilities:
  - 1. Digital inputs (e.g. a contact closure of a control device).
  - 2. Analog inputs (varying electrical signal from a control device to a controller).

- 3. Digital output (e.g. a contact closure by a controller).
- 4. Analog outputs (varying electrical signal from a controller to a control device).
- 5. PWM (pulse width modulation) with feedback position indication.
- B. Controllers: The system controllers shall directly control all valves, fans, HVAC equipment, dampers, coils, system equipment, and similar devices. All control software shall be implemented in the controllers.
- C . Controller Failure: Upon failure of any controller system shall display off-line occurrence for each individual affected point. Provide communication verification to each NAC for each I/O channel. If communication is disrupted, show error count for each attempt to communicate for each registered point per NAC. Operator shall be able to update count and reset to zero.
- D . Zone Control: Provide zone-by-zone control of space temperature, usage scheduling, equipment status reporting, and override timers for off-hours usage.
- E . Setpoints: Zone temperature setpoints, equipment setpoints, pressure setpoints and all other controlled parameters shall be able to be set by an operator (except where indicated otherwise). System shall have global command ability to override all settings of the same type to the same value. All setpoints shall be operator adjustable (via common English language commands).
- F. Password and Security: Access to system shall be by priority password security system to prevent unauthorized use. Minimum of five levels, each assignable to dedicated function keys. Invalid passwords shall lock data base access after three attempts. Password shall not be needed for access to monitoring programs. Operator may select individual security level assignments for each operation and menu selection available.
- G. Time Control: System shall have capability for each equipment to have its own independent time schedule; including occupied/unoccupied modes and optimum start cycles. In addition, system shall have capability for each equipment that could be operated on a seasonal basis (e.g. boiler in heating season, chiller in cooling season, associated pumps, de-stratification fans, baseboard heaters, AC units, etc.) to have independent time of year seasonal schedules.
- H. Auto-Restart: System shall start automatically on power failure, with a sequence to prevent excessive electrical demand due to all equipment starting at the same time, or undesirable affects due to improper sequencing of equipment. Provide staggered start times for all equipment to prevent more than 10 kW of electrical load from starting at the same time (except where not possible due to individual equipment size exceeding this size). Provide a two minute delay (adjustable) between loads (or as required to allow for a proper re-start).
- I. Time Schedule Override: Bypass devices shall send signal to control system indicating requirement for time schedule override operation. The operator shall program the time of override operation at the keyboard from 1 to 15 hours; set initially for 2 hours. Override time remaining to be displayed as part of system graphics; and operator shall be able to alter override time or turn area back to automatic.
- J . Run Time: Equipment run time totalization and start/stop totalization of all equipment connected to system; may be trended totalization information, with no required auxiliary equipment.
- K . Menu Modification: Operator shall have complete capability to modify displays, menus and menu format headings, data base information, with no required auxiliary equipment.

## L. Energy Usage:

- 1. Peak Demand Recording: The building's electrical demand shall be measured; demand peak in kW and its date and time of occurrence shall be recorded. These values shall be observable by an operator. Provide a KW-hour trend log. Provide demand reading program that matches method and time base used by local utility company to bill for demand so that control system demand readings match the utility readings.
- 2. Power Recording: Measure building's electrical energy usage; current annual, monthly and daily total building electrical power usage shall be recorded. Provide a KWH trend log.
- M . Clock: Real-time clock shall be self-contained and accurately controlled by a quartz crystal. The clock shall be set via the keyboard and may be viewed on the display. A battery standby power supply shall be used to maintain clock operation when primary power fails. When primary power returns, the system shall automatically restart to the appropriate schedules with accurate clock time and require no action from personnel to re-initialize.

# N. Disk System:

- System shall be able to store data base on standard digital disk or load data base from the disk. Operator to be able to program system to automatically dump data base to disk storage system at end of each day for the purpose of updating all point data information and logs.
- The disk system shall be activated to load or store data to the system controllers on system initialization or as permanent changes as recorded. Disk system shall not be utilized for routine system operation.

## O. Alarms:

1. For each analog input point allow operator assignable high and low alarm limits; for each digital input point allow operator assignable alarm.

### P. Logs:

- Trend Log: Provide trends for all input and output data and the ability to log the data.
   For each trend log, operator may assign multiple points and an interval sampling rate of
   1 minute to 96 hours. Store time segments. Provide for review of data on graphic
   display and printer. Each trend log shall be able to be assigned individual start/stop
   times/dates in advance. System shall automatically begin entry into each log as
   scheduled. Each point in the log shall have 360 entries, all data stored for future
   retrieval. Trends shall be formatted for ease of reading.
- Current Alarm Log: An alarm log shall track and display all points currently in alarm.
- 3. Alarm History Log: Log last 100 alarms as to time of occurrence, time of acknowledgment and time of return to normal. Maintenance alarms shall be separate from operational type alarms.

# Q . Scheduling:

1. Time Schedules: The Control System shall provide time clock schedule with at least 100 time schedules. Each schedule to be 8-day type, 6 entries per day. All entries to be in 12 hour AM/PM format. The complete schedule shall be displayed at one time on the operator workstation for easy editing. Each time program shall be able to include on/off, high/low speed or duty cycle commands, or Analog Control Values as applicable for the application. Equipment may be assigned to named schedules, with master revisions to the schedule revising all assigned equipment.

- 2. Holiday Schedules: A minimum of 24 holiday time schedules shall be available and shall be assigned to any number of available points.
- 3. Holiday schedule shall display entire year and shall also allow for an interval holiday time, program showing holiday start date to end date (example: December 24 to January 2).
- 4. Schedules shall provide control of all equipment as indicated in the sequence of operation. Coordinate with Owner for final project schedules.
- R . Demand Limiting: Provide a demand limiting program with a hierarchy of equipment loads to be shed. System shall support at least 100 loads and three demand meters.
- S. Warm-up Mode: Control System shall have warm-up mode prior to occupied mode on heating to pre-warm building prior to occupancy. Time of beginning warm-up cycle shall be determined by an optimum start/stop program.
- T . Optimum Start/Stop: Control System shall have optimum start/stop program to reduce run time of HVAC equipment. Optimum start/stop program shall consider building mass, building temperatures, outdoor air temperatures, and other system factors in determining time of system start-up or shut-down. Program shall record previous warm-up times versus actual warm-up times and shall adjust the program algorithm so that program calculated warm-up time corresponds to actual.

# U. System Graphics:

- 1. Graphics: Provide complete system color graphics with displays of all controlled systems. Graphics shall allow operator capability of constructing additional floor plan drawings, mechanical equipment diagrams, piping diagrams, and similar systems drawings at will, while system is on line. Graphics to be color dynamic, displaying current monitored system values. Graphics shall be menu driven from keyboard keys and from mouse. System shall use English language and acronyms selected to allow operators to use the system without extensive training or without programming backgrounds. Software shall use command strings in a request-response sequence in which the machine prompts the operator for all required information; operator response required shall be the appropriate parameter input data. Software shall contain edit functions and escape modes to eliminate continuous logic loops requiring system reboot to escape. Coordinate with Owners staff to develop all operational data to satisfaction of Owner.
- V. All percentage values on actuators shall indicate percentage open.
- W. Provide adjustable date and time stamp on main graphics page.
- X . Provide link on main graphics page navigating to pdf files (or equivalent) files showing sequences of operation and as-built drawings.

# 2.4 CONTROLLERS

- A . General: Shall be manufacturer's standard controllers used for commercial DDC systems complying with the system communication protocol specified and allowing the system to provide the specified features and sequence of operation. Controllers shall be listed, certified, or in some definitive way deemed compliant by an appropriate independent agency that they comply with the system communication protocol being utilized.
- B . Types: Type, capacities, arrangement and features shall be Contractor selected to provide an overall system complying with Contract Document requirements.

- C . Operating Conditions: Controllers shall be capable of operation over a temperature range of 32 deg F to 130 deg F and a humidity range of 5% to 95% (non-condensing).
- D. Network Area Controller (NAC): Shall be modular, multi-tasking, microprocessor based direct digital controller, capable of forming a complete interconnected/communications. Shall provide the interface between the LAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:
  - Calendar functions.
  - 2. Scheduling.
  - 3. Trending.
  - 4. Alarm monitoring and routing.
  - 5. Time synchronization.
  - 6. Network management functions for control devices.
  - 7. The NAC must provide all hardware features and accessories as necessary, including ethernet port and battery backup, to provide a complete and operational control system.
  - 8. Provide with flash memory for long term data backup (if battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity).
  - 9. The NAC shall support a standard Web browser access via the Intranet/Internet and provide multiple user access.
  - 10. Controller mounted display with LCD screen with user friendly menu for system access.
- E . Terminal Unit Controllers (TUC's): Controller specifically designed for control of individual air handling units, fans, VAV terminal units, and similar type units; controllers shall be microprocessor based and shall contain a non-volatile resident program to allow for proper sequencing of controlled equipment. TUC shall interface to the building control system a multi-drop communications network. An individual controller shall be provided for each piece of unique equipment. Each terminal controller shall be accessible for purposes of control and monitoring from a central or remote operator's terminal as specified herein.

# 2.5 TEMPERATURE SENSORS

- A . Room Temperature Sensors: Solid state electronic type, employing a resistance type output. Factory calibrated to an accuracy of plus/minus 0.5 deg F with a temperature range of 32 to 130 deg F in normally occupied areas and -40 to 140 deg F in other areas, with the following features:
  - 1. Space temperature display.
  - 2. Momentary push button for placing room's system into occupied mode when pressed.
  - 3. Means for adjusting temperature setpoint up or down with setpoint display.
- B. Room Temperature Sensor Guards: Lockable, slotted, clear plastic type.
- C . Duct Temperature Sensor: Shall be solid state electronic type, employing a resistance type output. Factory calibrated accuracy of plus/minus 0.5 deg F with a temperature range shall be -40 to 160 deg F. The sensor shall include a utility box and gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 5 foot long sensor element installed so as to sense a representative sample of the medium being controlled.

D. Outside Air Temperature Sensor: Solid state electronic type device, for outdoor installation, factory calibrated accuracy of plus/minus 0.5 deg F, with a temperature range of -20 to 180 degrees F. Provide a sun shield and weatherproof assembly.

### 2.6 CONTROL DAMPERS

- A. Type: Low leakage control dampers, parallel blade or opposed blade type as selected by Division 25 contractor to best suit application (unless a specific type is indicated).
- B. Leakage: Class 1A leakage rated in accordance with AMCA 500-D.
- C . Construction: Construct of galvanized steel, except where installed in ducts of stainless steel or aluminum construction or handling corrosive air, shall be of stainless steel or aluminum construction (to match duct material) or have corrosion resistant coating. All materials in contact with the airstream shall be suitable for the conditions without deterioration. Frame shall be minimum 16 gauge with reinforced corners.
- D. Blades: One-piece airfoil shape, minimum 16 gauge, with neoprene, extruded vinyl or butyl rubber edge seals and flexible metal jamb seals; linkage interconnecting all blades and actuator axle. Blades width shall not exceed 6 inches, and shall be smaller width where a smaller blade best suit the application (i.e. provides improved airflow or smaller frame size).
- E . Bearings: Nylon, molded synthetic, or oil impregnated sintered metal bearings (or other materials as conditions require).
- F. Special Configurations: Provide with configuration and accessories to suit specific application and installation requirements. Where install in walls behind grilles, provide for use with direct coupled actuator (with actuator residing in the damper frame) and reduced size damper (to allow for actuators) that protrude past damper frame, with blank-off (and installation) to prevent bypass of air (or heat) around damper.

## 2.7 ACTUATORS

- A . General: Actuators shall use a brushless DC motor controlled by a microprocessor with protection from overload at all angles of rotation. Run time shall be constant, independent of torque. Actuator shall have manual positioning mechanism and direction of rotation control switch and visual position indicator. Housing shall be NEMA rated to suit the conditions at the actuator location.
- B. Type: Proportional or two position or floating point type, as required for application. Proportional type shall modulate in response to a 2-10 VDC, or 4 to 20mA control input. Provide with auxiliary switches as required for sequence of operation and to allow for safe operation of items served (and interlocked items), switches shall meet requirements for "double insulation" so an electrical ground is not required.
- C . Automatic Closure: Actuator shall spring return upon power interruption, spring return position shall be fail-safe as dictated by freeze, fire or temperature protection requirements; except that actuators required to be the fast operating type may utilize a capacitor discharge for fail-safe closure in lieu of spring (subject to Engineer's approval). Spring return is not required for air terminal unit dampers or for zone dampers.
- D . Performance: Actuator power and torque shall be sufficient to match dampers or valves being controlled and allow proper damper and valve operation against system pressures liable to be encountered. Actuator shall be capable of driving control devices from full closed to full open in less than 90 seconds (unless indicated otherwise) and where fast operating type are required (i.e. where interlocked with equipment operation). Where actuators serve

valves or dampers directly serving equipment (e.g. boiler water flow control valves) or are interlocked with equipment operation (e.g. make-up air equipment dampers) verify required operating time of actuator with equipment manufacturers and timing of other system components to allow for proper system operation without nuisance shutdowns of equipment or creating undesirable effects due to improper actuator response time.

E . Accessories: Units shall be complete with all brackets, and hardware required for mounting and to allow for the proper control for the application.

### 2.8 SWITCHES

- A . Current Monitoring Switches: Electric current sensing device with integral switching contacts. Device shall sense current (amperage) through the conductor the device is applied to and activate switch action (to make and break contacts) once current reaches a preset value. Device shall be able to be clamped around conductor, and be removable. Switch rating, size, switching current, and type selected by Contractor to suit application and provide the required function. Provide type specifically rated for the motor and load type being applied to.
- B. End Switches: Shall be momentary type limit switches for monitoring the motion of an object at a prescribed arc of rotation or set linear movement. The switch shall be mounted on the exterior of the duct so that the trip lever is aligned with the damper vane. Mechanical adjustments in the switch case shall permit the proper lever action for tripping the mercury switch contacts. The switch shall have a SPDT contact arrangement that exceeds the load requirements for both voltage and current.
- C . Interval Timer Push Button Type: Momentary contact type illuminated pushbutton with metal operator, amber LED light, and stainless steel cover plate. Sized to suit standard electrical wall junction box. Label as to function.

## 2.9 CARBON DIOXIDE SENSOR - WALL

- A . Type: Wall mounted non-dispersive infrared (NDIR) type carbon dioxide sensor. Vaisala GMW45 (or approved).
- B. Performance: Measuring range 0 to 2000 ppm CO2, accuracy plus or minus 3% of reading (including repeatability and calibration uncertainties), non-linearity plus or minus 1% of full scale. Shall have long term stability of 5 years (i.e. no more than 5% of full scale error after 5 year operation).
- C. Housing: ABS molded plastic housing, white, with vent openings.
- D. Output: Shall provide 4 to 20mA, and 0 to 10V outputs, selectable by output jumpers.

# 2.10 CARBON DIOXIDE SENSOR – DUCT

- A . Type: Duct mounted non-dispersive infrared (NDIR) type carbon dioxide sensor. Vaisala GMD20 (or approved).
- B. Performance: Measuring range 0 to 2000 ppm CO2, accuracy plus or minus 3% of reading (including repeatability and calibration uncertainties), non-linearity plus or minus 1% of full scale. Shall have long term stability of 5 years (i.e. no more than 5% of full scale error after 5 year operation).

- C . Housing: Plastic housing, with enclosure and accessories for mounting to duct and obtaining sample gas airstream.
- D . Output: Shall provide 4 to 20mA, 0 to 20 mA, and 0 to 10V outputs, selectable by output selection jumpers.
- E. Display: Provide with liquid crystal display showing CO2 ppm reading.

### 2.11 ACCESSORIES

## A. Wiring and Conduit:

- 1. Basic Materials: As specified in Division 26.
- 2. Power Wiring: 18 AWG minimum and rated for 300 VAC service. Wiring for circuits greater than 24 V shall be as specified in Division 26.
- Analog Signal Wiring: Field-installed analog signal wiring shall be 18 AWG single or multiple twisted pair. Each cable shall be 100 percent shielded and have a 20 AWG drain wire. Each wire shall have insulation rated for 300 VAC service. Cables shall have an overall aluminum-polyester or tinned-copper cable-shield tape.
- 4. Life Safety Applications: Wiring that performs code required life safety control (e.g. shutdown of equipment), control of engineered smoke systems, fire alarm interface and similar functions shall comply with code and NFPA standards for fire alarm system wiring and the specific application.

## B. Labels:

- 1. General: Shall comply with Section 20 05 00.
- Control Devices: Labels on control devices shall use the same designation that
  appears on the control shop drawings and an indication as to purpose; except that
  devices in finished rooms shall be labeled as to the generic item controlled for better
  user understanding (i.e. "Room Exhaust Fan", "Hood Fan").
- 3. Wiring: Wiring labels shall be the self-laminating or heat shrink type with numbering, lettering, or an alpha-numeric identifier indicating the wire signal/power purpose and matching the designation that is used on the control drawings
- C . Control Cabinets: Wall mounted, NEMA rated construction, type and rating to suit location environment, UL listed, minimum 14 gauge sheet metal, hinged front door with latch. Size as required to house controls. Controls/devices shall be logically assembled in cabinet, with all devices and cabinet labeled.
- D. Relays/Contactors: Shall be the single coil electrically operated, mechanically held type. Positive locking shall be obtained without the use of hooks, latches, or semi-permanent magnets. Contacts shall be doubled break silver to silver type protected by arching contact where necessary. Number of contacts and rating shall be selected for the application intended. Operating and release times shall be 100 milliseconds or less. Contactors shall be equipped with coil transient suppression devices to limit transients to 150% of rated coil voltage. Relays shall have mechanical switching to allow manual operation of relay and LED light to indicate the energized state.
- E . Thermowells: Series 300 stainless steel or brass construction, with 2-inch lagging neck and extension type well. Diameter and insertion length to suit application.
- F. Condensate Overflow Switch: Overflow switch to detect high condensate level to stop unit operation and indicate an alarm, low voltage, PVC or ABS construction, with switch rated for

voltage/amperage used with. Style to best suit application (i.e. in drain pan type, in drain line type, or type that installs in unit auxiliary drain outlet); selected by Contractor subject to Engineer review. Little Giant No.s ACS-2, -3, -4, or -5 (or approved equal).

- G . Miscellaneous Sensors/Transmitters/Switches/Transformers: Shall be manufacturer's standard, designed for application in commercial building HVAC control systems, compatible with other components so as to provide sequence of operation specified. Transformers shall have integral circuit breakers with push-button reset.
- H . Gas Sub-Meters: Shall be suitable for pressures and flows to suit application; with accuracy of plus/minus 1% and repeatability of 0.5%; pressure drop at max flow shall be no greater than 0.5 psi; provide with straightening vanes. Submit shop drawing of proposed locations. Coordinate with Division 22 contractor for installation of monitoring devices.
- I. Tubing: Soft copper tubing, per ASTM B 88.

# **PART 3 - EXECUTION**

## 3.1 INSTALLATION

- A . General: Provide complete control system design, all computer software and hardware, operator input/output devices, sensors, relays, switches, dampers, actuators, conduit, tubing, wiring, motor starters, transformers, control cabinets, power panel circuit breakers, and all other components required to provide a complete control system with the system features and sequence of operation specified. Select control components with proper characteristics to suit the application, meet specified system performance, provide specified system features, and provide the specified sequence of operation. Coordinate work with other trades. Review as-builts and field conditions for work involving existing systems or replacements of existing systems. Develop as-builts of existing systems as needed to perform the Work. Perform field reviews prior to developing shop drawings.
- B. Room Sensors: Room sensors (i.e. thermostats) shall be mounted at 48" above finished floor, unless indicated otherwise. Thermostats shall control the equipment which affects the temperature serving the space the thermostat is located in, unless indicated otherwise. Not all room sensors are shown on the drawings and those shown are preliminary only. Contractor shall indicate all final room sensor locations on submittal drawings. Contractor is responsible for coordinating locations to avoid chalkboards, tack boards and other interferences.

## C. Electrical Power and Wiring:

- General: All work shall comply with code, Division 26 requirements, and ANSI/TIA standards. Run conduit and wiring in neat lines, parallel with building construction and coordinated with other trades. Use wire type and size as required by code and recommended by component manufacturers and to suit the application conditions.
- 2. Conduit: All wiring shall be installed in conduit and in accordance with Division 26 section of these specifications, except that low voltage wiring within ceiling plenum spaces and in mechanical mezzanine areas may be ran without conduit provided that plenum rated cable is used. Install all conduit and wiring parallel to building lines.

### 3. Electrical Power:

Scope: It is the responsibility of the Division 25 Contractor to provide power for all
control devices requiring electrical power. Coordinate with the Division 26
Contractor to confirm which panels and circuits are to be utilized. Provide all
electrical wiring, conduit, junction boxes, circuit breakers, grounding, panel circuit

- breakers (of proper size/type), transformers, enclosures and all other components as needed to power all control devices.in accordance with code and Division 26 requirements.
- b. Sources: Power for control devices shall be obtained from electrical panels and not from power serving the equipment (unless noted otherwise or the Engineer gives approval). Utilize panels located closest to the items served to the greatest extent possible. Where the building has a generator, equipment served by the generator shall also have their control power (i.e. power to control devices which allow the item to be controlled and monitored) shall also be served by the generator (this is in addition to any required UPS').
- 4. Service Loop: Provide minimum of 6" extra wiring at all wiring terminations for ease of future maintenance/servicing. Such extra wiring shall be neatly coiled/bundled to allow for uncoiling when the connected equipment is serviced.

## D. Equipment Interconnect Wiring:

- General: In addition to control wiring between equipment and control devices (furnished under this Section) to accomplish the specified sequence, provide added control wiring to interconnect equipment components and associated control/safety devices. Provide as required by the equipment manufacturers to allow for proper operation of the equipment and system.
- 2. Minimal Wiring Required: For bidding purposes, assume a minimum of four wiring connections for each piece of equipment to an adjoining/connecting piece of equipment and/or device(s), and special wire type and special connectors as required by the equipment manufacturer. Coordinate and review all requirements with manufacturers, contractor installing the equipment, and local representatives to confirm scope. Field review existing conditions where controls interface with existing components.
- 3. Equipment: This work applies to:
  - a. Split system HVAC Equipment: Connect between indoor and outdoor units, and between the indoor unit and its thermostat.
- E. Labeling: All control components, except regular room thermostats, shall be labeled. All control wiring shall be labeled except where color coded wiring is used and the control shop drawings clearly identifier wiring for each color and it is fully consistent through-out the entire project. Submit list of proposed labeling prior to installing.
- F. Complete Functions: Provide complete system totally programmed to provide all specified functions, including but not limited to:
  - 1. Time and Holiday Schedules.
  - 2. Alarm Limits.
  - 3. Optimum Start of Each Zone.
  - 4. Dynamic Graphic of Each Distinct Floor Area; include graphic key to allow changes in graphic display.
  - 5. Dynamic Graphic of Each Mechanical System; include graphic key to allow changes in graphic display.
  - 6. Summary of All Zone Temperatures.
  - 7. Summary of Data for Each Zone.
  - 8. All Displays Specified in Sequence of Operation.
  - 9. Master Menu and Graphics as requested by the Owner.

- 10. All Controller Setpoints and Operational Values Required.
- 11. Demand Limiting.
- 12. Optimum Start/Stop and Warm-up.
- G . Electrical Phase Loss: Provide all necessary wiring, components, software, and accessories to monitor building electrical power quality and 3-phase power; initiate shutdown of 3-phase powered mechanical equipment on loss of a phase.
- H. On/Off Status Indication: All devices which indicate on/off status to GUI, shall have this on/off status manually or automatically controlled from GUI, and shall have positive proof of on or off by differential pressure switch or other applicable device.
- I. OA Sensors: Provide at least one new OA sensors for this project for energizing, with display at the GUI; use average of two for control purposes. Provide logic to allow disuse of "Bad" OA sensor and indicate alarm.
- J. TUC: To simplify controls and mechanical service and trouble-shooting, the TUC shall be mounted inside a waterproof cabinet on the side of rooftop units. This shall allow all controls maintenance and trouble-shooting to be made while at the unit location.
- K . Programming: Provide complete system totally programmed to provide all specified sequences, monitoring data, communications and features.
- L . CO2 Sensors: Duct mounted type, installed in the return ducts for areas (or units) indicated to have such sensors, except where a wall sensor is indicated on the plans provide a wall mount type. Install where units would be easily accessible for maintenance. Indicate locations on floor plans with submittals.
- M . Signal for Motor Control: For EC motor applications, Contractor shall assume that an analog signal is required to be provided by the control system as a constant reference speed, unless the control sequence requires otherwise. For VFD motor applications, Contractor shall assume that an analog signal is required to be provided by the control system as a variable reference speed, unless the control sequence requires otherwise. In either case, confirm the type of signal with the equipment supplier.
- N. Condensate Overflow: Provide all cooling coils (except not required for exposed AC units) with field installed condensate overflow switches wired to stop unit operation upon detection of a high condensate level and to indicate an alarm at the system graphics.

## 3.2 MONITORING DATA

A . General: Monitoring information shall be provided at graphic user interface. Provide all necessary controls/devices to provide the data indicated. Monitoring data listed is not a "points list" but is a list of items that shall be monitored and is in addition to data (or "points") required by the sequence of operation and other specification requirements. A complete "points list" shall be compiled by the Division 25 Contractor based on all system requirements and sequence.

### B. Exhaust Fans:

- 1. Fan on/off status.
- 2. Fan commanded status (on/off).
- 3. Fan failure alarm; (i.e. not "proven" on when commanded on).

- C. Air Handling Units (all units with fans and ability to heat or cool environmental air):
  - 1. Zone temperature.
  - 2. Zone temperature setpoint.
  - Unit commanded mode (heating/cooling).
  - 4. Supply air temperature off unit.
  - 5. Mixed air temperature at unit.
  - 6. Percent commanded heating or cooling.
  - 7. Override status.
  - 8. Outside air and return damper positions (% commanded open).
  - 9. Fan on/off.
  - 10. FAN COMMANDED POSITION (ON/OFF).
  - 11. Alarm/trouble conditions, shall include as a minimum: freezestat alarm; fan not "proven" on when should be on; heat failure alarm SA temp not warmer than ma and unit is in heating; cooling failure alarm SA not cooler than ma and unit is in cooling; "false" cooling or heating call i.e. Unit calls for heating when OA temperature is above 70 deg F, unit calls for cooling and OA temperature is below 30deg F).
  - 12. CARBON DIOXIDE LEVELS (AS NOTED ON AHU SCHEDULE).
  - 13. VFD COMMANDED PERCENTAGE (FOR UNITS WITH VFD'S).

### D. Water Heater:

- 1. Leaving HW temperature each water heater.
- 2. HWC temperature (at each HWC pump).
- 3. High tank temperature alarm (10 degrees above scheduled tank temperature).
- 4. HW temperature after TMV-1.
- 5. HW temperature from two water heaters.

## E. Circulating Pumps:

- 1. On/Off status (by differential pressure device or flow switch).
- 2. Failure alarm (i.e. not "proven" on when commanded on).
- 3. Variable frequency drive (VFD) commanded position (as applicable).

## F. Miscellaneous:

- Outside Air Temperature (two locations).
- 2. Fire Alarm Status.

## G. Energy Metering:

- 1. Building overall electrical consumption and demand.
- 2. Building overall gas consumption and peak flow rate.

3. Unit Commanded Mode (On/Off).

# 3.3 START-UP

- A . Calibration and Commissioning: As each part of the systems become operational, this Contractor shall calibrate all sensing and readout devices and shall test and observe the operation of each and every air moving and/or heating unit and shall adjust all controls so that the items function according to the intent of the specifications. The control contractor shall commission all controls prior to the work of Section 20 08 00 being done. This commissioning work shall include a point-to-point check of all devices, check of sequences, check of proper wiring, and documentation substantiating the work.
- B . Report/Statement: After making all necessary system testing and adjusting, the Contractor shall submit a report to the Engineer indicating all testing/adjustment work done and comment on how system is operating. Such report shall be signed by the individual directly responsible for supervision of the installation of the control system. When the Contractor feels that the system is complete and ready for review by the Engineer, Contractor shall submit a written statement (signed by same individuals as for report) stating that the system is in compliance with the project requirements and ready for review.
- C. Owner Instruction: See Section 20 05 00.
- D. Start-up Trend Logs: The Contractor shall submit to and review with the Engineer daily for a period of four weeks after substantial completion a hard copy log of the following:
  - 1. Five Owner selected room temperature values at 15 minute intervals.
  - Outside air temperature values at 15 minute intervals.
- E . Warranty Trend Logs: Two months after Owner acceptance of the work, the Contractor shall submit to and review with the Engineer a single tabulated 30 day hard copy printout of the systems historical data containing the following information:
  - 1. Date.
  - 2. Hour by hour zone temperature, for five Owner selected rooms.
  - 3. Hour by hour OA temperature.
- F. Documentation: Contractor shall provide a hard copy documentation of the software application program for each digital controller (TUC, NAC). Documentation provided shall include block software flow chart showing the interconnection between each of the control algorithms and sequences for systems utilizing program listings. A program listing shall be printed onto the same blueprint, along with the program flow chart, and description of the sequence of operation. A hard copy of this document shall be stored and maintained in each stand-alone digital controller panel. System acceptance shall not be completed until this documentation is provided and located in each panel.

## 3.4 ENGINEER REMOTE ACCESS

A . Provide programming and coordination to allow remote access to the control system graphics by the Engineer, accessed from the Engineer's office via a web browser (Google Chrome or similar). Provide separate login/password for Engineer for such access. Contractor shall also provide efforts for setting up Trends and instructing the Engineer in setting up trends. This remote access shall be maintained prior to Substantial completion, through the warranty period.

# 3.5 COMMISSIONING

A . The Products referenced in this section are to be commissioned per Division 01 and Section 20 08 00. The Contractor has specific responsibilities for scheduling, coordination, startup, test, development, testing and documentation. At a minimum, the Contractor shall provide a documented and signed record to verify that all equipment and systems installed under this contract have been inspected and functionally tested to verify full compliance with the contract specifications. In many cases, this shall require the Contractor to create or otherwise provide procedures and checklists for approval by the Commissioning Agent prior to the start of functional testing. Coordinate all commissioning activities with the Commissioning Agent.

**END OF SECTION** 

# PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

## 1.2 WORK INCLUDED

- A. Control System Design.
- B. Control System Sequence of Operation.

## 1.3 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Sequences: Submit complete description of sequence of operation for all systems. Sequence submitted shall not be a direct copy of the sequence specified herein, but shall be written to reflect the actual control sequences provided and to more closely match the actual programming used.
- C. Programming: Submit copy of system programming logic.

### 1.4 GENERAL REQUIREMENTS

- A . Bidder Design: The control system is bidder designed subject to the requirements of the Contract Documents.
- B. Modifications: Software, graphics, and sequences shall be revised and updated as necessary to reflect Owner or Engineer desired changes. Contractor to include in bid no less than 16 hours of control technician's/programmer's time to accomplish the required system modifications.
- C . Sequence Terminology: Wherever the control sequences refer to an article, device or piece of equipment in the singular number, such reference shall mean to include as many of such articles, devices, or equipment as are shown on the plans, required for the sequence, or required to complete the installation. Wherever the control sequence refers to an operating stage in the singular number, such reference shall mean to include as many stages as are specified for the equipment and shall mean analog (i.e. proportional) type control where specified for the equipment (reference drawings and equipment specifications).
- D. All DDC Control: All controls and sequences shall be provided by the Division 25 DDC control system, unless specifically noted otherwise. Where interval timer, switch control, or a similar manual control is indicated, the control device shall provide an input to the DDC system with the DDC system providing an output for control. No line voltage controls or other controls which do not "pass through" the DDC control system are allowed, unless directly stated that is the method of control to be used. Exceptions to DDC Control: emergency shut-down and similar safety devices required (or noted) to be hard wired.

# **PART 2 - PRODUCTS**

NOT USED

## **PART 3 - INSTALLATION**

# 3.1 GENERAL

# A. Complete System:

- 1. General: Provide complete control system design, all software, programming, wiring, and control devices as required to allow for automatic control of all mechanical equipment and other systems as indicated; with sequences of operation and features specified. Provide all control interconnections between indoor and outdoor units, all required control connections between equipment components, and to any other devices needed for proper operation. See also Section 25 50 00 for related requirements.
- Various thermostats, motorized dampers, and other devices are not shown on the drawings but are required per the sequence of operation specified. Coordinate with Engineer for location of all such devices prior to installing. Indicate proposed locations on submittals.

### B. Sequences:

- 1. Additional Sequences: See Section 25 50 00 for system requirements that relate to control sequences; see drawings for additional control sequences and requirements.
- Control Action: Sequences which involve maintaining a setpoint in response to variable conditions shall use proportional-integral (PI) or proportional-integral-derivative (PID) control (unless noted otherwise). Sequences shall comply with the system performance requirements and other requirements of Section 25 50 00.
- 3. Missing Sequences: Where no sequence of operation is indicated submit a proposed sequence to the Engineer for review. Such sequences shall match the intended equipment use, code, and ASHRAE standards for the type of equipment and application. HVAC equipment shall have control of heating/cooling operation by area thermostats and control of unit components (i.e. fans dampers) to allow for distribution of heating/cooling and control of ventilation air; fans and similar on/off items shall have time schedule and thermostat control (unless the application clearly implies a different method).

# C . Settings:

- 1. Adjustability: All settings, setpoints, and differentials shall be adjustable. All setpoints indicated are initial settings.
- 2. Confirm Settings: Confirm with Owner all setpoints, all time schedules, and all other adjustable programming parameters before substantial completion.
- 3. Thermostat Setpoints: Shall be adjustable at operator's workstation, with initial settings as follows unless indicated otherwise:

Occupied Heating 70 degrees F Unoccupied Heating 65 degrees F Occupied Cooling 75 degrees F Unoccupied Cooling 85 degrees F

### D. Time Control:

- Control system shall provide time schedules for occupied/unoccupied mode switching for all items having sequences with occupied/unoccupied modes, and for all items indicted as having time schedule control.
- 2. Provide independent time schedules for all mechanical equipment, except where equipment is indicated to be interlocked to other equipment.
- 3. Provide seasonal (i.e. time of year) control for all mechanical equipment.
- 4. Provide a single Holiday Schedule or Master Holiday schedule for logical equipment groups as directed by the Owner at submittal time and revised by the Owner during the Owner training. At the end of the warranty period readjust the grouping of equipment as directed by the Owner.
- 5. Provide independent optimum start schedules (i.e. warm-up cycles) for mechanical equipment indicated to have (or required to have) optimum start.
- 6. VRF Heat Pump System: Shall operate under its own controls. See Section 23 81 27 for VRF sequences.
- E . Hand-Off-Auto Control: Provide all control devices and connections to allow Hand-Off-Auto (HOA) control of all controlled items; where unit starters or VFD's provide HOA control no additional controls are required, but this Section controls shall be arranged to allow for HOA controls.
- F. Average Thermostats: Where average thermostats are indicated on plans combine and average requirements from each sensor and use these average requirements to control unit. Averaging shall combine the deviation from setpoint from each thermostat and rate of change of this deviation combined to create control values as if they are from a single thermostat to determine control actuation. Each thermostat shall have the same functions as the other. Provide means (at GUI, in single screen command) the ability to select between use of either thermostat.
- G . Variable Speed Operation: On variable speed (including staged) equipment, start equipment low speed (or other appropriate speed as recommended by equipment manufacturer or system requirements) and control speed changes at a rate that is coordinated with other equipment to provide proper system operation without undesirable effects, nuisance trips and system alarms.
- H. Alarms: Provide alarms for the following:
  - 1. Status of item does not equal commanded status (where proof of status is monitored, e.g. supply fan not proven on when commanded on).
  - 2. Equipment in alarm (where equipment alarm state is monitored).
  - 3. System response is not consistent with commanded response (e.g. air handling unit SA temperature is not less than MA temperature and unit is commanded to cooling).
  - 4. Safety device alarm (where device is monitored by or connected to the control system).
  - Space temperature in alarm range (10 deg F or more above cooling setpoint; 10 deg F or more below heating setpoint).
  - Sensor failure (out of range).

## I. Fire/Smoke Shutdown:

1. Smoke Detector: Provide necessary conduit, wiring, and accessories to shutdown each unit upon activation of that unit's smoke detectors. Connections shall be hardwired; independent of any control system logic, so that failure of control system or loss of control system will in no way prevent the shutdown of each unit. In addition to shutting

- down the unit with the alarmed smoke detector, all equipment interlocked or served by that unit shall be off. Other units shall also shut-off as required to avoid building pressure differentials and similar undesirable effects.
- 2. Fire Alarm System: Shut-down all air handling equipment when the building fire alarm system goes into alarm. Contacts in the fire alarm system are available for this purpose. This shut-down may be accomplished by use of control logic and is not required to be hardwired but shall be of a fail-safe nature so as to provide the necessary shut-down in case of control failure and the control components shall be rated for such purposes (as required by the AHJ).

#### J. Automatic Restart:

- General: Equipment shall automatically restart after being shut-off by a power outage, fire alarm, smoke detector, or similar alarm (or fault); upon clearing of the alarm (or fault). System shall revert to its normal operation for the conditions at the time of restarting.
- 2. Controlled Restart: Provide controlled re-start by building wing or building floor and in a manner to prevent pressure differentials, equipment issues, or other undesirable effects. Provide time delay on the re-start of equipment 2.5 KW and larger to minimize electrical surges.
- K. Interlocks: May be accomplished by software rather than field hard wired relays or other devices, except for: fire alarm shut-down of equipment 2000 cfm and greater, freezestat shutdown, boiler and chiller emergency shut-off switches, where required by manufactures, where required by AHJ, and where noted to be hard-wired.

#### 3.2 VRF SYSTEM - SEQUENCE OF OPERATION

- A. Heat Pumps: See Section 23 81 27.
- B. DOAS ERV Units: See below.
- C . ERV Outside Air and Exhaust Dampers: See below.
- D . VRF Off/Auto: Provide output to VRF controls to enable (in auto) or disable (off) the VRF system.
- E. OA/Relief Damper serving DOAS HRUs: Shall open when the system is in the occupied mode, and shall close when the system is in the unoccupied mode.
- F. DDC system shall provide interface to allow reset of temperature setpoint, occupied/unoccupied schedule, and VRF system alarms at the campus facilities office.

## 3.3 DOAS ERV UNITS

- A . General: VRF controls (See Section 23 8127) shall provide time schedule control of the Energy Recovery Unit (ERV) in conjunction with the heat pump units. ERV mode shall match the mode for the VRF system served, except that when any heat pump (served by the ERV) is in the occupied mode, the ERV shall be on in the occupied mode.
- B. Occupied Mode:
  - 1. Fans: Supply and exhaust fans are on.
  - 2. Outside Air and Exhaust Air Dampers: 100% open.

- 3. Bypass Damper and Economizer: The bypass damper shall be closed (to allow energy recovery) unless: the outside air temperature is above 60 deg F (adjustable) and is lower than the exhaust air temperature and the majority of areas served by the ERU are in cooling then the outside air bypass damper shall be activated so that outside air bypasses the energy recovery coil (for economizer cooling).
- C. Unoccupied Mode: Unit shall be off. OA/EA Dampers shall be closed.
- D. Warm-Up Mode: Unit shall be off. OA/EA Dampers shall be closed.
- E . Frost Control: Controlled by ERV integral controls. When the exhaust air temperature drops below the frost control setpoint (initial setting 35 deg F), the outside air damper shall bypass the energy recovery coil to prevent frost buildup due to freezing condensate.

#### 3.4 FANS

- A. General: See "Control" column on Fan Schedule for which of the following control method is required. See notes on plans for control of fans not listed below and other requirements. Where interval timer, switch control, or a similar manual control is indicated, the control device shall provide an input to the DDC system with the DDC system providing an output for control. No line voltage controls or other controls which do not "pass through" the DDC control system are allowed, unless directly stated that is the method of control to be used.
- B. Wall Switch: Fan shall be controlled by on/off wall switch. Fan shall be on when switch is in the on position, and be off otherwise.
- C . Interval Timer: Fan shall be controlled by interval timer, to be on when timer is activated and off otherwise.
- D. Time Schedule: Fan shall run from time schedule.
- E. Time Schedule and Interval Timer: Fan shall run in low speed via time schedule, and operate in high speed when interval timer is activated (regardless of time schedule).
- F. Dampers: Motorized Dampers at Exhaust Fans shall open when fans runs and shall be closed otherwise.

#### 3.5 ELECTRIC HEATERS – DUCT TYPE

- A . General: Heater shall be controlled by a space thermostat to provide heating to satisfy space conditions.
- B. Operation, SCR Heaters: Provide proportional control of heater to vary heater output to provide 72°F (adjustable) discharge air temperature.
- C . Interlock: Shall be hard-wire interlocked with the supply fan on the unit which serves the heater, to only allow heater operation when the unit's fan is proven on. Provide differential pressure switch or CT's at unit fan to provide interlock and proof of operation.

#### 3.6 PUMPS

A . Domestic HW Circulation Pumps: Pump shall be enabled to operate by time schedule. When enabled, pump shall be controlled in conjunction with a sensor in the hot water recirculation line. When HWC falls to 5 degrees F below setpoint, the pump shall run; when

temperature returns to setpoint, pump shall be off. Setpoint and differential shall be adjustable. Initial setpoint shall be 5 degrees less than domestic hot water setting for system used on.

B. Sump Pumps: Sump Pumps shall operate via controls provided with pumps. Provide high high level alarm monitoring by DDC.

# 3.7 ZONE DAMPERS

- A. General: Damper shall be controlled by a wall mounted thermostat to vary the air volume supplied to the zone to satisfy space conditions. Airflow shall vary from damper maximum and minimum positions: coordinate with balancer for settings.
- B. Changeover: A changeover supply air duct temperature sensor shall be provided to reverse damper operation to allow proper control depending on whether the unit supplying the zone damper is in heating or in cooling. Changeover to "Unit in Heating" mode shall occur whenever the supply air temperature is 3 degrees above room temperature; changeover back to "Unit in Cooling" mode shall occur whenever the supply air temperature is below room temperature.

# C. Occupied Mode:

- Unit in Cooling: When the unit serving the zone damper is in cooling and the zone temperature rises, the air volume to the zone shall increase to maintain the zone setpoint. As the zone temperature falls, the air volume to the zone shall decrease to maintain the zone setpoint.
- 2. Unit in Heating: When the unit serving the zone damper is in heating the zone damper operation shall be reversed from when the unit is in cooling. As the zone temperature rises, the air volume to the zone shall decrease to maintain the zone setpoint. As the zone temperature falls, the air volume to the zone shall increase to maintain the zone setpoint.
- D. Unoccupied Mode: Same as for occupied.
- E. Warm-Up Mode: Same as for occupied.

#### 3.8 DOMESTIC WATER HEATERS

A . High Temperature Shutdown: Provide water heaters with hard wired high temperature shutdown safety, which will stop water heater operation and alarm at EMCS; set initially for 10 degrees F above water heater setpoint.

# 3.9 MISCELLANEOUS

A . Miscellaneous Dampers/Devices: See plans for other dampers and devices requiring control. Provide control indicated. Where control is not indicated provide standard sequence typical for such devices in similar projects/applications.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 0 and 1 Specification Sections, apply to this Section.

#### 1.2 WORK INCLUDED

- A. Perform tests of the electrical system to ensure code compliance and proper system operation according to the intent of the contract documents. Retain the services of approved testing agency(s) to comply with the ground fault protection systems requirements of this section.
- B. Applicable Codes, Standards & References for Tests:

All inspections and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.

- 1. National Electrical Code NEC
- 2. National Electrical Manufacturer's Association NEMA
- 3. American Society for Testing and Materials ASTM
- 4. Institute of Electrical and Electronic Engineers IEEE
- 5. National Electrical Testing Association NETA
- 6. American National Standards Institute ANSI
- 7. State and Local Codes and Ordinances
- 8. Insulated Cable Engineers Associate ICEA
- 9. Association of Edison Illuminating Companies AEIC

#### 1.3 CIRCUIT TESTS

- A. The Contractor shall perform routine insulation resistance, continuity and grounding tests for all distribution and utilization equipment prior to their connection and energization. A standard megger-type instrument shall be used to demonstrate that insulation values are acceptable, ground system is continuous, and the neutral system is isolated from the grounding system except at the systems' single ground point.
- B. System defects, indicated by the circuit tests, shall be corrected. Tests shall be repeated until satisfactory results are obtained.

## 1.4 GROUNDING TEST

- A. Measure the ohmic value of the Electrical Service Entrance "System Ground" with reference to "Earth Ground" using multiple terminal, fall of potential methods and suitable test instruments.
- B. Maximum resistance to ground shall be less than 10 ohms unless lower values are specified in the contract documents. Notify the Architect/Engineer if this resistance value is not obtained for the initially installed system; and then provide corrective measures required to

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reduce ground resistance to less than 10 ohms.

#### 1.5 MOTOR AND EQUIPMENT TESTS

- A. Verify proper rotation of all motors before placing into service.
- B. Measure and record electrical data for each motor installed under this contract. Data shall include these items:
  - 1. Motor description
  - 2. Controller description
  - 3. Motor nameplate amperes
  - 4. Actual measured motor running amperes
  - 5. Overload heater manufacturer and catalog numbers
  - 6. Overload heater ampere range
  - 7. Voltage (measured) and phase
- C. Motor controller overload heaters shall be sized to the actual motor nameplate full load current: do not oversize overload heaters.

#### 1.6 PHASE BALANCE TESTS

A. Verify the balance of the electrical system's phase currents. Reassign load connections if necessary, to obtain a balance is acceptable to the Engineer.

#### 1.7 ARC FLASH AND PERSONNEL PROTECTIVE EQUIPMENT (NEC 110-16)

A. Contractor shall prepare an arc flash and Personnel Protective Equipment study. Contractor shall provide labeling of the electrical equipment within the facility. All labels shall have a permanent marked date of the label installation per National Electrical Code requirements.

#### 1.8 SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDY

A. Contractor shall prepare a short circuit and protective device coordination study of the electrical equipment within the facility per National Electrical Code requirements.

#### **PART 2 - PRODUCTS**

# 2.1 MATERIALS AND INSTRUMENTATION

- A. Contractor and/or testing agency shall supply all apparatus and materials required for indicated tests.
- B. Contractor shall include all costs associated with testing in bid proposal.

# 2.2 TEST REPORT(S)

- A. Furnish electronic PDF copy of test reports, as specified herein, for inclusion into the project operation and maintenance manuals. Each test report shall include the following items:
  - 1. Name, address and telephone number of the testing agency.

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- 2. Name(s) of personnel conducting the tests
- 3. Type of test
- 4. Description of test procedure
- 5. List of items tested
- 6. List of actual test equipment including make, model(s), serial number(s) and calibration date(s) as applicable.
- 7. Test results
- 8. Conclusion and recommendations
- 9. Appendix, including appropriate test forms

#### **PART 3 - EXECUTION**

# 3.1 TESTING PROCEDURE

- A. Submit a copy of test procedure(s) to the Engineer prior to testing.
- B. All tests shall be conducted according to applicable industry standards.

# 3.2 SCHEDULING

A. Notify Architect/Engineer and Owner at least five (5) working days prior to performance of any test.

**END OF SECTION** 

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# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

#### 1.2 GENERAL CONDITIONS

- A. Bidding documents including Division 1 General Conditions, Supplementary General Conditions, Published Addenda and related work in other Divisions form an integral part of these Specifications and shall be binding on the Division 26 Contractor for all work performed under Division 26, Electrical.
- B. General requirements for materials and installation methods.

#### 1.3 DEFINITIONS

- A. The term "provide" shall mean furnish, install and connect equipment and materials complete in operating condition.
- B. The term "approved" as used herein shall mean the written approval of the Engineer.
- C. The term "Contractor" as used herein shall mean the organization responsible for accomplishing all work within the contract documents. The plural term "contractors" as used herein shall include all of the trade organizations that comprise the project workforce.
- The term "drawings" as used herein shall mean all contract drawings for all divisions of work.
- E. NEC means National Electrical Code.
- F. The term "code" as used herein shall mean all applicable National, State and local codes.

#### 1.4 SCOPE OF WORK

- A. The Electrical work consists of furnishing, installing, testing and placing in satisfactory operation all equipment, materials, devices and appurtenances, necessary to provide complete systems according to the intent of the Drawings and Specifications. In general, this includes all labor, materials, equipment, tools, etc. to complete the electrical work.
- B. Electrical requirements are not limited to electrical drawings and specifications. There is additional electrical work required to be included in the bid, indicated on the architectural, structural, landscape, civil, kitchen and mechanical drawings. Additional electrical work required in the bid is also located in the specifications. Contractor shall review all architectural, structural, landscape, civil, kitchen and mechanical, drawings and specifications for additional electrical requirements and information.

# 1.5 INTENT OF DRAWINGS

A. The Electrical drawings are intended to serve as working drawings for general layout. Equipment, receptacles, tele/data, switches, panels, lights, disconnects and raceways are partially diagrammatic and do not necessarily indicate actual routings or all appurtenances

required for a complete installation.

- B. The drawings and specifications are complementary. What is called for in either is binding as if called for in both. In case of conflict within the drawings, specifications or between drawings and specifications the Architect/Engineer will select the method to be taken.
- C. Take all working dimensions, device heights, door swings and the like from architectural drawings and check them against those shown or scaled on the electrical drawings. In the event of conflict, report discrepancies to the Architect/Engineer for resolution before proceeding with the work.
- D. Minor changes in the locations of raceways, devices and the like, from those shown on the plans, shall be made without extra charge if so, directed by the Architect/ Engineer before installation.
- E. Motor horsepower and apparatus wattages indicated on the plans are estimated requirements of equipment furnished under other Divisions of this contract. Advise the Architect/Engineer in writing of any deviations in actual equipment supplied that affect the electrical installation.

#### 1.6 MANUFACTURERS' RECOMMENDATIONS

A. Make all installations in strict accordance with manufacturers' published recommendations and details. All equipment and materials recommended by them shall be considered as part of this contract.

# 1.7 WORK RELATED TO OTHER DIVISIONS

#### A. TEMPORARY CONSTRUCTION POWER AND LIGHTING

- 1. Contractor is responsible for all costs associated with removal of the temporary construction service meter.
- Provide, maintain and remove, when no longer required, temporary electrical
  construction wiring from the construction service meter to and within the building for the
  number of lights and receptacles required. Wiring to construction sheds, outdoor
  construction machinery, and temporary exterior work areas shall be the responsibility of
  individual contractors.
- Provide and maintain construction lighting with portable wiring and temporary energization of the permanent building wiring, complete with lamps. Suitable construction lighting shall be provided in each room where lighting is required for any of the contractors on the job. See NEC ARTICLE 305. Temporary wiring.
- 4. Contractor is responsible for re-lamping construction lighting after the initial lamping.
- 5. Provide adequate feeders, circuit breakers and duplex 15-ampere 120-volt receptacles at locations as required. Note: 120 volt construction receptacles shall provide Ground Fault circuit protection in accordance with applicable WISHA safety standards.
- 6. Portable power cords from the outlets specified herein shall be the responsibility of individual contractors using the cords.
- 7. Responsibilities outlined in the Paragraph Temporary Construction Power and Lighting are delineated herein to avoid conflicts between the various contractors. Assume all responsibility for safety, Electrical and Safety Code compliance, performance and adequacy of the construction power and lighting installation. The Architect and Engineer assumes no responsibility for the performance or safety and will not inspect nor design this temporary installation as it is not part of the completed structure.

#### B. MECHANICAL CONTROL WIRING

1. See Division 23.

#### C. EQUIPMENT FURNISHED BY OTHERS

- All electrical equipment furnished for this project shall be coordinated with the drawings
  to insure correctness of Voltage, Phase and Ampacity. Equipment served by single
  circuit or feeder shall be provided with appropriate internal wiring including fusing of
  multiple circuits as required by code.
- 2. Contractors supplying equipment incompatible with the designed electrical service shall be responsible for arranging and providing necessary changes in their supply wiring to suit the equipment.
- Verify dimensions of equipment to be furnished by others to insure correct clearances and connections.
- 4. Control Voltages shall not exceed 120 volts. Provide control transformers for higher line voltages. Control transformers shall be connected from phase to neutral.

## 1.8 SUPERVISION AND COORDINATION

- A. Coordinate work with local power, telephone, cable and data utilities to ensure compliance with their specific requirements. Before starting work, contact both power and telephone utilities and make arrangements for their services to this project.
- B. Contact Electrical Inspection and obtain a permit before starting work. Electrical plans have been submitted for plans review and will be available with payment for electrical permit.
- C. Maintain adequate supervision of Division 26 work and have a responsible person in charge at the site any time work is in progress or when necessary for coordination with other trades.
- D. Schedule work to best serve the interests of the Owner. Lay out work by referring to Civil, Landscape, Architectural, Structural, Mechanical and other Contractors to anticipate their movements. Cooperate with the other contractors on the job and coordinate work to avoid interference with them.
- E. Determine a satisfactory space allocation arrangement where electrical material is installed in proximity to work of other trades. No extra payments will be allowed to relocate work that interferes with that of other trades.

### 1.9 CODES AND REGULATIONS

A. All work shall conform to current applicable National, State and local Codes; these shall be regarded as the minimum standard of quality for material and workmanship. Contractor shall provide all Labor and Material that may be required for compliance with Code Requirements or Code Interpretations, although not specifically detailed on the Drawings or in the Specifications. Contractor shall become familiar with all the following codes prior to bidding.

ASTM American Society for Testing and Materials

NBFU National Board of Fire Underwriters

NEC National Electrical Code

WAC Washinton State Administrative Code

NESC National Electrical Safety Code

NEMA National Electric Manufacturers Association

NFPA National Fire Protection Association

UL Underriters Laboratories, Inc.

ICEA Insulated Cable Engineers Associations

CBM Certified Ballast Manufacturers

ETL Electrical Testing Laboratories

IFC International Fire Code

IBC International Building Code

- B. Nothing in these Drawings and Specifications shall be construed as permitting work not conforming with governing codes.
- C. The Contractor shall not be relieved from complying with any requirements of these contract documents which may exceed, but not conflict with, requirements of the governing codes.
- D. Contractor shall include in bid all costs to have a Department of Labor & Industries approved firm to evaluate the installation safety, and compliance with code as required per WAC 296-40-100 for any equipment specified or furnished that is not UL labeled.
- E. For equipment furnished by others that is not UL labeled the contractor shall not connect the equipment to the electrical system until receiving written approval by the electrical authority having jurisdiction.

### 1.10 PERMITS & FEES

A. Obtain and pay all fees for licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work and provide inspectors with all necessary assistance.

## 1.11 WORKMANSHIP

A. All work shall be done by competent craftsmen skilled in the specific work to be done. Equipment shall be installed in a neat and workmanlike manner following the best practice of the trade.

#### 1.12 ITEMIZED COST BREAKDOWN

A. Furnish the Engineer with an itemized contract cost breakdown to allow evaluation of partial payment requests. The cost breakdown shall categorize major items of the contract such as: Job organization and setup, conduit system, primary switchgear, transformers, secondary panel gear, service and feeder wiring, branch circuit wiring, lighting fixtures, wiring devices, trim, fire alarm and special systems.

#### 1.13 OPERATING INSTRUCTIONS

- A. Fully instruct the Owner's designated representatives in the operation and maintenance of all components of the electrical system upon completion of the work and after all tests and final inspection(s) by the Authority(s) Having Jurisdiction.
- B. All costs for contractor's instruction are to be included in the bid proposal. These costs are in addition to contractors' costs for commissioning.

- C. Instructors shall be contractor's superintendents or foremen knowledgeable in each system and equipment suppliers' representatives for special systems.
- D. Refer to Section 01 77 00 Closeout Procedures.

#### 1.14 AS-BUILT RECORD DRAWINGS

- A. Continuously maintain a set of AS-Built Drawings to indicate all significant deviations from the original design and the actual placement of equipment and underground conduits. (Location of conduit stubouts shall be dimensioned from accepted reference lines). Changes shall be shown with red colored pencil while work is in progress. This "As-Built" set shall be clearly marked: "AS-BUILT RECORD DRAWINGS - Do Not Remove From Office."
- B. Quarterly "As-Built" review refer to 01 77 00 Closeout Procedures.
- C. "As-Built Record Drawings" and "Corrected to As-Built" prints shall be delivered to the Engineer for transmittal to the Owner.
- 1.15 ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE (O&M) MANUALS
  - A. Refer to Section 01 77 00 Closeout Procedures.
- 1.16 FINAL INSPECTION
  - A. Refer to Section 01 77 00 Closeout Procedures.
- 1.17 FINAL ACCEPTANCE
  - A. Refer to Section 01 77 00 Closeout Procedures.
- 1.18 GUARANTEE
  - A. The Division 26 Contractor shall provide written guarantee to repair or replace (without additional expense) any defective materials or workmanship which become evident within a period of one (1) year after final acceptance or for such longer period as elsewhere specified. All warranty work shall be to the satisfaction of the Owner.
  - B. Any material guaranteed by a specific manufacturer for a period in excess of two (2) years shall be specifically noted on the Owner's written guarantee.
  - C. The Division 26 Contractor will not be expected to perform normal maintenance, such as replacement of incandescent lamps, etc., 60 days beyond date of Beneficial Occupancy by Owner or Final Acceptance, whichever date is earlier.
  - D. Refer to Section 017700 Closeout Procedures.

# **PART 2 - PRODUCTS**

#### 2.1 GENERAL

A. All materials shall be new, free from defects, of the quality specified herein and on the drawings. Materials shall be designed to ensure satisfactory operation and rated life in the prevailing environmental conditions where they are being installed. They shall be listed by Underwriter's Laboratories or a recognized testing laboratory for use under these conditions.

B. Each type of material shall be of the same make and quality throughout the job. The materials furnished shall be the latest standard design products of manufacturers regularly engaged in their production.

#### 2.2 TECHNICAL DATA

A. Technical information contained herein relies entirely on tests and ratings provided by manufacturers who are solely responsible for their accuracy. The Engineer, by use of this information in no way implies the results of published manufacturer's information has been verified.

## 2.3 AS SPECIFIED EQUIPMENT

A. This specification generally lists only one make and model number for each item of equipment or material required for the project. This is not intended to be restrictive but is intended to indicate the standard of quality, design and features required. In addition, the listed product is the basis of the design regarding physical size, electrical power requirements and performance. The product so identified is designated "as specified."

#### 2.4 SUBSTITUTION OF MATERIALS

A. Listing of approved materials is not intended to prevent acceptance of other materials provided the substitute products are submitted for approval and have been approved in accordance with the Substitution of Materials requirements.

#### B. Approval Prior to Installation

- 1. All substitution requests shall be made on the substitution request form.
- 2. The Contractor shall be responsible for a substitute item suiting the space limitations shown and for any additional installation costs incurred by the substitution.
- 3. Approval of substitute materials shall not be construed as authorizing any deviation from the contract drawings and specifications except where such deviation is clearly described in writing on the substitution request form and is approved in writing by the Engineer.
- 4. Requests shall clearly define and describe the proposed substitute product. Such requests shall be accompanied by samples, record of performance, certified test reports and such additional information as the Engineer may require to satisfactorily evaluate the substitute product(s).

#### C. Approval Prior to Bid Opening

- Bidders or vendors may submit prior approval requests for substitute materials that are similar in appearance, quality and performance to those specified herein or on the drawings.
- 2. All requests shall be made in writing at least ten (10) days prior to date of bid opening using the substitution request form. Telephone requests and written requests for approval received in the engineer's office less than ten (10) days prior to bid opening will not be accepted.
- 3. Approved substitute materials will normally be included in addenda published prior to bid opening.
- D. Approval After Contract Award: Substitute products will be considered after contract award only under these conditions:
- 1. Non-Availability of Specified Materials: The Contractor shall have placed orders for Project # 22006 26 05 00 6

specified materials within ten days after notice to proceed and received written confirmation of non-availability from the supplier(s). The reason of non-availability shall be beyond the contractor's control such as: discontinuation of manufacture, strikes and acts of God.

- Contract Price Adjustments: The Contractor may submit substitution requests for Owner cost savings. All substitute request forms submitted after award of contract shall clearly indicate the proposed contract price change or the request will not be considered.
- Where Permitted in the Specifications: For items where "approval prior to bidding" is not required in these specifications. It shall be the contractors' responsibility to show that a substitute item is equal or superior in performance and quality to the specified item.

#### E. No Substitute:

1. It is the intent of this specification to require specific materials to be compatible with the existing installation. Certain materials and systems, consequently, are indicated "No Substitute" and shall be provided as specified.

#### 2.5 COMPLETE SYSTEMS

A. All systems specified herein and shown on the drawings shall be complete and operational in every detail. Mention of certain materials in bidding documents shall not be construed as releasing the Contractor from furnishing such additional materials and performing all labor required to provide a complete and operable system.

## 2.6 SUBMITTALS

#### A. Purpose of Submittals

- Submittals processed by the Engineer are not change orders. The Contractor, by the submittal process, demonstrates an understanding of the design concept by indicating equipment and materials intended to be provided and fabrication/installation methods intended to be utilized to meet all requirements of the contract documents.
- 2. The Engineer's review is for general conformance with the design concept and the contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the contract documents.
- B. Submittal items: Submittals shall include, but not be limited to the following items:

Raceways Protective Device Coordination Study

Wiring Devices Arc Flash and PPE Study

Disconnects Short Circuit Study

Lighting Fixtures Switchboard and Panels with Coordination Study

Time Switch Splicing Kits

Nameplates Labels

Wires and Cables Fuses Pre-cast Concrete Handholes/Covers

Fused Disconnects Items Requested by Engineer

#### C. Submittal Format

1. A transmittal letter with reference identification (i.e., Electrical Submittal No. 1, material

lists and catalog data, etc.) shall accompany all submittals.

- 2. Provide electronic PDF copy of each submittal items.
- 3. All information contained in the electronic PDF shall be grouped by specification sections.

#### D. Submittal Completeness

- The Contractor shall make every effort to ensure the completeness of the initial submittal. Availability of certain shop drawings and catalog materials, however, may prevent this. Submittal shall not be delayed past specified time periods to await delivery of the missing items. The Contractor, instead, shall identify missing items on the transmittal letter and provide index listings and divider tabs for later insertion of these materials into the completed submittal brochure.
- E. Engineer's Selection of Materials for Installation: The Engineer may select specified items that the Contractor shall provide, without change in contract price or time of completeness, under these circumstances:
  - 1. Late and/or Unqualified Partial Submittals: Submittals must be made within the specified time periods; all partial submittals shall indicate manufacturer(s) catalog numbers, pertinent technical information and status of missing items.
  - 2. Failure to follow Re-submittal Procedures: Contractor, within 14 days after the Engineer rejects any items, shall re-submit new materials for approval.
  - 3. Materials have been submitted and rejected twice by the Engineer.
- F. Contractor's Responsibilities: The Contractor is responsible for all submittal details, accuracy of quantities and dimensions, selection of fabrication processes and techniques of assembly.
  - 1. The Contractor shall furnish equipment/material suppliers with all Drawings and Specifications pertinent to their work.
  - The Contractor shall review, stamp and sign all submittals and shop drawings, prior to submitting shop drawings to the Engineer for review. Contractor shall correct them to ensure compliance with the specifications and drawings. Obtain Engineer's written approval before manufacture is started on any special equipment.
  - 3. Deviation from Shop Drawings in fabrication and/or installation of equipment is not permitted unless proposed changes are clearly noted in writing by the Contractor and approved in writing by the Architect/Engineer at the time of submittal.
  - 4. Maintain at least one complete approved submittal brochure on the jobsite for reference during construction.

#### 2.7 ELECTRICAL EQUIPMENT IDENTIFICATION

- A. General: These items shall be provided with nameplates:
  - 1. All motors, motor starters, pushbutton stations, control panels and time switches.
  - 2. Disconnect switches, switchboards, panelboards, time clocks, low voltage control panels and circuit breakers, contactors, and relays in separate enclosures.
  - 3. Wall switches controlling receptacles, lighting fixtures or equipment where the receptacles are not located within sight of the controlling switch.

4. Special systems shall be properly identified at outlets, junction and pull boxes, terminal cabinets and equipment racks.

# B. Nameplate Inscription

- All nameplates shall adequately describe the function or operation of the identified equipment as required.
- 2. Panelboard and Switchgear nameplates shall include equipment designation, voltage and phase of supply, i.e., Panel A, 208/120V, 3 phase, 4 wire.
- 3. Nameplate designations shall be consistent for all components of a particular piece of equipment, such as starter, disconnect switch, Push Button control station(s) and the like.
- 4. Contractor shall submit a complete list of nameplates for approval.

## C. Nameplate Construction

- 1. Nameplates shall be laminated phenolic plastic with minimum 3/16" high black engraved characters on white background (alternate background colors shall be provided as noted in the specifications or drawings for special applications).
- 2. Nameplates shall be securely fastened to the equipment with No. 4 round-head phillips, cadmium plated steel, self-tapping screws. Contact cement adhesive only is not acceptable.
- Motor nameplates may be non-ferrous die-stamped metal, minimum 0.03 inch thick, in lieu of separate phenolic nameplate. Device plates may be identified by engraving directly on the plate. All engraved or stamped lettering shall be filled with contrasting enamel.

#### **PART 3 - EXECUTION**

## 3.1 PROTECTION OF WORK

- A. Protect all work, wire, cable, materials and equipment installed under this division against damage by other trades, weather conditions or any other causes. Equipment found damaged or in other than new condition will be rejected as defective.
- B. Switchgear, panels, light fixtures and electrical equipment shall be kept covered or enclosed to exclude moisture, dust, dirt, plaster, cement, or paint and shall be free of all such contamination before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches or other finish defects. Properly refinish in a manner acceptable to the Engineer if damaged.
- C. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete or foreign objects. Raceways shall be clean and dry before installation of wire and at the time of acceptance.
- D. Make up and insulate wiring promptly after installation of conductors. Wire shall not be pulled-in until raceways are complete, all bushings are installed, and raceway terminations are completed. Wire shall not be pulled into conduit embedded in concrete until after the concrete is placed and forms are removed.

#### 3.2 CUTTING AND PATCHING

- A. Obtain permission from the Architect/Engineer prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills or saws except where space limitations prevent the use of such equipment.
- B. Penetrations of fire rated elements shall be carefully made to maintain that rating after the installation is complete. See Section 01 3100 and Section 07 8400.
- C. All construction materials damaged or cut into during the installation of Division 26 work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

#### 3.3 EXCAVATIONS

- A. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the underground locate line at 1-800-424-5555 a minimum of 48 hours prior to any excavation. The contractor will also be responsible for maintaining all locate marks once the utilities have been located.
- B. All excavations are to be so conducted that no walls or footings shall be disturbed or injured in any way.
- C. Remove all surplus earth not needed for backfilling and dispose of same as appropriate at a licensed disposal facility.

# 3.4 PAINTING

- A. Painting in general will be covered under another Division of this specification. Items furnished under this Division scratched or marred in shipment or installation are to be refinished by the Contractor to the satisfaction of the Engineer.
- B. Junction boxes for telecom shall be painted blue. Fire alarm junction boxes shall be painted red.

# 3.5 CLEAN UP

A. Contractor shall continually remove debris, cuttings, crates, cartons, etc., created by his work. Such clean up shall be done at sufficient frequency to minimum hazard to the public, other workmen, the building and the Owner's employees. Before acceptance of the installation, Contractor shall carefully clean cabinets, panels, wiring devices, coverplates, etc., to remove dirt, cuttings, paint, plaster, mortar, concrete, etc. Blemishes to finished surfaces or apparatus shall be removed and new finish equal to the original applies.

# 3.6 LABELING

- A. Clearly and properly label the complete electrical system, as specified herein, to indicate the loads served or the function of each item of equipment connected under this contract.
- B. Control circuits shall utilize combinations of colors with each conductor identified throughout using wrap around numbers or letters. Identification shall be consistent with the contract drawing requirements and operation and maintenance shop drawings.

Labels shall be provided on all disconnects, combination motor starter, and junction boxes indicating the specific panel and branch circuit utilized. Do not provide circuiting labels on light switch and receptacle cover plates

#### MECHANICAL EQUIPMENT CONNECTIONS 3.7

- Provide complete electrical connections for all items of equipment, including incidental A. wiring, materials, devices and labor necessary for a finished working installation.
- B. Mechanical/Electrical equipment connection coordination shall be as follows:

FURNISHED ITEM	INSTALLED BY	POWER BY	CONTROL WIRING BY	WIRING BY	
Mechanical Equipment Motors	MC	MC	EC	MC	
Fused & Unfused Disconnect Switches, Thermal Overload & Heaters	EC	EC	EC		
Motor Starter & Overload Heaters	EC	EC	EC	MC	
Manual Operating & Speed Switches	MC	EC	EC	MC	
Control Relays & Control Transformers	MC	MC	EC**	MC	
Low Voltage Thermostats	MC	MC	EC**	MC	
Temperature Control Panels	MC	MC	EC**	MC	
DDC Panels	MC	MC	EC**	MC	
Motor & Solenoid Valves, Damper Motors, PE & EP Switches	MC	MC		MC	
Fire/Smoke Dampers (Actuators)	MC	MC	EC***	MC/EC*	
Duct-Mounted Smoke Detectors	EC	MC		MC/EC*	
MC = Division 23					

EC = Division 26

<sup>\*</sup> Motor interlock by MC, Fire Alarm System Interconnection by EC.

- \*\* EC shall provide conduit and wire from nearest un-switched 120V circuit location. Label on "as built" drawings.
- \*\*\* EC shall provide conduit and wire from nearest 120V panel. Connect to spare circuit breaker and label on "as-built" drawings.

#### 3.8 SUPPORT AND ALIGNMENT

- A. Each fastening device and support for electrical equipment, fixtures, panels, outlets and cabinets shall be capable of supporting not less than four times the ultimate weight of the objects fastened to or suspended from the building structure.
- B. Install panels, cabinets and equipment level, plumb, and parallel with structural building lines. Switchgear, panels and all electrical enclosures shall fit neatly without gaps, openings or distortion. Properly and neatly close all unused openings with approved devices.
- C. Fit surface panels, devices and receptacles with neat, appropriate trims, plates or covers, (without over-hanging edges, protruding corners or raw edges) to leave a finished appearance.
- D. All junction boxes, pull boxes or other conduit terminating housings located above a suspended ceiling shall be securely suspended from structure or ceiling grid system to prevent sagging or swaying.

#### 3.9 NOISE CONTROL

- A. Back-to-back or straight-through installation of wall or partition boxes is not permitted to minimize noise transmission between occupied spaces.
- B. Contactors, transformers, starters and similar noise producing devices shall not be placed on walls which are common to occupied spaces. Where such devices must be mounted on walls common to occupied spaces, they shall be shock mounted or isolated in such a manner as to effectively prevent the transmission of their inherent noise to the occupied space.
- C. Ballasts, contactors, starters, transformers and like equipment which are found to be noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced.

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

#### 1.2 WORK INCLUDED

A. Provide all wire, cable and terminations for a complete installation.

# PART 2 - PRODUCTS

## 2.1 PACKAGING

A. Conductors shall be delivered to the job site in approved original cartons, or on reels as recommended by the manufacturer, and shall bear the Underwriter's Label. Reels shall be provided with suitable protection to prevent fork-lift damage to conductors during shipment or storage prior to use.

#### 2.2 SPECIALIZED CONDUCTORS

A. Conductors for specialized systems shall be as recommended by the equipment manufacturer.

#### 2.3 CONDUCTORS - 600 VOLTS

- A. Stranded copper, insulated for 600 volts. For long runs provide 90 degree rated wire as identified on drawings.
- B. Insulation types THW, THHN, THWN, XHHW, RHH, RHW, or as required to suit installation conditions.
- C. Thru wiring in fluorescent fixtures shall be rated for 90 degree C minimum.

### 2.4 CONNECTORS - 600 Volts

- A. Branch circuit conductor splices: Pre-insulated "twist-on" type or "crimped-on" type as approved (Scotch-lok, Ideal or equal).
- B. Cable Splices: Split-bolt or tool applied sleeves with pre-formed insulated cover, heat shrinkable tubing or approved plastic insulating tape.
- C. Terminator lugs of No. 12 wire and smaller: Spade, insulated type to be tool applied.
- D. Terminator lugs for No. 10 wire or larger: Two bolt (or approved positive restraint), tool applied compression type (Burndy or equal).

#### 2.5 INSULATING MATERIALS

A. Insulating tape or heat shrink tubing shall have the equivalent rating of the applicable conductor insulation (Scotch 3M, RAYCHEM or equal).

# 2.6 PLASTIC CABLE TIES

A. Nylon, or equivalent, locking type (T&B or equal).

#### 2.7 METAL CLAD CABLE

A. Metal clad cable is an acceptable wiring method instead of EMT conduit and wire for lighting and receptacle branch circuits. Metal clad cable is not acceptable from the homerun junction box back to the panel for lighting and receptacle circuits.

#### **PART 3 - EXECUTION**

- 3.1 GENERAL
  - A. Install all wiring in raceway.
- 3.2 MINIMUM WIRE SIZE

Lighting and Power System ...... No. 12 AWG

Fixture Wire ...... No. 14 AWG

Wiring in Fixture Troughs ...... No. 12 AWG

Control Circuits for Motors, etc. ...... No. 14 AWG

Fire Alarm Line Voltage Wiring ...... No. 14 AWG

Low Voltage Wiring ...... As recommended by Mfgr

- 3.3 CONDUCTOR TYPES, REFERENCED ON PLAN
  - A. Conductors shall be copper, unless noted otherwise on drawings.
- 3.4 CONDUCTOR COLORING CODE

Conductor color coding shall be as follows:

- A. 208/120 volt system
  - A Phase Black
  - B Phase Red
  - C Phase Blue
  - Neutral White

Grounding – Green

Switched wires - Other colors

- B. Conductors shall have colored insulation except wires larger than #8 may be black with colored tape identification at all terminations and splices.
- C. Additional colors may be used where such colors will help in identifying wires and different systems.

## 3.5 CONDUCTOR INSTALLATION

A. Raceways shall be complete, clean and free of burrs before pulling conductors.

- B. U.L. approved pulling compounds may be used with the residue cleaned from the conductors and raceway entrances after the pull is made.
- C. Contractor shall obtain the manufacturer's published recommendations for the handling, pulling and terminating of the cable. Contractor shall perform work in accord with manufacturer's recommendations and accept all responsibility for work not in accord with manufacturer's recommendations.
- D. Pulleys or blocks shall be used for alignment of the conductors when pulling. Pulling shall be in accordance with manufacturer's specifications regarding pulling tensions, bending radius of the cable and compounds. No mechanical pulling means shall be used for wires No. 8 AWG and smaller. Cables shall be pulled by the conductor, not by the insulation or shielding.

#### 3.6 MOISTURE PROTECTION

A. Cable ends shall be protected at all times from moisture. Provide approved heat-shrink end caps or equivalent for all unterminated cable ends.

#### 3.7 CONDUCTORS IN PANELS AND SWITCHBOARDS

A. Conductors in panels, switchboards and terminal cabinets shall be neatly grouped and formed in a manner to "fan" into terminals with regular spacing.

#### 3.8 CABLE SUPPORTS

A. Provide conductor support devices as required by code in vertical cable runs.

#### 3.9 INSULATION REMOVAL

A. Insulation shall be removed with approved wire stripping tools. Conductors that are nicked or ringed are unacceptable and shall be cut off and re-stripped.

# 3.10 INSULATION OF ENERGIZED TERMINATIONS

A. Insulate all exposed energized connections and splices with approved tape or heat shrink tubing. Tape, if used, shall be half-lapped in two directions.

#### 3.11 TERMINATIONS - COPPER CONDUCTORS 600 VOLTS

- A. Control and special systems wires shall be terminated with a crimped on lug when terminating at a screw connection.
- B. All screw and bolt type connectors shall be made up tight and retightened after an eight hour period. Tighten all bolted connections with a ratcheting type torque wrench per manufacturer's standards.
- C. All tool applied crimped connectors shall be applied per manufacturer's recommendations and physically checked for tightness.

**END OF SECTION** 

#### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

#### 1.2 WORK INCLUDED

A. Provide a complete grounding system that complies with the current edition of the National Electrical Code (NEC), and all applicable regulatory codes.

#### **PART 2 - PRODUCTS**

# 2.1 GROUND RODS

A. Minimum size: 3/4" diameter by 10'-0" long, copper clad steel rods, or as noted on the drawings.

#### 2.2 GROUND CONDUCTORS

- A. Grounding conductors shall be soft drawn, bare, stranded copper unless otherwise noted. Size as shown on the plans and per the National Electrical Code (NEC) Article 250.
  - 1. GROUNDING ELECTRODE CONDUCTORS FOR A.C. SYSTEMS: See NEC table 250.66
  - 2. EQUIPMENT GROUNDING CONDUCTORS:

See NEC table 250.122

Equipment grounding conductors may be insulated; provide green insulation and/or approved permanent identification for conductors larger than No. 6 AWG. Equipment grounding conductors shall be provided in all feeder and branch circuit conduits.

#### 2.3 GROUND ELECTRODE CONNECTORS

A. Connectors for grounding electrode conductor to ground rod shall be of the thermal fusion type; conductor-to- conductor connections may be either thermal fusion or approved hydraulically applied compression type.

#### 2.4 GROUNDING BUSHINGS

A. Grounding bushings shall be matched to the ampacity of the grounding conductor and shall have approved set-screw type grounding lug connectors.

## 2.5 GROUNDING CONNECTORS

A. Shall meet the requirements of ground bushings, cast, set-screw or bolted type.

#### 2.6 GROUNDING CLAMPS

A. Clamps shall be matched to the ampacity of the grounding conductor. Provide approved raceway hub where grounding conductor is shown protected by conduit or armored cable. Clamps shall be U-bolt type for connection to waterpipes.

# **PART 3 - EXECUTION**

#### 3.1 GROUND CONTINUITY

- A. Maintain ground continuity throughout the entire electrical system.
- B. Permanently connect the electrical system neutral to the water service. The system shall be grounded only at transformer secondaries and at the main distribution board. Branch panel neutrals must be isolated from additional points of grounding.
- C. Provide approved grounding bushings or locknuts on all conduits terminating in panelboards, pullboxes or other enclosures to ensure continuity of conduit grounding connections.
- D. Securely ground lighting fixtures.
- E. Provide a separate grounding conductor in all metal or non-metallic conduits and in all flexible metallic conduit runs. Connect to the grounding system in an approved manner.
- F. All plug-in receptacles shall be bonded to the box and raceway ground system.

#### 3.2 GROUNDING CONNECTIONS

- A. All grounding connections shall be carefully made to insure low system impedance. Locate grounding connections to allow future servicing and expansion.
- B. Prior to making mechanical or thermal connections, all conductors shall be clean, dry and bright with the bonding surface thoroughly cleaned of any oxides, mill, scale or other foreign matter.
- C. Ground conductors shall be protected from mechanical injury during construction. Provide protective coverings or rigid non-ferrous conduit.

# 3.3 GROUND RODS

A. Ground rods shall be driven into undisturbed soil to full depth. Provide additional rods, ionic salt solutions and the like where special low-resistant grounds are specified.

# 3.4 CONCEALED GROUND ELECTRODE SYSTEM

A. Concealed ground electrode systems, shall be installed, inspected, tested and certified for low resistance connections and low resistance to earth ground prior to being covered.

#### 3.5 THROUGH-SLAB GROUND PENETRATIONS

A. Ground conductors extending through the slab shall be protected by a rigid conduit sleeve; the void portion of the sleeve shall be packed with a non-hardening type duct seal.

#### 3.6 TESTING

A. Shall conform to Section 26 01 26.

**END OF SECTION** 

# **PART 1 - GENERAL**

# 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

#### 1.2 WORK INCLUDED

- A. Provide raceways for a complete electrical system. Include all fittings, hangers and appurtenances required for a complete installation.
- B. Provide outlet and pull boxes required to enclose devices, permit pulling conductors, for wire splices and branching.

## **PART 2 - PRODUCTS**

#### 2.1 GENERAL

A. Provide boxes suitable for the location. Boxes shall meet NEMA Standards for various types.

#### 2.2 CONDUITS

- A. Galvanized Rigid Steel, thick wall (GRS)
- B. Intermediate Metal Conduit (IMC)
- C. Electrical Metallic Tubing (EMT)
- D. Flexible Metal Conduit with and without polyvinyl chloride jacket
- E. Non-metallic, polyvinyl chloride (PVC), schedule 40

# 2.3 FITTINGS

- A. GRS and IMC couplings and connectors shall have threaded connections. Galvanized malleable iron or non-corrosive alloy compatible with galvanized conduit. Running thread or set screw type fittings are not permitted.
- B. EMT Couplings and connectors shall be rain tight, steel or malleable iron, utilizing a split corrugated compression ring and tightening nut or stainless steel locking disk. Set screw fittings are permitted in dry locations. Set screw fittings are not permitted in wet locations or in concrete. Zinc, pot metal, die cast fittings and indenter fittings are not acceptable.

# C. Flexible Metal Conduit

- 1. Dry Locations: malleable iron or steel, Thomas & Betts "Squeeze" type or equal.
- 2. Damp or Wet Locations: Thomas & Betts "Super Liquid-Tight" with external ground lug.

D. PVC Fittings shall be solvent welded types.

- E. Sealoff fittings shall be with filler fiber, poured compound and removable cover.
- F. Expansion Couplings shall be O.Z. type EX with ground jumper.

#### 2.4 INTERIOR WIRING, NEMA 1

- A. Flush and concealed outlet boxes shall be galvanized stamped steel with screw ears, knock-out plugs, mounting holes, and fixture stud.
- B. Surface outlet boxes shall be galvanized stamped steel same as above for use on ceilings and in accessible locations. Contractor shall provide cast iron galvanized for use on walls below 8 feet.
- C. Boxes exceeding 4-11/16 inches square shall be welded steel construction with screw cover and factory painted.
- D. Surface Metal Raceway boxes shall be of same manufacture to match raceway. Boxes shall accommodate standard devices and device plates.
- E. Boxes for casting in concrete or mounting in masonry walls shall be galvanized steel (not aluminum or zinc die castings), specifically designed and listed for that purpose.

#### 2.5 SPECIAL LOCATIONS

- A. For indoor damp or dusty locations provide NEMA 4 boxes
- B. For corrosive locations provide NEMA 4X boxes
- C. For outdoor equipment where a drain is appropriate provide NEMA 3R boxes.
- D. For outdoor locations requiring dust and water protection provide NEMA 4 or 4X boxes.

#### 2.6 BELOW GRADE

A. Where exposed to earth, boxes (handholes or vaults) shall be constructed of precast concrete with size, configuration, hinged and locking cover. Structural loading shall be minimum H25 traffic rating.

# **PART 3 - EXECUTION**

#### 3.1 GENERAL

- A. Install raceways concealed in construction of finished spaces.
- Cut conduit ends square, ream smooth and extend maximum distance into all couplings and connectors.
- C. Provide and install manufactured end caps on all conduit ends during construction to prevent the entrance of water or dirt. Tape, as a cover, is not acceptable.
- D. Pull a properly sized mandrel through each conduit prior to installation of conductors or pull-lines to remove any materials trapped within the conduit run.

E. All PVC elbows shall be factory made.

- F. Field made elbows are acceptable for steel conduits when made with approved bending tools. Bends that show conduit flattened or deformation are unacceptable and shall be replaced.
- G. Conduits shall maintain a minimum 12" clearance from any high temperature surface.
- H. The conduit layout shall be carefully planned by the contractor to ensure neat and workmanlike installation.
- I. Any work showing inadequate planning may be ordered removed by the Architect/Engineer and shall be replaced in a neat and proper manner at no additional cost to the owner.

#### 3.2 CONDUIT SIZING

A. Conduits shall be sized per code for conductors with type THW insulation, although thinner insulation types are permitted in some cases. Conduit size shall not be reduced if large size is specified on the drawing. Minimum conduit size shall be ¾ trade diameter. Conduit ½ trade diameter may be used for dead end receptacles and switch runs.

#### 3.3 GRS AND IMC

- A. Install GRS or IMC for all conduits in wet locations, concrete, underground, exposed to weather, where subject to physical damage and as noted on drawings.
- B. Connections shall be watertight in damp locations.

#### 3.4 EMT

- A. EMT may be installed for wiring in masonry block, frame construction, furred ceilings, above suspended ceilings and in dry location concrete, exposed dry location unfinished spaces not subject to physical damage. EMT shall not be installed underground, under concrete slabson-grade, in concrete slabs-on-grade, exposed to weather, on exterior of buildings or on roofs.
- B. Contractor shall coordinate assembly and installation of EMT in masonry block construction to avoid construction delays. Avoid surface cut masonry units wherever such masonry units are to remain unplastered or exposed.

#### 3.5 FLEXIBLE CONDUIT

A. Provide flexible conduit connection to motors and equipment subject to vibration with at least a 60 degree loop to allow for isolation and flexibility. Use liquid-tight for pumps, equipment which is regularly washed down, and for equipment in damp locations. Provide bonding jumper as required by N.E.C.

#### 3.6 PVC CONDUIT

A. PVC conduit may be used underground when permitted by code and where designated as an acceptable substitute for GRS or IMC on the drawings. Field bends, less than 45 degrees, when necessary, shall be formed with factory recommended heater. PVC bends 45 degrees or greater shall be factory made.

### 3.7 UNDERGROUND RACEWAYS

A. Burial depth of underground raceways shall be not less than NEC minimums and shall be

deeper where so noted herein or required to avoid conflicts.

- B. Arrange and slope conduits entering buildings to drain away from the point of entry.
- C. Conduits passing through the exterior walls below grade and/or bridging areas of naturally unstable soil conditions or previously filled areas shall be placed in a manner to avoid crushing from ground settlement. Backfill under conduit shall be thoroughly compacted. Provide approved deflection fittings on conduits.

## 3.8 CONDUITS IN FOUNDATION AREA

A. Conduits in foundation areas shall be installed so as not to undermine the footings. Check structural drawings for any specific instructions. Backfill over conduits under footings and concrete slabs shall conform to the requirements of the Architect/Structural Engineer.

#### 3.9 STUBUPS THROUGH CONCRETE SLABS OR FINISH GRADE

- A. Conduits through concrete slabs shall be steel. Install at such depth that the exposed conduit is vertical and curved section of the elbow is not visible.
- B. All steel conduit below grade to 6" above grade shall be wrapped with Scotch 50 Anti Corrosion Protective tape or equal.

#### 3.10 INSERTS AND SLEEVES

- A. Furnish and install all inserts and sleeves necessary for Division 26 installation prior to pouring of concrete slabs and walls.
- B. In existing concrete slabs and walls utilize drilled-in threaded inserts, installed as recommended by the manufacturer, where additional supports are required. Neatly core drill openings where additional sleeves are required.

# 3.11 SEALING RACEWAY PENETRATIONS

A. Exterior Wall Surface Above Grade

For concrete construction above grade, cast raceway or sleeve in wall or core drill wall and hard pack with a mixture of equal parts of sand and cement. Seal around all penetrations, with caulking approved by Architect/Engineer.

B. Exterior Surface Below Grade

Cast raceway into wall/floor or use manufactured seal assembly cast in place. OZ type "FSK" or equal. Change from PVC to steel conduit (couplings or bushings) where necessary to obtain a watertight seal in poured concrete wall or floors.

C. Roof

Conduits passing through building roof shall be flashed using a 4 lb. per square foot lead plumbing vent flashing extending not less than 10" from the conduit under the roofing, and not less than 10" above the roof around the conduit. Flashing shall be attached by an approved galvanized or stainless steel clamping band.

#### D. Fire Rated Construction

- 1. All seals must meet with the approval of the local Fire Marshal.
- 2. Concrete or Masonry

- a. Seal around raceway with an approved firestop compound that passes UL test 1479 (ASTM E814) DOW CORNING 3-6548, T & B FLAME SAFE, 3M Fire Barrier Caulk, 3M #Fire Barrier Putty, or equal.
- 3. Plaster or Gypsum Wallboard
  - a. Seal around raceway penetration with plaster and approved fire tape.

# E. Acoustical Sealing

1. Provide Acoustical Sealing of all wiring and raceway openings in ceilings, walls and floors which are critical barriers for noise transfer. Acoustical sealing shall consist of resilient caulking to seal all openings around wiring and electrical raceways.

#### 3.12 SEALING CONDUITS

- A. Seal interior of all conduits which enter the building through floor, roof or outside walls and may carry water into the building. Seal on the end inside the building, using duct sealing mastic, non-hardening compound type, specifically designed for such service. Pack around wires in the conduit.
- B. For exterior wall penetrations below grade, install OZ type "CSB" sealing bushing at interior end of penetrating conduit. Threaded fittings-only are permitted in entering conduits ahead of the sealing bushing.
- C. Provide for water drainage so no electrical problems will result if seals leak.

#### 3.13 CONDUIT HANGERS

#### A. General

- 1. Provide for supporting all conduits from the building structure. Space supports per NEC. Contractor shall provide supports adequate for the loads and resistant to earthquake forces.
- Contractor is responsible to calculate lbs/sq ft of proposed main conduit runs and verify
  with project structural engineer if acceptable or additional structural bracing is required.
  Contractor shall alter conduit route or provide additional bracing acceptable to the
  structural engineer.

#### B. With Suspended Ceiling Areas

- Contractor may attach 1/2" and 3/4" EMT conduits to ceiling suspension systems
  provided such systems are structurally suitable. Attachment to suspension systems
  shall be made with clips specifically manufactured for this purpose. (CADDY or equal)
- C. Conduits not attached to the ceiling suspension system shall be fastened with approved pipe straps or separate suspension hangers to ceiling metal inserts and/or structural members.
- D. Hangers for Direct Mounted Conduits
  - 1. Hangers attached directly to building surface shall be two hole sheet steel or one hole malleable iron, all galvanized, pipe clamps. (Thomas & Betts or approved equal).
  - 2. Hangers for ground cable and PVC conduit supporting ground cable shall not encircle the cable or conduit in metal but shall be 2-hole plastic or 1-hole metal clamps.
- E. Hangers for Single Suspended Conduit
  - 1. Hangers suspended below ceilings shall utilize steel rods and malleable iron pipe rings

sized for the application (Grinnell No. 97 or approved equal). Provide concrete hanger inserts as required.

# F. Trapeze Type Suspended Supports

 Trapeze type supports shall be used where two or more conduits use the same routing. Such hangers shall utilize steel rods, structural steel channels, and clamps of Kindorf, Unistrut or approved equal, sized for the application.

# G. Support of Conduit in Steel Stud Walls

 Attach conduits to studs with approved straps or 18 gauge steel wire secured to steel bars.

#### 3.14 CONTINUITY OF CONDUIT SYSTEM

A. Conduits shall be assembled continuous and secured to boxes, panels, etc., with appropriate fittings to maintain electric continuity.

#### 3.15 PULL-LINES

A. Provide 150 pound plastic pull-lines in conduit-only systems and spare conduits to facilitate future conductor installation.

#### 3.16 ANCHORING

- A. All interior boxes shall be firmly anchored directly or with concealed bracing to building studs or joints. Boxes must be so attached that they will not "rock" or "shift" when devices are operated.
- B. Exterior boxes shall be fastened to approved hot dipped galvanized mounting supports and racking appropriate for size of enclosure.

#### 3.17 FLUSH MOUNTING

A. All boxes shall have front edge (box or plaster ring) even with the finished surface of the wall or ceiling. Use of long screws with spacers or shims will not be acceptable.

#### 3.18 RECEPTACLES AND SWITCHES

- A. Coordinate the work of this Section with the work of other Sections and trades. Study all drawings that form a part of this contract and confer with the various trades involved to eliminate conflicts between the work of this Section and the work of other trades. Check and verify locations with respect to door swings, installation details, cabinet work, and suspended ceilings indicated on contract drawings. Review and coordinate locations of all plumbing, heating, and ventilating equipment and other equipment indicated on the contract drawings of all trades.
- B. Centered on Built-In Work: In the case of doors and cabinets, where devices are centered between two such features, rough-in these device locations exact. Relocate any devices which are located off center at no additional cost to the owner.
- C. Where more than one device is shown or specified to be at the same elevation or one above the other, align them exactly on centerlines horizontally or vertically. Relocate as directed all such devices including light switches, receptacles, voice/data, signal and thermostat devices which are not so installed, at no additional cost to Owner.

D. Device Outlet Height: Measure from the finished floor to the centerline, unless otherwise noted on electrical or architectural drawings, or required to serve specific equipment.

Switches 42 inches, set vertically Receptacles 18 inches set vertically

Other As shown on the plans or as directed by the Architect/Engineer

## 3.19 LIGHTING FIXTURES

A. Locate in accordance with approved architectural ceiling layout plans so light fixtures replace full size lay-in ceiling tiles wherever possible. Notify Architect/Engineer of any conflicts between plans prior to rough-in. Contractor shall relocate light fixtures at no additional charge if field coordination is not done prior to installation.

# 3.20 ELECTRICAL WORK IN COUNTERBACKS, MILLWORK AND CASEWORK

A. Provide templates, where required, to other trades for drilling and cutting to insure accurate location of electrical devices as field verified prior to rough-in with the Architect.

#### 3.21 CONNECTION TO EQUIPMENT

A. Provide device back boxes of size and at locations necessary to serve equipment furnished under this or other Divisions of the specifications or by others. A device box is required if equipment has pigtail wires for external connection, does not have space to accommodate circuit wiring or requires wire different from circuit wiring used. Study equipment details to assure proper coordination.

#### 3.22 BLANK COVERS

A. Provide blank cover or plate over all boxes.

# 3.23 JUNCTION BOXES OR PULL BOXES IN SUSPENDED CEILINGS

A. Shall be supported from structure independently from ceiling suspension system.

#### 3.24 DEVICES BOXES CONTAINING EMERGENCY AND NORMAL DEVICES

A. Permitted only with steel barrier manufactured especially for that purpose of dividing the box into two completely separate compartments.

# 3.25 DEVICE BOXES CONTAINING MULTIPLE DEVICES FOR SYSTEMS RATED OVER 150 VOLTS TO GROUND

A. Permitted only with steel barrier manufactured specifically for the purpose of dividing the box into separate compartments for each device having exposed live parts.

**END OF SECTION** 

# PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

#### 1.2 WORK INCLUDED

- A. Commissioning of electrical systems and equipment by General Contractor's Commissioning Agent (GCCxA) and support thereof, including:
  - 1. Automatic lighting controls: inside and outside.
  - 2. Power panels (circuit labeling).
  - 3. Emergency lighting (exit signs and egress pathway lighting).
  - 4. Fire alarm system interlocks with HVAC equipment and controls.
- B. Support for Owner's Commissioning Authority (OCxA) review and checking of GCCxA work.

## 1.3 ADDITIONAL SCOPE OF NOTE

A. Project is pursuing LEED credit EA Enhanced Commissioning. Enhanced Commissioning will be completed by owner's agent. Contractor is responsible for providing access to site and support from subs to allow Enhanced Commissioning to occur.

#### 1.4 RELATED WORK

A.	26 05 00	COMMON WORK RESULTS FOR ELECTRICAL SYSTEMS
	26 09 43	WIRELESS LIGHTING CONTROLS - ENCELIUM
	26 50 00	LIGHTING

# 1.5 SUBMITTALS

- A. Submittals shall comply with Division 1, General Requirements
- B. Submit a list of team members who will represent the Contractor in the commissioning activities and functional performance testing. This must be provided for electrical shop drawing approval.
- C. Submit qualifications and experience of Contractor's commissioning related personnel
- D. Submit detailed procedures for pre-functional checks (PC) and functional performance tests (FT), at least 4 weeks prior to the start of these activities. Contractor shall prepare individual system checklist sheets for Division 26 work. The pre-functional checklists shall be written to demonstrate the systems and/or controls are complete and ready for functional testing and the functional tests shall be written to demonstrate systems and controls perform their functions as intended by the contract documents and manufacturer(s). The pre-functional checklists and functional performance tests for all lighting controls shall also be written to satisfy the acceptance testing outlined in paragraph 3.03, Lighting Control Acceptance Testing in this section, 26 08 01 Commissioning of Electrical Systems.

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- E. Submit schedule for pre-commissioning activities.
- F. After all commissioning is complete, submit completed Contractor checklists, pre-functional checklists, and functional performance test checklists organized by system and by subsystem and submitted as one package to Owner Representative. The results of failed

tests shall be included along with a description of the corrective action taken.

# 1.6 SEQUENCING AND SCHEDULING

A. Contractor checklists shall be completed as equipment arrives on site. The pre-functional checklists shall be completed prior to system tests. The functional performance tests shall occur after the systems are substantially complete during the completion phase. Functional performance tests shall begin only after all work required in related Sections have been successfully completed, and all test, inspection reports, and Operation and Maintenance manuals required have been submitted and approved.

# **PART 2 - PRODUCTS**

#### 2.1 TEST EQUIPMENT

- All test and verification equipment for electrical systems testing shall be provided by the Contractor.
- B. The instrumentation and test equipment provided by the Contractor shall meet the following requirements:
  - 1. Be of necessary accuracy to test and measure system performance within the tolerances required to determine adequate performance.
  - 2. Be maintained in good operating condition for the duration of the project.

# **PART 3 - EXECUTION**

# 3.1 COMMISSIONING TEAM AND CHECKLISTS

- A. The Contractor shall designate team members to participate in the contractor checklist, prefunctional checks and the functional performance testing specified herein. In addition, Engineer and Owner may have a representative present.
- B. The Contractor shall complete the approved pre-functional checklists and functional test forms and submit completed checklists and forms for review and inclusion into the final O&M. Each item on the pre-functional checklists shall be completed by the responsible contractor. Each commissioning team member must be given visual or other absolute proof the item indicated has been done (or is complete). Provide test logs or Inspector sign-offs to prove systems have been tested. If the Contractor has failed to keep adequate test logs or records, retesting will be required. Acceptance by each commissioning team member of each pre-commissioning checklist item shall be indicated by initials and date. Acceptance by each commissioning team member of each functional performance test checklist shall be indicated by signature and date.
- C. The Engineer and Owner will participate fully as observers in the commissioning process as deemed necessary or on a "spot-check" basis, after the Contractor's team has completed all their commissioning work. The magnitude/quantity of the spot-checks will be determined by the Engineer and Owner. If the Owner or Engineer find items not complete or not as represented by the Contractor, then the Contractor shall correct all deficient items.
- D. Provide red line construction document plans showing actual sensor locations, devices, control sequences and notes.

#### 3.2 TESTS

- A. The pre-functional checks and functional performance tests shall be performed in a manner which essentially duplicates the checking, testing, and inspection methods established in the related Sections. Where checking, testing, and inspection methods are not specified in other Sections, Contractor shall propose methods which will provide the information required. The Contractor is responsible to develop such methods and submit to the Engineer for approval.
- B. The Contractor shall provide all materials, services, and labor required to perform the prefunctional checks and functional performance tests.
- C. A pre-functional check or functional performance test shall be aborted if any system deficiency prevents successful completion of the test or if any participating non- Owner commissioning team member of which participation is specified is not present for the test.
- D. Functional Performance Tests: Functional checks shall be performed for all systems in related specification sections. The contractor shall prepare the functional performance test checklist. Functional performance tests shall begin only after all pre-functional checks have been successfully completed. Tests shall prove all modes of the sequences of operation and shall verify all other relevant contract requirements. Tests shall begin with equipment or components and shall progress through subsystems to complete systems. Upon failure of any functional performance test checklist item, the Contractor shall correct all deficiencies in accordance with the applicable contract requirements. The checklist shall then be repeated until it has been completed with no errors. After Contractor has all checks 100% complete, arrange mutually agreeable times with owner representative to perform "spot-checks".

#### 3.3 LIGHTING CONTROL ACCEPTANCE TESTING

- A. Occupancy Sensor Acceptance
  - 1. Prior to functional performance testing, verify and document the following:
    - a. Occupancy sensitivity has been located to minimize false signals.
    - Occupancy sensors do not encounter any obstructions that could adversely affect desired performance.
  - 2. Equipment Testing: Simulate an occupied condition and verify and document the following:
    - a. Lights controlled by occupancy sensors turn off within a maximum of 30 minutes from the start of an occupied condition.
    - b. The occupant sensor does not trigger a false "on" from movement in an area adjacent to the controlled space or from HVAC operation.
    - c. Signal sensitivity is adequate to achieve desired control.
  - 3. Equipment testing: Simulate an occupied condition and verify and document the following
    - a. Status indication or annunciator operates correctly
    - b. lights controlled by occupancy sensors turn on immediately upon an occupied condition, or sensor indicates space is "occupied" and lights are turned on manually automatic OFF and manual ON control strategy).
- B. Automatic Time Switch Control Acceptance
  - 1. Prior to functional performance testing, verify and document the following:
    - a. Automatic time switch control is programmed with acceptable weekday, weekend,

- and holiday schedules.
- b. Document for the Owner automatic time switch programming including weekday, weekend, and holiday schedules as well as all set-up preference program settings.
- c. Verify the correct time and date is properly set in the time controls.
- d. Override time limit is no more than 2 hours.
- 2. Equipment testing: Simulate an occupied condition and verify and document the following.
  - a. All lights can be turned on and off by their respective area control switch.
  - b. Verify the switch only operate lighting in the ceiling-height partitioned area in which the switch is located.
- 3. Equipment Testing: Simulate an occupied condition and verify and document the following:
  - a. All non-exempt lighting turn off.
  - b. Manual override switch allows only the lights in the selected ceiling height partitioned space where the override switch is located, to turn on or remain on until the next scheduled shut off occurs.
- 4. Equipment testing: Performing manual switching control. Verify and document the following:
  - a. Manual switching or dimming achieves a lighting power reduction of at least 50%.
  - b. The amount of light delivered to the space is uniformly reduced.
  - c. Dimmable light dim uniformly to 10%.
  - d. Operational light hour meters record accurately.

#### 3.4 SENSOR CALIBRATION

A. Calibrate all testing equipment prior to use per manufacturer's direction. Submit final calibration report to owner for approval prior to commencement of commissioning.

#### 3.5 RECORD DOCUMENT VERIFICATION

- A. Record documents shall be present during the commissioning process. As each area of the building and site are visited, the documents shall be reviewed with members of the commissioning team to verify completeness.
- B. O & M Manual Review: Applicable portions of O & M manuals shall be reviewed during the commissioning process with the commissioning team present. Each section shall be reviewed with the commissioning team to verify completeness.
- C. Electrical Contractor shall prepare a Field Report listing all lighting fixtures, controls, and light levels in the room. Report shall include any adjustments made during commissioning and final settings.

Sample Format:

Room/Area Identification	Occupancy Sensor			Photosensor		Time Switch		Time Clock		Comments:		
	Y/ N	Time Setting	Manual On/Off	Y/ N	Gain	Set FC Level	Y/ N	Time Setting	Y/ N	Time On	Time Off	

Completed field report shall be sent to Engineer and Owner for review and included with Electrical O & M documents.

#### 3.6 POWER PANEL COMMISSIONING

- A. Verify power panels installed with access clearances per National Electrical Code (NEC) and contract documents.
- B. Verify power panels labeled to match electrical one-line diagram.
- C. Verify power panel circuits labeled to match panel schedules and that the circuits are labeled with equipment, fixtures and devices controlled.

# 3.7 EMERGENCY LIGHTING COMMISSIONING

- A. Egress Light Fixtures: Verify adequate egress illumination (1 footcandle average) on loss of normal power.
- B. Exit Sign Fixtures: Verify operation on loss of normal power.

**END OF SECTION** 

## **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

### 1.2 SUMMARY

- A. The following specification covers all system components for a complete and fully operational distributed intelligence sensor and lighting control system.
- B. System commissions shall be completed by a factory trained representative.
- C. The electrical contractor shall have two electricians available for an afterhours (after dark) final punch list to review and program / trim lighting controls with the Lighting Designer. The contractor shall anticipate 6 hours and have a ladder available to complete this work.

#### 1.3 REFERENCES

- A. cULus Listing/Certification
  - 1. Certified as Energy Management Equipment (UL 916)
  - 2. Certified as Emergency Lighting Equipment (UL 924)
  - 3. Meet Heat and Smoke Release for Air-Handling Spaces (UL 2043)
- B. Federal Communications Commission (FCC)
- C. Local Building Codes

# 1.4 SYSTEM DESCRIPTION

- A. Lighting Control System includes computer-based software that provides control, configuration, monitoring and reports. System includes the following components:
  - ZigBee based Wireless Manager
  - 2. System Server
  - 3. 0-10V Dimming, 0-10V LED Drivers
  - 4. System Field Devices (ZigBee based Wireless Input & Output Modules)
  - 5. Sensors (Low Voltage/Wireless Occupancy & Photo sensors)
  - 6. Wireless Wall Stations
  - 7. Lighting Control System Software
  - 8. Interface to Audio Visual equipment (e.g. LCD Touch Screen Panel)
  - 9. Interface to BACnet
  - 10. Interface to Tridium Niagara
  - 11. Interface to customizable Energy dashboard
  - 12. Relay panel for site lighting

### 1.5 SUBMITTALS

- A. General: Provide submittals per 1.4 (B J) below:
- B. Bill of Materials: Complete list of all parts needed to fully install selected system components.
- C. Product Data: For each type of product indicated.
- D. Shop and Wiring Drawings: Submit shop drawings detailing control system, as supplied, including one-line diagrams, wire counts, coverage patterns, interconnection diagrams showing field-installed wiring and physical dimensions of each item.
- E. Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections.
  - 1. Show interconnecting signal and control wiring and interfacing devices that prove compatibility of inputs and outputs.
  - For networked controls, list network protocols and provide statements from manufacturers that input and output devices meet interoperability requirements of the network protocol.
- F. Software Operational Documentation:
  - 1. Software operating and upgrade manuals
  - 2. Program Software Backup: On portable memory storage device, compact disc, or DVD, complete with data files.
  - 3. Printout of software application and graphic screens, or upon request, a live demonstration of Control, Configure and Analyze functionality or a video demonstrating above stated system capabilities.
- G. Installation Instructions: Manufacturer's installation instructions.
- H. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.
- I. Warranty: Copy of applicable warranty.
- J. Additional information as required on a project specific basis.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be one who is experienced in performing the work of this section, and who has specialized in installation of work similar to that required for this project.
- B. Manufacturer Requirements: The manufacturer shall have a minimum of 10 years of experience manufacturing networked lighting control systems and shall provide 24/7 telephone support by qualified technicians and have local technician within 100 miles of Seattle/Tacoma area.
- C. Contractor shall ensure that lighting system control devices and assemblies are fully compatible and can be integrated into a system that operates as described in the lighting control notes on drawings and as described within this specification. Any incompatibilities between devices, assemblies, and system controllers shall be resolved between the

contractor and the system provider, as required to ensure proper system operation and maintainability.

D. Performance Requirements: provide all system components that have been manufactured, assembled, and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.

## E. Performance Testing Requirements

1. Manufacturer shall 100% test all equipment prior to shipment. Sample testing is not acceptable.

### F. Code Requirements

- System Control Unit and System Field Devices shall be cULus listed and certified.
- 2. All system components shall be FCC /IC compliant.
- 3. All system components shall be installed in compliance with National Electrical Codes and Canadian Electrical Code.
- 4. Building Codes: All units shall be installed in compliance with applicable, local building codes.
- G. ISO Certification: System components shall be manufactured at ISO-9000 certified plants.

### H. Coordination

- 1. Coordinate lighting control components to form an integrated interconnection of compatible components.
  - Match components and interconnections for optimum performance of lighting control functions.
  - b. Display graphics showing building areas controlled; include the status of lighting controls in each area.

### 1.7 PROJECT CONDITIONS

- A. System Field Devices (Input/Output modules) shall meet the following Environmental Conditions:
  - 1. Operating Temperature Range: -40 deg C (-40 deg F) to +40 deg C (104 deg F).
  - 2. Humidity: 0% to 100% RH condensing rated for damp locations. 0% to 95% RH non-condensing rated for indoor locations.

### 1.8 DELIVERY, STORAGE & HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged packaging with intact identification labels.
- C. Storage and Protection: Store materials away from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

## 1.9 WARRANTY

- A. On-going system expansion, service and support shall be available from multiple factory certified vendors. Recommended service agreements shall be submitted at the time of bid complete with manufacturers suggested inventory and pricing for system parts and technical support labor.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship within specified warranty period.
- C. Manufacturer's Warranty: All equipment shall be warranted free of defects in materials and workmanship.
  - 1. Warranty Period: All system hardware components shall have full warranty (non-prorated) for at least four (4) years and all software components shall carry a warranty of one (1) year from date of installation.
  - 2. Owner Rights: Manufacturer's warranty is in addition to, not a limitation of, other rights the Owner may have under contract documents, or warranties of third party component manufacturers.

### **PART 2 - PRODUCTS**

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Controls: Copper Wavelinx by Copper Lighting Solutions.
- B. Low Voltage and/or ZigBee based Sensors: Wavelinx Sensors by Copper Lighting Solutions, Leviton Mfg. Co., Hubbell Building Automation, Inc., SensorSwitch, Inc., PLC Multipoint Inc., The Watt Stopper, or equivalent.
- C. 0-10V Dimming and/or 0-10V LED Drivers: OSRAM Sylvania, Inc., Tridonic, Universal Lighting Technologies, Philips Lighting or equivalent.
- D. Prior approved controls manufacturer Alternates
  - 1. The wiring methods indicated on the electrical drawings are based around the Encelium Wireless System. Prior approved manufacturer control systems have a different wiring method, ballast, occupancy sensor, and photosensor requirements than what is shown on the electrical drawings. Contractors are required to familiarize themselves with all required wiring, additional parts and pieces, necessary ballasts, required installation labor, etc. to provide for a complete installed system that meets the intent and functionality of the specified system. The contractor shall provide as part of the shop drawing submittals, complete lighting drawings including wiring, equipment, equipment locations, etc. for the prior approved manufacturer alternate systems. All costs shall be included in the bid for a complete operational system that meets the specified and design system.

## 2.2 SYSTEM PERFORMANCE REQUIREMENTS

This specification is intended to fully describe all of the design, engineering, programming, hardware, software, ancillary devices and associated technical services required to provide a building-wide networked lighting control system. This system is specified to perform scheduled and automated lighting control sequences.

A. The lighting control "system" shall include a fully distributed WAN/LAN network of global controller/routers, sensors, switches, relays and other ancillary devices required for a complete and operable system. The system WAN/LAN shall be commissioned by Copper

Wavelinx personnel or other Copper Wavelinx certified commissioning contractors.

- B. The basis of system design shall utilize non-proprietary DALI Certified Control Gear (Ballasts and/or LED Drivers), industry standard 0-10V dimming or fixed output ballasts and/or 0-10V LED drivers, occupancy sensors, daylight sensors, etc.
- C. UL 924 listed devices shall have the ability to control 120V/277V/347V/480V load.
- D. System software interface shall have the ability to notify communication failures to system users via system & email messages. Email messages shall be available in html and text formats.
- E. On-going system expansion, service and support shall be available from multiple factory certified vendors. Recommended service agreements may be submitted at the time of bid complete with manufacturers suggested inventory and pricing for system parts and technical support labor.
- F. Lighting Control Software: The system shall offer two separate levels of lighting control: (1) personal lighting control for the average building occupant to control and adjust basic lighting functions in their workspace, and (2) central lighting control for the facility lighting administrator to perform energy management, configuration maintenance, monitoring operations, and providing support to building occupants.
  - 1. Native central control software shall be utilized for energy reporting status and complete programming without the need for any third party hardware or software. Systems that require any third party linked software or graphics shall be unacceptable.
  - 2. Software shall provide information on general system settings via mouse click on a floor plan. Left clicking over a device on the graphical software interface shall show a description of the selected device/function attribute.
  - 3. Central Lighting Control:
    - a. Shall provide an Interactive, Web-based graphical user interface (GUI) showing floor plans and lighting layouts that are native to the lighting control software. The only means required to program and operate the lighting control system shall be programmed and operated from a user interface that is based on a plan view graphical screen on the user's computer or the lighting control system's main computer. Shall include the navigational features listed below to allow for user's orientation within the controlled space, geographic heading and/or landmarks:
      - 1) Interactive;
      - 2) Vector based;
      - 3) Zoom;
      - Rotate;
      - Pan;
      - 6) Tilt.
    - b. Shall allow building operator to navigate through an entire facility both in twodimensional and three-dimensional multi-floor view, allowing for fast and easy navigation.
      - 1) Three-dimensional view shall exclude walls and other structural features to avoid shadowing and cluttering of the plan view.
      - Shall display multiple floors in single view resulting in easier system performance visualization for the entire site as well as individual zones or

spaces.

- 3) Shall allow system performance visualization across a portfolio of buildings via a single interface.
- 4) All programming, assignments of lighting loads to control strategies, lighting status and lighting energy reporting shall be native to the software and executed from this GUI. Editing shall be available from this GUI in a drag and drop format or from drop down menus without the need for any third party software. Systems that utilize or require third party linked graphics are unacceptable. The GUI shall continuously indicate the status of each connected device on the system and a warning indicator on the software if a device goes offline. Systems requiring spreadsheet editing for programming and that don't offer real time feedback are not acceptable.
- 5) Software settings and properties shall be selectable per individual device, room based, floor based or global building based.
- c. Lighting Control Software interface shall provide current status and enable configuration of all system zones including selected individual luminaire availability, current light level, maximum light level, on/off status, occupancy status, and emergency mode (response to an emergency signal) status.
  - Shall have the ability to display various lighting system parameters such as Lighting status (ON/OFF); Lighting levels, Load shedding status, or Lighting energy consumption, Occupancy status in a colorized gradient ("weather" map) type of graphical representation.
    - a. Energy Analysis data shall be exportable in CSV or image file formats.
    - b. Shall allow import of native AutoCAD files.
  - 2) Reports: Reporting feature shall be native to the lighting control software and capable of reporting the following parameters for each device and zone individually without requiring any third party hardware and software:
    - a. Energy consumption broken down by energy management strategy.
    - b. Energy demand broken down by energy management strategy.
    - c. Occupancy data by zone.
    - d. Building wide occupancy status
    - e. Lighting energy consumption in a color gradient ("weather map" type) view
    - f. Energy performance reports shall be printable in a printer friendly format and downloadable for use in spreadsheet applications, etc.
  - 3) Personal Lighting Control: The Personal Control Software interface shall provide current status and enable each user with the ability to dim and brighten lights, and turn them on and off by individual luminaire or zone. The Software shall offer user configurable light scenes, which may be programmed and then selected via the Software. Personal lighting control shall be available in open/private office environments.
- G. Daylight Harvesting (Light Regulation Averaging): In a photo sensor-equipped system, the Central Controller Unit shall rationalize changes to light levels when ambient (natural) light is available and shall maintain a steady light level when subjected to fluctuating ambient conditions where 0-10V dimming-ballasts and/or drivers exist. Areas equipped with fixed output ballasts and/or drivers shall energize when natural light falls below foot-candle levels specified. System shall utilize light level inputs from common and/or remote sensor locations

to minimize the number of photo sensors required. The System shall operate with multiple users in harmony and not react adversely to manual override inputs.

- H. Time Clock Scheduling: The system shall be programmable for scheduling lights on or off via the Lighting Control Software interface.
  - Programming: User friendly, Outlook style interface shall be available for programming schedules.
  - 2. Override: Manual adjustments via wall stations or personal control software shall temporarily override off status imposed by time clock schedule.
  - 3. Response to Power Failure: In the event of a power failure, the time clock shall execute schedules that would still be in progress had they begun during the power outage.
  - 4. Flick Warning: Prior to a scheduled lights-off event or expiry of a temporary override, the system shall provide two short light level drops as a warning to the affected occupants. Flick warning time shall have the ability to be programmed via software between 1 and 5 minutes.
  - 5. Option to automatically turn on or wait for an input: Using this option, a group of luminaires can be made to turn on automatically in response to a scheduled event or wait for a signal from a wall station to turn the same group of luminaires on (and stay on) for the reminder of the scheduled event.
- I. Load Shed Mode: An automatic load shedding mode shall be available where, when activated through the system, the control unit will reduce its output to a programmable maximum electrical demand load. The system shall not shed more load than required and load shedding priority shall be centrally configurable by control zone or by common uses (i.e., all hallways can be treated as one load shed group), with subsequent load shed priority groupings being utilized until the required defined load has been shed, for either a defined period, or until the demand response input has been removed. Systems that simply select a "load shed scene" whereby there is no guarantee that the defined required load will actually be shed are not acceptable unless the contractor provides (where allowed) and installs additional on-site peak power generation capacity via generators that are capable of carrying at least 20% of the connected load (but in no case less than a 25KW rating).
- J. Emergency Mode: There shall be a mode, when activated through the system, that will immediately adjust lights to full light output and retain that level until the mode is deactivated in the event of an emergency. This setting shall override all other inputs. The system shall interface with the building emergency monitoring system at a convenient point and not require multiple connections.
- K. Addressing: All ballasts and/or drivers shall be centrally addressable, on a per luminaire or multiple luminaire/zone basis, through the Central Control Software. To simplify ongoing maintenance, the system shall not require manual recording of addresses for the purpose of commissioning or reconfiguration.
- L. Programmable Task Tuning: Maximum light level programmability shall be available by individual luminaire.
- M. Unoccupied State: The system shall provide two states when occupancy status is vacant as per an occupancy sensor lights turn off or lights adjust to configurable (dimmed) light level.
- N. Occupied State: The system shall be capable of creating "comfort" or "support" zones to ensure that occupants are not isolated by turning off lights in adjacent areas for occupant comfort and safety, such as a hallway path to exit the premises.

- O. Overlapping Zones: System shall be capable of creating "overlapping" zones to ensure continuous lighting and safety of the occupants as they move from one lighting zone to another (for example, hallways) while minimizing the energy use.
- P. Participation in Intelligent Building Framework: The system shall have the ability to be a component of Intelligent Building framework. Central Control Units and System server communication shall be based on TCP/IP over Ethernet backbone.
- Q. LAN Operations: System shall be capable of operating independent of building's existing network infrastructure if desired and shall not rely on tenant supplied PCs for operation. Network infrastructure shall only be utilized for Personal Control Software.
- R. Firewall Security: Firewall technology shall be utilized to separate tenants from the lighting control network.
- S. Lighting Maintenance:
  - 1. 0-10V Dimming and/or Fixed Output Ballast/LED Driver replacements shall not require re-programming of the system or re-addressing of the said components.
  - 2. System software shall have the ability to notify lamp & DALI Certified Control gear failures on the bus to the system users via system & email messages. Email messages shall be available in html & text formats.
- T. Re-configurability: The assignment of individual luminaire to zones shall be centrally configurable by Central Control Software such that physical rewiring will not be necessary when workspace reconfiguration or re-zoning is performed. Removal of covers, faceplates, ceiling tiles, etc. shall not be required.
- U. Sensor Control Parameters: Occupancy sensor time delays shall be configurable through software. Light level sensor parameters shall be configurable through software.
- V. Automatic Time Adjustment: System shall automatically adjust for leap year and daylight savings time and shall provide weekly routine and annual holiday scheduling.
- W. The system software shall have the capability of providing an optional web based energy dashboard to show real time energy savings data and carbon footprint reductions.
- X. Contact closure input: System shall be capable of receiving a momentary and sustained contact closure input from third party sources to control lighting zones.
- Y. System shall auto-configure lighting controls for spaces that have been combined or divided temporarily by moving wall or similar systems.
- System shall have the capability to emulate the changing colors of the natural daylighting cycle.
- AA. System shall automatically lock wall stations and/or disable sensors based on one of the following system inputs: contact closure, a time schedule or the status of a monitored space.
- BB. BAS Interface: The light management system shall be capable of interfacing digitally with a building automation system via either BACnet/IP or Tridium Niagara AX interface. The lighting control system shall be capable of communicating the status of output devices (lighting loads) as well as input devices (dry contacts, switches, occupancy sensors, vacancy sensors, and photocells) to the BAS. Building Automation System, utilize data from lighting control system input devices such as occupancy sensors to determine the status

(occupied/unoccupied) of the mechanical control zones and perform climate adjustments accordingly.

- CC. Minimized system down time: Low voltage communication bus shall be able to self-diagnose and display communication shorts or open loops resulting in minimum system down time.
- DD. System shall have the capability to communicate with wireless devices (sensors & wall stations) for the purpose of lighting control.
- EE. Wireless networks shall be reliable (mesh technology), self-configuring (discovery) and self-healing. Unexpected interruptions in the network shall be automatically compensated for by re-directing communication.
- FF. Wireless network shall provide high level of security via 128-bit encryption.

### 2.3 WALL STATIONS

The system shall utilize wireless and/or low voltage wall stations.

#### A. General

- Software configurable wall station that provides on/off switching and dimming control
  for up to three lighting zones/scenes per wall station or more with allowable multi-gang
  configurations. Status is indicated by an LED display to indicate function, scene or
  zone. Allows manual override of the time schedule.
- Manual dimming and/or switching wall station that provides local on/off and dimming control over at least three lighting zones. Allows manual dimming of light levels and override of the time schedule.
- Scenes in the central control software shall be synchronized with the buttons on the wall station.
- 4. Wall stations shall fit in a standard Decorator style wall plate and may be ganged together as required.
- 5. Addressing: All wall stations shall be individually addressable & reconfigurable via Central Control Software.
- 6. Shall provide local on/off or dimming control over lighting zones
- 7. Shall utilizing a standard single-gang or multi-gang form factor
- 8. LEDs: All wall stations shall feature LED's to indicate light on and light off status of the corresponding zones.
- 9. Color: All wall stations shall meet NEMA WD1 color specifications.
- 10. Style: All wall stations shall feature Decorator styling wall plates.
- Lighting scenes reconfigure automatically based on scene changes from personal control software.
- 12. Wireless wall stations shall at minimum meet the listed electromagnetic, mechanical, electrical and data specifications and functionalities:

### B. Electrical:

1. Power source: 120/277 VAC

C. Wireless:

- 1. Range: 100 ft. for line of sight and 30 ft. for through walls
- 2. Radio strength: Tx: +5.7 dBm; Rx: -96 dBm sensitivity (1% PER)
- 3. Protocol: ZigBee HA, AES 128-bit encryption

#### D. Performance:

- 1. User Interface Options
  - 1. Three (3) scene switching with dimming Custom labeling available upon request
  - 2. Three (3) zone switching Custom labeling available upon request
  - 3. One (1) zone switching allows configuration as a vacancy sensor
- 2. LEDs: LEDs on the wall stations shall illuminate only if a motion is detected in the close proximity of the wall station.

### E. Mechanical:

- 1. Dimensions: Shall meet NEMA WD-6 spec.
- 2. Plastic material White, other colors available upon request
- 3. Mounts in standard size wall box or surface mounting

# F. Reliability:

- 1. Ambient temperature range: -10 deg C (+14 deg F) to 50 deg C (122 deg F)
- 2. Storage temperature range: -40 deg C (-40 deg F) to 70 deg C (158 Deg F)
- 3. Humidity: 5% to 95% RH non-condensing rated for indoor locations.
- 4. Warranty: 4 years

## G. Regulatory:

- 1. Safety: UL916 listed (pending)
- 2. Environmental protection: Rated for dry location; RoHS compliant
- 3. Radio Interference: FCC Part 15 Class B

## 2.4 SYSTEM FIELD DEVICES (OUTPUT MODULES)

The system shall utilize wireless field devices.

#### A. General:

- 1. Addressing: System Field Devices shall be individually addressable via Central Control Software.
- System shall automatically address individual nodes during system commissioning thus eliminating the need to pre-address devices or record serial numbers during installation.
- 3. Memory: Retains all system settings in non-volatile memory.
- 4. Wireless Output Modules provide a common interface to 0-10V Dimming, Fixed Output Ballasts and/or 0-10V LED Drivers. The Wireless Manager, through these modules, assigns addresses to the lighting components during commissioning and establishes two-way communication. These individually addressable modules enable each lighting component to be independently controlled and configured to best meet the needs of the facility. Wireless field devices shall at minimum meet the listed electromagnetic,

mechanical, electrical and data specifications and functionalities:

### B. Electrical:

- 1. Input voltage: Ballast/General purpose/Tungsten: 120V 347VAC (+/-10%)
- 2. Maximum load rating: 4.5A, 300W
- 3. Communication ports: One (1) port for communication with low voltage devices via NEC/CEC Class 2 communication bus that uses pre-terminated 18 AWG cable.

#### C. Wireless:

- 1. Range: 100 ft. for line of sight and 30 ft. for through walls
- 2. Radio strength: Tx: +5.7 dBm; Rx: -96 dBm sensitivity (1% PER)
- 3. Protocol: ZigBee HA, AES 128-bit encryption; Mesh network

## D. Performance:

- 1. Control Options
  - a. ON/OFF Switching
  - b. Continuous dimming (0 10V down to 1V)

#### E. Mechanical:

- 1. Dimensions: 3.5" L x 1.5" W x 1.5" H
- 2. Dual mounting: Mounts inside a standard (4" x 4") j-Box or to ½" knock-out
- 3. Material: Plenum rated black plastic (UL2043)

### F. Reliability:

- 1. Ambient temperature range: -40 deg C (-40 deg F) to 40 deg C (104 deg F)
- 2. Humidity: 5% to 95% RH non-condensing rated for indoor locations.
- 3. Mean time between failures (MBTF): 50,000 hours.
- 4. Warranty: 4 years

#### G. Regulatory:

- 1. Safety: UL916 listed-pending
- 2. Environmental protection: Rated for damp location (IP54); RoHS compliant
- 3. Radio Interference: FCC Part 15 Class B

# H. AIR GAP OFF - Output Module

- Of Definition: Air Gap Off shall refer to the physical disconnection of AC power to the ballast or driver when "OFF" is selected either automatically or manually, thus ensuring maximum energy savings by eliminating off-state phantom power losses as well as ensuring that no potentially lethal high-voltage is present at the ballast or driver when the lights appear to be off (for life-safety reasons).
- 2. Provisions: Provide an air-gap off relay for each control zone in the system. Where each luminaire is to be controlled (dimmed and/or switched) independently, provide one relay per luminaire. Where multiple luminaires are to be controlled (dimmed and/or switched), provide one relay per control zone, sized to handle both the inrush current as well as the maximum connected load, at the specified voltage.

3. Alternatively, for luminaire mounted at ceiling heights of 10' or less, contractor may supply a label on each luminaire that is visible from 5' AFF that states "WARNING: Potentially lethal voltage/currents may be present when lights are turned OFF". Provide a sample of label as part of submittal process. For luminaire mounted above 10', this provision is not an option.

#### 2.5 SENSORS

The system shall utilize wireless sensors with integrated occupancy & light level measurement capabilities.

Wireless sensors shall at minimum meet the listed electromagnetic, mechanical, electrical and data specifications and functionalities:

#### A. Electrical:

1. Power source: 120/277 VAC

### B. Wireless:

- 1. Range: 100 ft. for line of sight and 30 ft. for through walls
- 2. Radio strength: Tx: +5.7 dBm; Rx: -96 dBm sensitivity (1% PER)
- 3. Protocol: ZigBee HA, AES 128-bit encryption

#### C. Performance:

1. Shall interface wirelessly with the Lighting Control System

#### D. Occupancy sensor configuration:

- 1. Shall allow timeouts configurable via system software.
  - a. 15 minutes default
- 2. Shall allow occupancy and vacancy sensor configurations via system software.
- 3. Depending on the software configuration shall switch or dim the luminaires.
- 4. Shall allow overlapping and comfort zone configurations via system software.
- 5. Shall provide the following coverage:
  - a. 8 ft ceiling: 360°, 320 ft.2 floor or larger
  - b. 9 ft ceiling: 360°, 400 ft.2 floor or larger
  - c. 10 ft ceiling: 360°, 480 ft<sup>2</sup> floor or larger
  - d. 12 ft ceiling: 360°,650 ft.2 floor or larger

#### E. Photo sensor configuration:

- Shall supply a wireless signal to the Lighting Management System proportional to the light measured.
- 2. Shall have a Fresnel lens, with greater than 60 degree cone of response. The range shall be between 0 and 100 FC.

### F. Mechanical:

- 1. Dimensions: 3" diameter x 1.25" height
- 2. Mounting: Options available for acoustic ceiling title, drywall, poured-in-concrete octagon, 4" x 4" electrical j-box or suspended octagon j-box.

- 3. Indicator light: Indicator light to signify different statuses (failure, commissioning, etc.)
- 4. Plastic material

### G. Reliability:

- 1. Ambient temperature range: 0 deg C (+32 deg F) to 40 deg C (104 deg F)
- 2. Storage temperature range: 0 deg C (+32 deg F) to 40 deg C (104 deg F)
- 3. Humidity: 5% to 95% RH non-condensing rated for indoor locations.
- 4. Warranty: 4 years

### H. Regulatory:

- 1. Safety: UL916 listed -pending
- 2. Environmental protection: Rated for dry location; RoHS compliant
- 3. Radio Interference: FCC Part 15 Class B

### 2.6 WIRELESS MANAGER

- A. General: The Wireless Manager is a lighting control device that collects processes and distributes lighting control information to system field devices & wall stations using radio frequency. Each wireless manager can control large quantity of wireless devices. The wireless manager automatically detect and during commissioning addresses the compatible sensors, switches & system field devices it is connected to and establishes two-way communication. The wireless manager is the central intelligence point for the area that it controls, collecting signal information from sensors, wall stations and personal control software and determining appropriate brightness levels or on/off status for each luminaire or zone. Each wireless manager has an Ethernet port for communication with the server.
  - 1. Shall interconnect with other wireless interface modules and System Server using standard Ethernet connection that employs TCP/IP protocol.
  - 2. Addressing: System shall automatically address compatible wireless sensors, wall stations & system field devices during system commissioning thus eliminating the need to pre-address the devices or record serial numbers during installation.
  - 3. Wireless Interface modules shall at minimum meet the general, mechanical and environmental specifications per (B F) below:

#### B. Electrical:

- 1. Input voltage: Via Power over Ethernet
- 2. Communication ports: One (1) Ethernet port (same port for powering the device/communication)

# C. Wireless:

- 1. Range: 100 ft. for line of sight and 30 ft. for through walls
- 2. Radio strength: Tx: +5.7 dBm; Rx: -96 dBm sensitivity (1% PER)
- 3. Protocol: ZigBee HA, AES 128-bit encryption

#### D. Mechanical:

- 1. Dimensions: 3" diameter & 1.25" height
- 2. Plastic material

- 3. Mounting: Via j-box
- E. Visualization & Performance:
  - Manages large number of nodes
  - 2. Shall appear in system software
  - 3. Shall be configured via system software
- F. Reliability:
  - 1. Ambient temperature range: 0 deg C (32 deg F) to 40 deg C (104 deg F)
  - 2. Humidity: 5% to 95% RH non-condensing rated for indoor locations.
  - 3. Warranty: 4 years
- G. Regulatory:
  - 1. Safety: UL916 listed-pending
  - 2. Environmental protection: Rated for dry location; RoHS compliant
  - 3. Radio Interference: FCC Part 15 Class B

#### 2.7 SYSTEM SERVER

- A. General: System Server shall host the lighting control system database for all the lighting control devices. In addition, it shall provide remote accessing capability to change system settings and/or parameters. Server shall have the ability to:
  - 1. Analyze system performance or energy data or generate system report;
  - 2. Record energy consumption with average sampling every 5 minutes for unlimited duration;
  - 3. Host the web interface required for the web enabled Personal Control Software or web based Central Control Software;
  - 4. Windows Server 2008 or Windows 10;
  - 5. Reside on a client server (virtual server) thus eliminating the need for dedicated physical hardware if desired;
  - 6. Interconnect with CUs over standard Ethernet connection that employs TCP/IP protocol; Hardware based servers shall at minimum meet the specifications listed below:
- B. Electrical:
  - 1. Power Supply: 120 VAC/60 Hz/300W; Emergency circuit preferred; Non-emergency circuit acceptable.
  - 2. Communication ports: Two (2) Ethernet ports
- C. Data Specifications:
  - Each System Server shall have two Ethernet 10/100Base Tx Cat 6 RJ45 ports that employ TCP/IP protocol.
- D. Mechanical:
  - 1. Dimensions: 1.69" H X 17.64" W X 27.56" D (42.93mm H X 448.06mm W X 700.02mm D)

2. Shall mount in a standard 19" rack (1U width), or alternatively where no rack is shown, via an individual wall mount.

### E. Regulatory:

- 1. FCC (US only) Class A.
- 2. DOC (Canada) Class A.
- 3. UL 60950.
- 4. CAN/CSA-C22.2 No. 60950.

### 2.8 COMMUNICATION WIRE

- A. Wiring: 18 AWG, pre-fabricated, polarity independent quick connecting wiring. The system shall have the capability to use both NEC/CEC Class 1 and Class 2 wiring. The maximum connected length of wiring shall be 2500 ft. per channel.
- B. Field Bus: Integrates peripheral devices such as low voltage occupancy sensors, photo sensors and wall controls into a complete, networked programmable lighting control system. Provides power to low voltage photo sensors, PIR and dual-technology occupancy sensors. Devices may be connected randomly on the network and special termination of each network channel is not required. Minimize system down time by self-diagnosing the field bus for any shorts and open loops.
- C. Field bus shall at minimum meet the specifications listed below:
  - 1. Specifications:
    - Multi-conductor cable with stranded-copper conductors not smaller than No. 18 AWG.
    - b. Pre-fabricated 1 ft., 5 ft., 10 ft., 15 ft., 20 ft., 25 ft. and 50 ft. lengths.
    - c. Daisy chain topology
    - d. Pre-fabricated with 2-wire connectors.
    - e. Flame rated jacket for plenum use NFPA 262 (UL: FT6, CSA: CMP).
    - f. Power Supply: 12 VDC (up to 24 VDC) to sensors.

#### 2.9 LIGHTING CONTROL SYSTEM SOFTWARE

- A. Personal Control Software: Enables individuals in a building to control lighting levels in their workspace from their own desktop PC. User can control the light level of each luminaire in their workspace or can control all of the luminaire together as a group. Preset lighting scenes may be stored, recalled and modified. This software shall have the capability of acting as a "virtual occupancy sensor" for the system by detecting keyboard or mouse activity on each PC for incremental occupancy status data.
  - 1. Technical Information:
    - a. TCP/IP network traffic < 2kb/s.
- B. Web based Personal Control Software: This feature allows individuals to control lighting levels in their workspace without the requirement for installation of software on client PCs. Individuals can access the interface through the web browser and perform individual luminaire dimming control, on/off switching, modify and save preset lighting scenes.
- C. Technical Information: Adobe Flash ® based user interface.

- 1. System Requirements:
  - a. Internet web browser with Flash® Player 8 or later.
  - b. Internet/Intranet connection.
  - c. SSU enabled and configured to host dynamic website.
  - Network connection with access to a network-enabled CU.
- D. Web based Central Control Software: Central control software application is used to commission, configure and manage the system. Every system parameter in a building (or campus of buildings) is configured for each individual user or space and baseline settings are established for each of the following (depending on the basis of design) system features:
  - 1. Daylight harvesting.
  - 2. Occupancy control.
  - 3. Smart time scheduling.
  - 4. Task tuning.
  - Personal control.
  - Load shedding.
- E. Software utilizes a web based interface that permits a user to easily navigate between zones, floors or different buildings and allows a user to zoom in or zoom out of specific areas of a building. Both 3-dimensional and two-dimensional multi-floor views shall be available. System features such as creation of zone hierarchies, overlapping and support zone definitions, user access rights, timeout settings for occupancy sensors, calibration of light levels for daylight harvesting and the configuration of multiple time schedule profiles shall be available. A web based Graphical User Interface (GUI) application integral to the system will be used to develop a dynamic, real-time, point-and-click graphic of each floor plan with representation of all light luminaire, wall stations, sensors, switches, etc. A central system server will be provided to support system data base and enterprise control management.
  - 1. System Requirements:
    - a. Software must be able to run on a Windows Operating systems (Windows 10 or newer) and also on Apple Mac Intel PCs.
    - b. Must support all common browsers, i.e.,
      - Internet Explorer
      - Mozilla Firefox
      - Safari
      - Google Chrome
    - Must provide network connection/access to all network-enabled CUs.
    - d. Color gradient ("weather map" type) data view (see below for an example) must be available to display the following criteria:
      - Current energy consumption
      - Current energy savings
      - Current luminaire brightness
      - · Current luminaire status

- Current occupancy data
- Current load shedding status
- Other custom modes that may be specified elsewhere

## 2.10 AUDIO-VISUAL INTERFACE

- A. General: Through this interface users can command (e.g. LCD Touch Screen Panel) various lighting scenarios depending on the audio & visual requirements of the room or building.
  - The lighting control system shall interface to the AV system via TCP/IP protocol using Telnet.
  - 2. The lighting control system shall allow a common AV processor to individually control multiple rooms from a single TCP/IP port through unique room, zone, and scene addresses for lighting in each room.

#### 2.11 BAS INTERFACE

- A. General: Two separate software interfaces (BACnet/IP or Tridium Niagara AX) shall be available for integration with Building Automation System. The lighting control system, via these interfaces, communicate the status of output devices (lighting loads) as well as input devices (dry contacts, switches, occupancy sensors, vacancy sensors, and photocells) over to the building automation system. Building Automation System, utilize data from lighting control system to switch/dim lighting, perform load shedding of lighting load, to turn lights on in response to emergency signal through fire alarm and perform HVAC adjustments.
  - The Lighting Control System shall be able to share the following information with BAS clients:
    - a. Light Zone State: State of the defined lighting zone ON or OFF
    - Light Zone Dimming: Light output level of the defined lighting zone, from 100% (maximum light output) to 0% (minimum light output)
    - c. Fire Alarm State: State of the fire alarm system alarm activated or alarm not activated
    - d. Occupancy State: State of the defined occupancy sensor occupancy detected or not detected
    - e. Photo Sensor Daylight Readings (available via BACnet interface only): Reports daylight readings by photo sensors
    - f. Sheddable Load: Reports the total lighting load available for load reduction according to the Light Management System, defined in watts
    - g. Shed Status: Reports the total current load reduction achieved according to Light Management System defined prioritization, defined in watts
    - h. Shed Request: Requested total amount of load reduction, defined in watts or as a percentage of sheddable load
    - i. Sheddable Load (Group): (As above, for the selected group)
    - j. Shed Status (Group): (As above, for the selected group)
    - k. Shed Request (Group): (As above, for the selected group)
    - I. Floor plans (available via Tridium Niagara AX only): Importing lighting control software floor plans into Tridium Niagara AX framework for viewing current status and changing the proxy values.

# **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Site Verification: Verify that wiring conditions, which have been previously installed under other sections or at a previous time, are acceptable for product installation in accordance with manufacturer's instructions.
- B. Inspection: Inspect all material included in this contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.

### 3.2 INSTALLATION

- A. The Electrical Contractor, as part of the work of this section, shall coordinate, receive, mount, connect, and place into operation all equipment. The Electrical Contractor shall furnish all conduit, wire, connectors, hardware, and other incidental items necessary for properly functioning lighting control as described herein and shown on the plans. The Electrical Contractor shall maintain performance criteria stated by manufacturer without defects, damage, or failure.
- B. Power: The contractor shall test that all branch load circuits are operational before connecting loads to sensor system load terminals, and then de-energize all circuits before installation.
- C. Related Product Installation: Refer to other sections listed in Related Sections for related products' installation.

## 3.3 SENSOR INSTALLATION

- A. Adjust sensitivity to cover area installed.
- B. Set time delay on occupancy sensors that are connect to the lighting control system to the minimum. Time delays shall be controlled via Central Control Software.
- Low voltage sensor shall be powered through Input Module. No external power packs shall be used for powering sensors.
- D. Install occupancy sensors on vibration free stable surface.
- E. Install atrium and skylight light sensor facing toward window or skylight.
- F. Install interior light sensor in ceiling facing the floor.

### 3.4 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 3/4 inch.
- B. Wiring within Enclosures: Comply with NEC & CEC. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in

junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

### 3.5 SOFTWARE INSTALLATION

A. Install and program software with initial settings of adjustable values. Make backup copies of software and user-supplied values. Provide current site licenses for software.

### 3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following field tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Operational Test: After installing wall stations and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Lighting control devices will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.7 COMMISSIONING REQUIREMENTS & SUPPORT SERVICES

- A. Commissioning: The manufacturer shall supply factory trained representatives to commission the lighting control system. Manufacturer shall start up all lighting control equipment and verify that it meets the requirements of this specification.
- B. Training: As part of the standard commissioning process, the manufacturer shall train the owner's representatives in the operation of the system to a maximum of 4 hours per building. Manufacturer shall also provide owner's representatives with system operating manuals.
- C. Technical Support: The manufacturer shall supply 24/7 technical telephone support to the client.
- Extended Service Coverage: Maintenance agreements shall be available from the manufacturer to provide service for the system both during and after the warranty period.
- E. Requests for commissioning shall be at least two weeks prior to date desired for commissioning.
- F. Electrical contractor shall perform functional testing under the guidance of commissioning agent and in accordance with factory specified guidelines.
- G. Factory appointed personnel shall provide commissioning services for the lighting control system.
  - 1. Verify proper communication over control wires.
  - Map addresses fixed output and 0-10V ballasts/LED drivers, low voltage wall stations, low voltage sensors, wireless sensors and wireless wall stations to Wireless Manager and System Server.

- 3. Verify communication to control units and system server.
- 4. Configure occupancy sensors, light level sensors, wall stations and other contacts to suit design specifications.
- Configure and program lighting control sequences as described on contract documents.
- 6. Demonstrate to Owner and Engineer proper operation of all areas the system is installed.

# 3.8 TESTING

- A. Upon completion of all line, load and interconnection wiring, and after all luminaire are installed and lamped, a qualified factory representative shall completely configure and test the system.
- B. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

### 3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel and building supervisors to adjust, operate, utilize, troubleshoot, conduct software installation, and maintain lighting controls and software training for PC-based control systems. Provide up to 4 hours of on-site training. Provide a hard copy of manuals and instructional videos on CD or DVD.

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

### 1.2 WORK INCLUDED

- A. Provide all panelboard equipment complete. All equipment shall be dead front type construction and shall bear the U.L. label. Load centers will not be acceptable.
- B. All panels provided for service entrance locations as defined by the NEC shall be provided with a UL label as Suitable for Use as Service Entrance Equipment (SUSE).

### 1.3 SHOP DRAWINGS

- A. Prepare and submit for review prior to manufacture. Include front view, dimensions, device sizes and layout, list of nameplates and all other information required to demonstrate conformance with contract documents.
- B. Dimensions of panelboards shall not exceed those noted on or scaled from the contract documents. Conform to 26 24 13, Switchboard Dimensions, when dimensions exceed those allowed by contract documents.

## **PART 2 - PRODUCTS**

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Siemens
- B. General Electric
- C. Square D
- D. Cutler Hammer

# 2.2 PANELBOARD DESCRIPTION

- A. Voltage, arrangement, and capacity of bus and overcurrent protective devices shall be as shown on the drawings. Bus shall extend behind all spaces ready for future overcurrent protective devices.
- B. Buss bars copper with ampere density not-to-exceed 1200/1000 amperes per square inch. Bussing will generally be 3 phase, 4 wire, 100 percent neutral, 200 percent for lighting and computer equipment panels, braced to match the interrupting rating of the breakers.
- C. Provide multiple lugs where parallel or "feed-through" connections are shown on drawings.
- D. Provide separate neutral and ground buses at the bottom of each panelboard.

#### 2.3 OVERCURRENT PROTECTIVE DEVICES

- A. Provide thermal-magnetic type circuit breakers.
- B. The AIC rating of the panel shall be as specified on the drawings.
- C. Mount breakers in all panelboards so that breaker handles operate in a horizontal plane. Provide common trip on all multiple pole breakers.
- D. 120/208 volt circuit breakers shall be the bolt-on type.
- E. Circuit Breakers rated 15A through 30A shall be U.L. rated for 60/75 degree centigrade wire. Breakers 35A and larger shall be rated for 75 degree centigrade.
- F. Circuit breakers intended for switching 120 volt loads shall be switching duty rated (SWD).
- G. Provide "Spare" overcurrent devices, where noted on the drawings, complete and ready for future circuit connections.
- H. Provide "Space" for future overcurrent devices, where noted on the drawings. Space shall include all bussing and device mounting hardware. Provide approved coverplates or overcurrent devices in all spaces. Open spaces in the panel are not permitted.

### 2.4 ENCLOSURE GENERAL CONSTRUCTION

- A. Provide cabinets of sufficient dimensions to allow future expansion and addition of overcurrent devices within the panelboards. All panelboards shall be provided with door-indoor construction. Provide increased enclosure width required for installation of conduits.
- B. Provide factory primer coat for cabinets located in finished areas. Where cabinets are located in unfinished areas, standard lacquer or enamel finish, gray or blue-gray color, shall be substituted for factory primer coat.
- C. All electrical distribution equipment locks shall be keyed identically.
- D. Fasten panelboard front with machine screws with oval counter-sunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible only when dead front door is open are acceptable.
- E. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall be hinged at right side in addition to hinged door over dead front. Provide three point latching mechanism with one T-handle operator.
- F. Provide matching trim of same height for adjacent panels or control devices in finished areas.
- G. Special remote control switches, contactors, current transformers, transducers or TVSS equipment where shown integral to a panelboard, shall be mounted on the same frame as the panelboard interior. Provide screw retained access door in the dead front shield. A common enclosure door shall cover both special integral device(s) and panelboard overcurrent protective devices.
- H. Integral mounted transient Voltage Surge Suppression (TVSS) equipment. Equipment provided by the panelboard manufacturer shall have equal or better characteristics as identified in section 264313.

## **PART 3 - EXECUTION**

# 3.1 GENERAL INSTALLATION

- A. Secure panelboards in place with top of cabinet at 6'-0", above finished grade unless otherwise noted. Top of cabinet and trim shall be level; trim and door shall fit neatly without gaps, openings or distortion.
- B. Top edges of adjacent panels shall be even.
- C. Securely anchor panelboards to structural framing or walls with approved fasteners and concealed bracing as required. Provide steel channel support framing where panelboard is free standing. Submit support rack shop drawings for approval prior to fabrication.
- D. Install panelboard interiors only after building structure is completely enclosed.

### 3.2 CIRCUIT INDEX

A. Each panelboard shall be provided with a typewritten index listing each circuit in the panel by number, with its proper designation. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers shall be the final room numbers used in the building as verified with the Owner. Mount index with a transparent protective cover inside the cabinet door.

#### 3.3 PANELBOARD NAMEPLATE

A. Provide phenolic engraved nameplate for each panelboard. See Section 26 05 00

### 3.4 LABELING

A. Panelboards shall be provided with required Arc Flash and Personal Protective Equipment (PPE) labels

### 3.5 SPACE

- A. Verify space available with equipment sizes and code required working clearances prior to submittal of shop drawings.
- 3.6 ARC FLASH LABELING, SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION
  - A. Provide per Section 26 01 26.

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

### 1.2 WORK INCLUDED

A. Provide all wiring devices and plates for a complete installation.

## PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

- A. Hubbell
- B. Arrow Hart
- C. Leviton
- D. Pass & Seymour

### 2.2 MATERIALS

- A. Wiring devices shall be specification grade, and the product of a nationally recognized manufacturer regularly engaged in their production.
- B. All wiring devices specified in this section shall be the product of one manufacturer. Each type shall have identical appearance and characteristics.

### 2.3 DEVICE COLOR

- A. Switch handles and receptacles: White
- B. Red for Emergency Systems.
- C. Paint or other surface finish treatments are not acceptable. Verify actual colors with project Architect for special installation conditions.

#### 2.4 SWITCHES

- A. Switches shall be 20 ampere, 277 volt, quiet type with plastic handle. Single pole, double pole, 3-way, 4-way or locking type as required. Provide matching styles and color in other devices as required for the conditions of installation.
- B. Momentary Contact line voltage switch: Single pole, double throw, 3 wire, normally open. Rating same as above.

#### 2.5 RECEPTACLES

A. Duplex NEMA 5-20R configuration (20 amp, 125V)

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### B. GFCI Receptacles

- 1. Interior: 20A-125V duplex receptacle with trip indicator light.
- 2. Exterior: 20A-125V duplex, weather resistant, GFCI receptacle with trip indicator light and single NEMA 3R "In Use" metal cover, mounted horizontally.

#### 2.6 DEVICE PLATES

- A. Non-metallic with color to match device. Provide pressed steel plates for surface devices in equipment and storage areas.
- B. Identification

Provide engraved device plates with amperage and voltage for all receptacles above 125V, 20 ampere rating.

## **PART 3 - EXECUTION**

#### 3.1 MOUNTING

A. Rigidly fasten each device to the box at proper position with the wall to bring device flush with plate or switch handle the proper distance through the plate.

### 3.2 ORIENTATION

- A. Set switches vertical with handle operating vertically, up position "ON" and +42" above finished floor.
- B. Set interior receptacles vertical with ground slot up; +18" above finished floor.
- C. Set interior receptacles above counters, horizontal, centered in backsplash or as directed by Architect. Verify prior to rough-in.
- D. Set exterior receptacles horizontal at +18" above finished grade.
- E. Devices and finish plates shall be installed plumb with building lines.

#### 3.3 RECEPTACLE GROUNDING

A. Provide bare bonding wire between receptacle grounding terminal and box. Plaster ear screws connecting the receptacle frame to the box will not be acceptable for grounding.

### 3.4 HANDICAPPED ACCESS

A. Comply with requirements of Washington State handicapped access code.

## 3.5 TRIM OUT

A. Provide device plate for each wiring device. Trim plates and devices shall not be installed until final painting is completed. Scratched or splattered plates and devices will not be acceptable.

### 3.6 RECEPTACLE TESTS

A. Receptacles shall be checked to ensure proper line to neutral, line to ground and neutral to

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ground voltages.

**END OF SECTION** 

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# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

## 1.2 WORK INCLUDED

A. Provide fusing and appurtenances for all fusible equipment provided under this contract.

# **PART 2 - PRODUCTS**

## 2.1 LOW VOLTAGE FUSES

- A. The low voltage fuse range is considered to extend over the range 600 volts or less. Fuses in this category shall be current limiting types, UL Class R, unless specified otherwise. Provide rejection style fuse clips for all current limiting applications.
- B. Fuses shall be as follows or equal:

APPLICATION	AMPERE RANGE	UL CLASS	GOULD - SHAWMUT	BUSS
Motor & Branch Circuit	1-100	RK 5 Time Delay	Tri-onic	Fusetron
Feeder	60-100	RK 5 Fast	Falt-Trap	Fusetron
All	125-200	RK 1 Time Delay	Amp-Trap 2	Low Peak
Motor Circuit	225-600	RK 1 Time Delay	Amp-Trap 2	Low Peak

### 2.2 SPARE FUSES

A. Provide 10 % of each rating with a minimum of 3 per rating.

## **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

A. Install fuses in all fusible devices provided under this contract.

**END OF SECTION** 

# **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

### 1.2 WORK INCLUDED

A. Provide all disconnect switches and enclosed circuit breakers required by NEC for equipment furnished under this and other divisions of these specifications and by the Owner.

## **PART 2 - PRODUCTS**

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Siemens
- B. General Electric
- C. Square D
- D. Cutler Hammer

### 2.2 DISCONNECT SWITCHES

- A. Switches shall be NEMA type HD (heavy duty), quick make, quick break, dual rated with electrical characteristics as required by the system voltage and the load served. Switches shall be single throw and have blades to open all ungrounded conductors.
- B. Enclosure shall have interlocking cover to prevent opening door when switch is closed. Interlock shall include a defeating scheme for authorized service work.
- C. Operator handle shall be lockable in the "off" position.
- Disconnect enclosures shall be suitable for mounting locations. Provide NEMA 1 for dry locations, NEMA 3R for damp or exterior locations. Provide other NEMA ratings to suit area requirements.
- E. All disconnect switches shall be the product of one manufacturer to facilitate future maintenance.

## 2.3 FUSIBLE DISCONNECTS

A. Fusible disconnect switches provided shall be per 2.2 above with the addition of fuse space and clips to accept only Class R fuses.

### 2.4 TOGGLE SWITCHES

A. Motor rated toggle type disconnect switches are acceptable for fractional horsepower equipment. Switches shall be suitable for the intended load and provided with handle guard/lock-off feature (similar to Square D Class 2510).

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# 2.5 ENCLOSED CIRCUIT BREAKERS

- A. Circuit breaker operator handle shall be lockable in the "off" position.
- B. Circuit breaker enclosures shall be suitable for mounting locations. Provide NEMA 1 for dry locations, NEMA 3R for damp or exterior locations. Provide other NEMA ratings to suit area requirements.
- C. All circuit breakers shall be the product of one manufacturer to facilitate future maintenance.

### 2.6 NAMEPLATES

A. Provide nameplates on all disconnects and fused switches. Nameplates shall be engraved laminated phenolic mounted with screws. Adhesive only will not be acceptable. Each nameplate shall include this information: Load served, voltage, phase, panel, circuit number, fuse size and type.

## **PART 3 - EXECUTION**

### 3.1 DISCONNECT LOCATIONS

A. Install disconnects and enclosed circuit breakers in the same relative location as the equipment being served unless that location is difficult to access or is in an unsuitable environment. Discrete disconnect switches of similar size may be grouped in a central location.

## 3.2 SUPPORT

A. Secure disconnect switches and enclosed circuit breakers to building structure, equipment unit or approved mounting frame. Support by conduit system only is not acceptable.

### 3.3 SPLICES

A. Wiring space within disconnect switches and enclosed circuit breakers shall not be used for splicing; provide suitable wire gutters or junction boxes for this purpose.

**END OF SECTION** 

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### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Divisions 0 and 1 Specification Sections, apply to work of this Section.

### 1.2 SUMMARY

- A. This Section describes the materials and installation requirements for Surge Protective Devices (SPD). SPD's are used for the protection of all AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.
- B. This specification also describes the mechanical and the electrical requirements for the SPD. The SPD shall be suitable for application in both category B and C environments as described in ANSI/IEEE C62.41- 2002.
- C. The Manufacturer/Vendor shall furnish all of the necessary SPD products and related hardware (i.e. flush mounting kits, mounting brackets, etc.) as required for the installation of

### 1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. VPR: Voltage Protection Rating.
- C. SPD: Surge Protective Device, replacement acronym for TVSS: Transient Voltage Surge Suppressor
- D. CLF: Component Level Fusing
- E. LIC: Low Impedance Cable
- F. SCCR: Short Circuit Current Rating

## 1.4 REFERENCE STANDARDS

- A. All manufacturers must comply with the standards listed below and any additions current revisions of industry standards. All products that do not comply with current industry standards will not be accepted.
  - 1. Underwriters Laboratories 1449 (UL 1449) 3<sup>rd</sup> Edition
  - NEC article 285. National Electrical Code 2008
  - 3. NFPA 780 Standard for the installation of lightning protection systems
  - 4. UL96A Lightning Protection System Master Label
  - 5. IEEE (Institute of Electrical and Electronic Engineering Inc.) Latest Revision C62.41.1, C62.41.2, C62.45, C62.33 & C62.35
  - 6. Previous NEMA LS-1 testing standards
  - 7. ISO 9001 (International Organization for Standardization) Quality Systems Quality Management System

### 1.5 SUBMITTALS

- A. Submittals shall include written specification response referencing each specification section and sub-section indicating compliance or non-compliance. If manufacturer cannot fully comply with specification section, this must be stated in the response along with a full description of the variance. Submittal responses shall be signed by manufacturer's VP of Engineering or Product Line Manager.
- B. Submit the following information, indexed by response and test results.
  - 1. Specification compliance response sheet referencing each specification section.
  - 2. Proof of UL1449 Third Edition compliance from Nationally Recognized Test Lab (NRTL) accepted by local authority having jurisdiction. UL1449 Third Edition Nominal Discharge Current Rating and Voltage Protection Ratings shall be provided.
  - 3. Published specifications, cut sheets & product data with appropriate IEEE C62.41 & UL1449 Third Edition performance ratings for intended installation locations.
  - 4. Electrical and mechanical shop drawings.
  - 5. Installation requirements/instructions.
  - 6. Operations & maintenance manuals.
  - 7. Performance / warranty information.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Manuals
- B. Warranty Documentation

### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Inspect for damage and replace any damaged device.
- B. Store in a clean, dry space suitable for equipment and protect against damage.
- C. Clean equipment and touch up minor scratches using suitable materials.

## 1.8 QUALIFICATIONS

- A. Manufacturer shall have local representation and distribution within 400 miles of the project location to provide technical, warranty claim, and installation support for the project.
- B. Manufacturer/vendor must be capable of supplying SPD for project within 30 days of receipt of order for orders of 25 units and less for models submitted in response to this specification.
- C. Manufacturers shall be certified to latest ISO 9001 standard and shall be registered for the design and manufacturing of SPD devices.
- D. Manufacturer shall provide access to a readily available factory engineer for answering questions about this product.
- E. Manufacturer qualifications shall be provided as part of the submittal.
- F. The successful manufacturer/vendor shall assign a technical contact person for SPD application, installation and warranty questions. This contact shall be available to provide a

response to a technical question within a maximum of two business days.

G. All SPDs for this project must be supplied by the same manufacture.

## PART 2 - PROCUCTS

- 2.1 ACCEPTABLE "PRE-APPROVED" MANUFACTURES/MODELS
  - A. Total Protection Solutions Contact Power Solutions NW (206) 930-1980

Total Protection Solutions (TPS) ServiceTrack & LowProfile Series						
Voltage Application	480Y277v 3 Phase Wye	480v 3 Phase Delta	208Y120v 3 Phase Wye	208v 3 Phase Delta	120/240v Single / Split Phase	
Main Services	ST240- 3Y480-FL	ST240- 480NN-FL	ST240- 3Y208-FL	ST240- 240NN-FL	ST240- 1S240-FL	
Distribution, MCC & Branch Panels	LP120- 3Y480-FL	ST120- 480NN-FL	LP120- 3Y208-FL	ST120- 240NN-FL	LP120- 1S240-FL	
Use Delta units for all unbonded/ungrounded & high resistance ground Wye applications.						

- B. Low Impedance Cable: Required for all installations with lead lengths over 36"
  - 1. Total Protection Solutions (TPS)
    - a. Main Services LIC-6X-xx
    - b. All other applications LIC-10X-xx
    - c. (Where xx denotes length in feet; 5', 10', 15')
- C. Approved Alternate Manufacturer's:
  - 1. Siemens Industry, LLC UL Listed with Electrical Switchboards and Panelboards.

## 2.2 SURGE CURRENT RATINGS

A. Minimum Single Impulse Ratings with Independent testing per previous NEMA LS1.

Main Services	240kA per Phase, 120kA per Mode
Distribution, MCC & Branch Panels	120kA per Phase, 60kA per Mode

### 2.3 TYPE

A. External, non-modular SPD/TVSS required for all applications (not integrated with gear/panels) connected in parallel to switchgear via dedicated circuit breaker.

# 2.4 LISTINGS: UL1449 3RD EDITION, UL96A & NFPA 780 (OR CURRENT REVISION)

- A. Type 1 & 2: Suitable for applications including direct buss connection with no additional overcurrent protection requirements.
- B. Nominal Discharge Current (In): 20kA for Main Service and 10kA for all other applications (for compliance to NFPA 780, NEC 280 and UL96A Lightning Protection Master Label).
- C. SCCR: 200KA Short Circuit Current Rating with no additional/external overcurrent protection.

### 2.5 MODES OF PROTECTION - ALL MODES FOR ALL CONFIGURATIONS AND

- A. WYE: Discrete MOV Line to Neutral, Line to Ground, Neutral to Ground
- B. Delta: Discrete MOV Line to Line & Line to Ground
- C. Sinewave tracking transient filter protection for all modes on Wye & L-L for Delta.

### 2.6 LOW IMPEDANCE CABLE (LIC):

A. An LIC must be available from the SPD manufacture that reduces effective lead impedance by 75% and be used for all SPD installations with lead lengths exceeding 36".

### 2.7 DURABILITY TESTING

A. TVSS/SPD devices shall withstand a minimum of 5,000 hits delivered at a rate of one pulse per minute. Unit shall not fail or suffer let through voltage degradation of more than 7%. Lead length for testing and let through measurements shall be 6".

### 2.8 COMPONENT LEVEL FUSING

A. Balanced array MOV based SPD/TVSS with individual Component Level Fusing (Oxygen Free High Conductivity [OFHC] elements in silica sand) are required for all components.

### 2.9 SPD MUST NOT HAVE, USE OR REQUIRE ANY OF THE FOLLOWING

- A. Board trace fuses, crowbar type gas tube arrestors or SAD devices are not allowed.
- B. Integrated primary overcurrent protection Fuses or Circuit Breakers are not allowed.
- SPDs with external over-current protection requirements (UL Type-2 listing only) are not allowed.

### 2.10 SAFETY

A. SPD must not fail catastrophically when a continuous over-voltage is applied to 6 modes simultaneously (Line-Neutral & Line-Ground \* 3 Phases). UL1449 only requires one mode be tested at a time.

#### 2.11 MONITORING

A. Green "Phase Status" LEDs, Red "Service Required" LED, Dry Contacts & Audible Alarm w/silence button are required. SPD must not rely solely on primary overcurrent protection (no CLF), as this will likely open up on SPD failure, thus disabling the alarm (no power, no

alarm).

### 2.12 SERVICE CONDITIONS

- A. SPDs shall be rated for continuous operation under the following conditions, unless otherwise indicated:
  - 1. Maximum Continuous Operating Voltage (MCOV) above nominal Minimum 115%.
  - 2. Enclosures: Heavy duty, powder coated steel with appropriate NEMA rating for application.
  - 3. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
  - 4. Humidity: 0 to 85 percent, non-condensing.
  - 5. Altitude: Up to 13,000 feet (4,000 m) above sea level.
  - 6. Noise Level: SPD shall not emit any audible noise unless "in alarm" indicating a "service required" condition.

## 2.13 DIMENSIONS (MAXIMUM):

A. MSB – 16"Hx13"Wx7"D; MCC/Dist/Branch – 4"Wx4"Dx10"H. Compact SPD dimensions are critical for achieving installations with short leads.

### 2.14 FLUSH COVER PLATE

A. Manufacture must provide smoked acrylic cover plates for flush mounting applications.

### 2.15 MAXIMUM LET THROUGH VOLTAGES (LTV)

A. Tested w/6" leads & 500MHz Scope from 0 ref per NEMA-LS1

### MAIN SERVICE APPLICATIONS

Voltage Configuration	Test Waveform	L-N	L-G	L-L	N-G	Phase °
480/277 Wye	IEEE C3 – 20 kV/10ka	1187	1540	1950	1500	90°
	UL VPR – 6 kV/3kA	1200	1200	1800	1200	90°
	IEEE A1 – 2kV – 67A	44	77	54	52	180°
120/208 Wye	IEEE C3 – 20 kV/10kA	907	1173	1267	1090	90°
	UL VPR – 6 kV/3kA	800	800	1200	800	90°
	IEEE A1 – 2kV – 67A	40	76	54	46	180°
480/277 Wye	UL VPR – 6 kV/3kA	1200	1200	2000	1200	90°
	IEEE A3 – 6kV – 200A	71	119	73	67	180°
	IEEE A1 – 2kV – 67A	27	52	39	48	180
120/208 Wye	UL VPR – 6 kV/3kA	700	700	1200	700	90°
	IEEE A3 – 6kV – 200A	56	81	88	112	180°
	IEEE A1 – 2kV – 67A	29	46	39	40	180°

#### 2.16 WARRANTY

### A. Warranty:

- 1. SPD Manufacturer's Warranty: shall provide a product warranty for a period of not less than thirty (30) years from date of installation. Warranty shall cover unlimited, complete replacement of TVSS devices during the warranty period with no exceptions for lightning, utility accidents etc.
- 2. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design, manufacturing and testing of TVSS for not less than five (5) years.

### **PART 3 - EXECUTION**

#### 3.1 PRE-INSTALLATION

- A. Training: Onsite installation training for the contractor must be provided by the SPD supplier.
- Review all installation information in manufacturer's installation manual prior to installing SPD's

### 3.2 INSTALLATION

### A. GENERAL

- Verify all voltages before connecting to avoid injury and damage to equipment.
- 2. The SPD's shall be installed external to switchboard, distribution and panelboard.
- 3. Internally mounted SPD's will not be accepted.
- 4. Ground resistance shall be 25 ohms or less per NEC Article 250.56
- 5. Suppressors shall be installed per the manufacturer's installation instructions and the requirements of: the NEC, the local authority having jurisdiction and the project engineer.
- 6. Project Engineer or their appointed representative may perform inspection of the installed suppressors and reserves the right to require corrections to the installation to comply with manufacturer's installation requirements and project specifications.
- 7. The SPD/TVSS supplier must provide on-site installation training for the electrical contractor.
- 8. All circuit breakers feeding SPDs much have locking safety clips installed to prevent the circuit breaker from inadvertently being turned off.

## B. SERVICE ENTRANCE

- 1. Install one primary suppressor at each utility service entrance to the facility as indicated on the drawings and/or as noted on the panel schedules.
- 2. Suppressor shall be installed on the load side of the service entrance disconnecting means unless noted otherwise by the project engineer.
- 3. Provide a 100 Amp circuit breaker (with a safety clip to ensure the circuit breaker cannot be inadvertently turned off) in the switchboard as over-current protection for the wire and as a disconnecting means for the SPD.
  - a. Only UL1449 Type-1 devices are allowed, so by definition of Type-1, the manufacture cannot have any external overcurrent protection requirements. If the

SPD manufacture does have external overcurrent protection requirements, that SPD equipment will not be accepted.

- 4. Use minimum #4 AWG wire for connecting the SPD.
- 5. Conductors between suppressor and point of attachment shall be kept as short and straight as possible. Lead length of connecting conductor shall not exceed two (2) feet without written permission of the specifying Engineer.
- 6. Whenever possible, SPD leads must be twisted together and securely tie-wrapped together every 6" to reduce impedance of the leads.
- 7. Over-length SPD leads (greater than 36") must use Low Impedance Cable (see "Pre-Approved" section 2.1-A for ordering information)
- 8 SPD leads must not be spliced.
- 9 Suppressor's ground shall be bonded to enclosure frame and the service entrance ground bus, and conduit between the TVSS/SPD and the switchboard must provide secure electrical/mechanical connections.

# C. SECONDARY SPDs FOR MCC, DISTRIBUTION & BRANCH PANELS

- Install one secondary suppressor at each MCC, Distribution Panel, Branch Panel & Sub-Panel location as indicated on the drawings.
- 2. Provide a 30 Amp circuit breaker (with a safety clip to ensure the circuit breaker cannot be inadvertently turned off) in the panel being protected as over-current protection for the wire and as a disconnecting means for the SPD.
  - a. Only UL1449 Type-1 devices are allowed, so by definition of Type-1, the manufacture cannot have any external overcurrent protection requirements. If the SPD manufacture does have external overcurrent protection requirements, that SPD equipment will not be accepted.
- 3. Conductors between suppressor and point of attachment to the panelboard shall be kept as short and straight as possible. Mount the TVSS directly adjacent to the circuit breaker closest to the neutral bus, such that the maximum length of all connecting wiring is kept as short as possible, not exceed 18 inches.
- 4. Over-length SPD leads (greater than 18") must be twisted together (2 twists/foot) and securely tie-wrapped once per foot to reduce impedance of the leads. Quality compression butt-splice connections are required when extending SPD leads (wire nuts are not acceptable).
- Grounding: Suppressor's ground lead shall be bonded to the panel enclosure with a small ground lug as close as possible to the TVSS mounting point. Conduit between the TVSS/SPD and the switchboard must provide secure electrical/mechanical connections.
  - a. Isolated Ground (IG) Applications: The ground lead is bonded to the SPDs metal enclosure, so a non-metallic conduit must be used to isolate the SPD from the panel enclosure. The ground lead must then be connected to the IG buss.
- 6. Multiple "Feed-Through" Panels with shared SPD/TVSS units must be immediately adjacent to each other (side by side) with short tie cables not to exceed 36". Subpanels must be feed from a primary panel with a "lug-out', lug-in" tie connection, and the tie connection lugs must be at the same end of the primary and sub-fed panel. i.e. bottom to bottom or top to top to ensure short tie "sub-feed" cables.

# 3.3 FIELD QUALITY CONTROL

A. A factory authorized representative shall inspect and photograph all SPD installations and Project # 22006 26 43 13 - 7

report findings in writing to the project engineer.

## 3.4 STARTUP SERVICE

- A. Do not energize or connect service entrance equipment or panelboards to their sources until SPD's are installed and connected.
- B. Do not perform insulation resistance "Hipot" tests of the distribution wiring with the SPDs installed/connected. Disconnect before conducting insulation resistance tests and reconnect immediately after the testing is over.

END OF SECTION

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#### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A. The provisions and intent of the Contract, the General and Supplementary Conditions, Division 1 Specification Sections, and published addenda apply to the work as if specified in this Section.
- B. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, LED module, drivers, emergency lighting units, and accessories.
- C. Provide the lighting system complete and operational. All light fixtures shall be provided complete with LED module, mounting hardware and accessories required for operation.
- D. Provide lighting fixtures of types, sizes and finish as listed on the drawings. Light Fixtures shall be complete assemblies constructed to ensure full life of components and minimize amplification and transmission of component generated noise.
- E. Contractor shall include in the bid all costs and documentation for lighting control commissioning. Contractor shall provide the owner a complete report of test procedures and results indicating all lighting controls have been tested, adjusted and operate in accordance with approved plans and specifications per the authority having jurisdiction.
- F. Light fixture schedule series numbers are a design series reference and do not necessarily represent the exact catalog number, size, voltage, wattage, type of LED, driver, finish trim, ceiling type, mounting hardware, ceiling trim or special requirements as specified hereinafter or as required by the particular installation(s). Provide complete light fixtures and drivers to correspond with the number of LED's, wattage, switching and/or size specified. Refer to light fixture schedule, Architectural drawings, and schedules for additional requirements.
- G. Light fixture voltage shall match voltage of circuit serving the light fixture. Contractor as part of the billing and submittal process shall verify each light fixture and notify engineer in writing of any conflicts.

#### 1.2 REFERENCES

A. Shall be as follows:

National Electrical Manufacturer's Association (NEMA): LE 5-1993 Procedure for determining luminaire efficiency ratings.

## 1.3 ADDITIONAL SCOPE OF NOTE

A. Coordinate with the requirements of LEED prerequisite EA Minimum Energy Performance and the following: LEED Credit EA Optimize Energy Performance; EQ Interior Lighting; and IN Purchasing – Lamps.

#### 1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide light fixtures, emergency lighting units, and accessories Listed and Labeled as defined in NFPA 70, Article 100 and marked for intended use for the location and environment in which installed.
- B. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

#### 1.5 SUBMITTALS

A. Submittals shall be neatly and clearly marked to indicate the light fixture(s), LED module and drivers fully comply with contract documents. When substitute light fixtures are submitted (if

permitted) the data shall clearly cross reference (written and highlighted) the substitute light fixture complies with every detail of the specified light fixture. Light fixtures not fully complying with contract documents are not permitted.

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LIGHTING

- Submittals shall have light fixture types and project name clearly indicated and shall be prepared by the authorized manufacturer's representative serving the project area. A list of manufacturer representatives (including address, telephone and fax numbers) identifying which light fixture types they represent shall be included with submittals. Submittals or requests for prior approval not meeting these requirements will be rejected.
- For light fixtures mounted in continuous rows, submit scaled drawings prepared by the light fixture manufacturer showing all details of construction, lengths of runs, weight pendant and power feed locations, accessory pieces, finishes method of field assembly and list of materials.
- D. Contractor to provide manufacturer with accurate field dimensions where required.
- Prior to receiving Engineers approval contractor shall schedule a meeting at the Engineers office with the light fixture manufacturer(s) representative, light fixture equipment supplier, engineer and contractor to review ceiling types, mounting heights, LED module, drivers, voltage, controls and colors. Provide shop drawings and catalog data to the engineer a minimum of five (5) days prior to the review meeting.
- Product Data: For each type of lighting fixture indicated on the drawing E0.00, lighting fixture schedule, arranged in order of light fixture designation. Include data on features, accessories, and the following:
  - 1. Dimensions of light fixtures.
  - 2. Certified results of independent laboratory tests for light fixtures and LED module for electrical ratings and photometric data.
  - 3. Emergency lighting unit battery and charger.
  - Types of LED's, color temperatures and (LPW) lumens per watt. 4.
- G. Wiring Diagrams: Detail wiring for light fixtures that clearly differentiates between manufacturer-installed and field-installed wiring.
- Delete paragraph below if not required. Η.
- I. Product Certificates: Signed by manufacturer(s) or their designated representatives stating lighting fixtures certifying that products comply with drawing and specification requirements.
- Dimming Driver Compatibility Certificates: Signed by manufacturer of driver certifying drivers are compatible with dimming systems and equipment with which dimming drivers are to be used.

#### **SUBSTITUTIONS** 1.6

Lighting fixtures designated for this project are based on the light fixture types and manufacturers specified. If substitution of light fixtures other than those specified is desired, then product information must be submitted, and prior to bid approved by the Engineer. All substation requests must be received in the Engineers office a minimum of 10-days prior to bid time. No requests for substitution will be accepted after this date.

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B. Substitution requests shall include all information required under 1.04 SUBMITTALS of this

section. Requests for prior approval shall be accompanied by a working light fixture sample (including LED module, drivers, cord and plug). Provide the name of at least one installation where each proposed substitute has been installed for at least six months. Provide the name and telephone number of the Engineer of Record.

#### 1.7 COORDINATION

- A. Lighting Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.
- B. Coordination Meetings: Contractor shall meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate each light fixture mounting condition with ceiling type.
- C. During second meeting, coordinate light fixture layout in each area. Contractor shall meet at least twice with the mechanical systems installer prior to fabrication and installation of ductwork. Coordinate depth and location of all light fixtures and ductwork in all areas.

#### 1.8 WARRANTY

- A. General Warranty: Special warranty specified in this section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties under requirements of the Contract Documents.
- B. Special Warranty for Batteries: Written warranty, executed by manufacturer agreeing to replace rechargeable batteries that fail in materials or workmanship within specified warranty period.
- C. Special Warranty Period for Batteries: Manufacturer's standard, but not less than 10 years from date of Substantial Completion. Full warranty shall apply for first year and prorated warranty for last nine years.
- D. Special Warranties for LED Drivers: Written warranty, executed by manufacturer agreeing to replace LED drivers, including labor for driver failure in materials or workmanship within specified warranty period.
  - 1. Special Warranty Period for LED Drivers: Five years from date of manufacture, but not less than four years from date of Substantial Completion.
- E. Light Fixtures Utilizing LED Lamp Technology: Provide manufacturer's warranty for a period of not less than 5 years including parts and labor for full replacement of defective product.

#### **PART 2 - PRODUCTS**

- 2.1 LIGHTING FIXTURES AND LIGHTING FIXTURE COMPONENTS, GENERAL
  - A. Metal Parts: Free from burrs, sharp corners, and edges.
  - B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
  - C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping

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and when secured in operating position.

- D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
  - 1. Whit Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
  - 4. Laminated Silver Metallized Film: 90 percent.
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.
  - 1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
  - 2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.

#### 2.2 LED MODULES AND LED DRIVERS

#### A. General:

- 1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
- 2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
- 3. LED drivers shall include the following features unless otherwise indicated:
  - a. Minimum efficiency: 85% at full load.
  - b. Minimum Operating Ambient Temperature: -20° C. (-4° F.)
  - c. Input Voltage: 120 277V (±10%) at 60 Hz.
  - d. Integral short circuit, open circuit, and overload protection.
  - e. Power Factor: ≥ 0.95.
  - f. Total Harmonic Distortion: ≤ 20%.
  - g. Comply with FCC 47 CFR Part 15.
- 4. LED modules shall include the following features unless otherwise indicated:
  - a. Comply with IES LM-79 and LM-80 requirements.
  - b. Minimum CRI 80 and color temperature 3500° K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
  - c. Minimum Rated Life: 50,000 hours per IES L70.
  - d. Light output lumens as indicated in specified fixture literature.

#### B. LED Fixtures:

- 1. Housing, LED driver, and LED module shall be products of the same manufacturer.
- 2. LED drivers, modules, and reflector shall be accessible, serviceable, and replaceable from below the ceiling.

#### 2.3 EXIT SIGNS

- A. General Requirements: Comply with UL 924 and the following:
  - 1. Sign Colors and Lettering Size: Comply with Authorities Having Jurisdiction.

- B. Internally Lighted Signs: As follows:
  - Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
  - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
  - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - 3. Operation: Relay automatically energizes lamp from unit when circuit voltage drops to 80 percent of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.
  - 4. Self-diagnostic type with test switches and indicator lights.

#### 2.4 EMERGENCY LIGHTING UNITS

- A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:
  - Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
  - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80
    percent of nominal voltage or below. LED module automatically disconnects from
    battery when voltage approaches deep-discharge level. When normal voltage is
    restored, relay disconnects lamps, and battery is automatically recharged and floated
    on charger.
  - 4. Integral Time-Delay Relay: Arranged to hold unit on for fixed interval after restoring power after an outage. Provides adequate time delay to permit high-intensity-discharge lamps to restrike and develop adequate output.
  - 5. Self-diagnostic type with test switches and indicator lights.

### 2.5 EMERGENCY LED POWER SUPPLY UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within light fixture body. Comply with UL 924.
  - 1. Test Switch and Light-Emitting Diode Indicator Light: Visible and accessible without opening light fixture or entering ceiling space.
  - 2. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 10-year nominal life.
  - 3. Charger: Fully automatic, solid-state, constant-current type.
  - 4. Operation: Relay automatically energizes lamp from unit when normal supply circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects LED module, and battery is automatically recharged and floated on charger.
- B. External Type: Self-contained, modular, battery-inverter unit. Comply with UL 924.
  - Test Switch and Light-Emitting Diode Indicator Light: Visible and accessible without entering ceiling space.
  - 2. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 10-year nominal

life.

- 3. Charger: Fully automatic, solid-state, constant-current type.
- 4. Operation: Relay automatically energizes lamp from unit when normal supply circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects LED module, and battery is automatically recharged and floated on charger.
- 5. Housing: NEMA 250, Class 1 enclosure.

#### 2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Contractor shall provide "Seismic Controls for Electrical Work" such as channel- and angleiron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as light fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount a single light fixture. Finish same as light fixture.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to light fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by light fixture manufacturer.

#### 2.7 FINISHES

- A. Fixtures: Manufacturer's standard, unless otherwise indicated.
  - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
  - 2. Metallic Finish: Corrosion resistant.

#### 2.8 OCCUPANCY SENSORS

- A. Provide ceiling mounted occupancy sensors for control of lighting in all areas. Sensors shall be ceiling mounted to provide adequate coverage. Ceiling mounted occupancy sensors shall be compatible with wireless lighting control system. Wall mounted occupancy sensors shall be Watt Stopper DT-100 complete with power pack. Locate wall mounted sensors at approximately 8'-0" above finished floor. Sensors shall be wired and installed per manufacturer's direction to maintain switching and circuits shown on drawings. Where multiple sensors are located in an individual room, sensors shall be wired parallel with the relays such that either sensor will provide input to turn all lights on and reset time delay.
- B. The occupancy sensor shall have the following features:
  - 1. Dual Technology
  - 2. Low Voltage
  - 3. Adjustable Sensitivity
  - 4. Isolated NO/NC Contacts

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5. 30 second - 30 minute time delay

## **PART 3 - EXECUTION**

#### 3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each light fixture.
- B. Verify mounting provisions prior to the ordering of fixtures. Fixtures shall be UL listed for the location, and application in which they are installed.
- C. Install lighting fixture diffusers only after construction work, painting and clean up are completed. Prior to final acceptance, remove all, reflectors and diffusers, wash, rinse and reinstall.

#### 3.2 SUPPORT OF LED FIXTURES

- A. Recessed Downlight Type: Mount in frames suitable for the ceiling, with the recessed portion of the light fixture securely supported from the ceiling framing. For light fixtures supported by a ceiling suspension system, provide as a minimum or as required by ARJ, two safety chains secured to structural members above suspended ceiling.
- B. Surface and Pendant Mounted Type:
  - 1. Where mounted on accessible ceilings, hang from structural members by means of hanger rods through ceiling or as approved.
  - 2. Continuous Runs of Light Fixtures: Straight when sighting from end to end, regardless of irregularities in the ceiling. Where light fixtures are installed, omit ornamental ends between sections. For surface pendant mounted fixtures of three or more provide a unistrut channel for mounting fixtures. Provide 3/8-inch thread rod secured to structural members for support of unistrut channel.
  - 3. Provide surface mounted fluorescent light fixtures with UL approval for direct mounting on the various ceilings used. Spacers will not be approved where mounted on lay-in ceilings, support light fixtures by at least two positive devices which surround the ceiling runner, and which are supported from the structure above by a No. 12 gauge wire. Spring clips or clamps that connect only to the runner are not acceptable.

#### 3.3 CONNECTIONS

#### A. Ground equipment

 Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

#### 3.4 FIELD QUALITY CONTROL

- A. Inspect each installed light fixture for damage. Replace damaged light fixtures and components.
- B. Advance Notice: Give dates and times for field tests.
- C. Provide instruments to make and record test results.

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D. Test as follows:

- 1. Verify proper operation, switching and phasing of each light fixture after installation.
- 2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation. Verify normal transfer to battery source and retransfer to normal.
- 3. Report results in writing.
- E. Malfunctioning Light Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

#### 3.5 CLEANING AND ADJUSTING

A. Clean light fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

#### 3.6 FIRE-RATED ENCLOSURES

A. The contractor shall provide 5/8" plasterboard minimum, taped box enclosures for all recessed light fixtures in 1 or 2-hour fire-rated ceilings, as required by local building or fire codes. Enclosure to provide minimum 3" air space around light fixture Contractor prior to bid shall verify Architectural drawings and specifications for areas where this provision is applicable.

## 3.7 CEILING TYPES

- A. Refer to Architecture drawings. Provide flange trim where light fixtures are installed in GWB ceilings.
- B. The Contractor prior to submitting shop drawings to the Engineer for review shall review the Architectural drawings to verify and coordinate the ceiling systems and lighting fixture frame requirements as well as proper ballast voltage. Contractor shall provide a written statement with the shop drawing submittal stating this has been completed.

### 3.8 OCCUPANCY SENSORS

- A. Locate ceiling mounted sensors per manufacturer's recommendation and near the center of the room.
- B. Set the time delay to 30 minutes.
- C. Set the sensitivity level to 8.
- D. Test each occupancy sensor to assure each is working properly.

## **END OF SECTION**

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Lighting fixtures will take between 6-8 weeks to arrive on site after the manufacturer receives the purchase order documentation. 6-8 weeks are standard lead times for most off-the-shelf lighting fixtures. Longer times will apply if customization, changes, or special requests are needed. Coordination for fixtures on this project has been done between lighting designer and local sales reps. Contractor and distributor to allow for Seattle Sales Reps to prepare and submit submittal packages for Blanca review, when applicable.

Lighting designer does not specify voltage and emergency lighting requirements, Electrical Engineer and/or Electrical Contractor to define, specify and document. Lighting designer does not design or specify any seismic bracing required for fixtures.

For lighting fixture mounting details refer to details in architectural documentation.

Dimming protocol is 0-10V to 1%, unless otherwise noted (U.O.N.).

All standard finishes, U.O.N. All 90 CRI minimum.

Refer to Project Manual for specification sections defining Interior and Exterior Lighting System Components. Refer to issued lighting fixture cuts for manufacturer's catalog pages. Lighting Manufacturer updates their catalog pages often. Contractor to verify that the most updated fixture cut is used in the submittal process. Please submit shop drawings as requested within fixture descriptions for approval as part of submittal process.

For all installation related information refer to manufacturer's published instructions.

Some fixtures will require aiming and high-end trimming after install at the direction of the lighting designer. The aiming and dimming settings of lighting fixtures shall occur after dark when daylight prevents accurate evaluation of lighting system performance. The Contractor shall provide all necessary personnel and equipment for aiming and adjusting of light fixtures, and programming of lighting control systems.

All recessed fixtures to be installed in existing grid ceilings Electrical Contractor to coordinate existing conditions and determine appropriate ceiling mounting gear.

All LED luminaires are integrated LED Fixtures with a dedicated LED light source, U.O.N. "L"=LED fixture, "XL"= Exterior LED



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Type Rev.	Description	Mfr.	Catalog	Source	Fixture Watts	Dim.	Location
INTE	<u> </u>					,	
L1	Linear recessed downlight. Fixture to be constructed out of extruded aluminum with a TBD finish. Fixture to measure 3/16" wide x 31/4" tall x various lengths as per drawings. Fixture to have flat lens and mount to edge of grid.	Axis	B2SQRLED-600- 80-30-BW- LENGTH PER PLANS-DMLED-W- UNV-DP-1- T(MOUNTING)	600lm/ft 3000K 80CRI	6 w-ft	0-10V to 1%	Various locations
L2	Recessed 2x2 downlight with regressed lens. Fixture to be constructed out of die formed cold rolled steel with a 0.125" PMMA satin blend lens and a white finish. Fixture to measure 2' wide x 2' length x 5 9/16" tall.	Axis	SKPA-22-3500-80- 30-SO-RE-W-UNV- DP-1- T(MOUNTING)-FW	3500lm 3000K 80CRI	33	0-10V to 1%	Various locations
L3	Linear recessed downlight in shape of square. Fixture to be constructed out of extruded aluminum with an extruded acrylic lens and a white finish. Fixture to measure 3/16" wide x 31/4" tall x exact configuration sizes as per drawings. Fixture to have 1" dropped lens and mount to edge of grid. Fixture to be provided with 90 degree corner and all parts and pieces required for a functional system in the configuration shown.	Axis	B2SQRLEDPAT-S- LENGTH PER PLANS-OPR-600- 80-30-1M-NL-W- UNV-DP-1-T(XX)	600lm/ft 3000K 80CRI	6 w-ft	0-10V to 1%	First Floor Stacks



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Type Rev.	Description	Mfr.	Catalog	Source	Fixture Watts	Dim.	Location
L3A	Linear recessed downlight. Fixture to be constructed out of extruded aluminum with an extruded acrylic lens and a white finish. Fixture to measure 3/16" wide x 31/4" tall x various lengths as per drawings. Fixture to have 1" dropped lens and mount to edge of grid.	Axis	B2SQRLED-600- 80-30-1M-LENGTH- W-UNV-DP-1- T(MOUNTING)	600lm/ft 3000K 80CRI	6 w-ft	0-10V to 1%	First Floor Stacks
L4	2x2 recessed downlight with dropped lens. Fixture to be constructed out of extruded aluminum with a frosted acrylic lens. Fixture housing to measure 23 13/16" wide x 23 13/16" length x 4 5/6" tall. Fixture to have a 1" dropped lens.	Axis	SKFLED-22-1700- 80-30-1SF-W-UNV- DP-1- T(MOUNTING)	1300lm 3000K 80CRI	32	0-10V to 1%	Various Locations
L4A	2x2 recessed downlight with dropped lens. Fixture to be constructed out of extruded aluminum with a frosted acrylic lens. Fixture housing to measure 23 13/16" wide x 23 13/16" length x 4 5/6" tall. Fixture to have a 3" dropped lens.	Axis	SKFLED-22-1700- 80-30-3SF-W-UNV- DP-1- T(MOUNTING)	1700lm 3000K 80CRI	32	0-10V to 1%	Various Locations
L4B	2x2 recessed downlight with dropped lens. Fixture to be constructed out of extruded aluminum with a frosted acrylic lens. Fixture housing to measure 23 13/16" wide x 23 13/16" length x 4 5/6" tall. Fixture to have a 5" dropped lens.	Axis	SKFLED-22-1700- 80-30-5SF-W-UNV- DP-1- T(MOUNTING)	1700lm 3000K 80CRI	32	0-10V to 1%	Various Locations



Tacoma Public Library	
Tacoma	
BuildingWorks	Bid Set
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Type Rev.	Description	Mfr.	Catalog	Source	Fixture Watts	Dim.	Location
L4C	2x2 recessed downlight with dropped lens. Fixture to be constructed out of extruded aluminum with a frosted acrylic lens. Fixture housing to measure 23 13/16" wide x 23 13/16" length x 4 5/6" tall. Fixture to have a 7" dropped lens.	Axis	SKFLED-22-1700- 80-30-7SF-W-UNV- DP-1- T(MOUNTING)	1700lm 3000K 80CRI	32	0-10V to 1%	Various Locations
L5	Recessed downlight with 3 1/2" aperture. Fixture to be constructed out of die-cast aluminum with a matte silver flange finish. Fixture to measure 4 1/8" tall x 3 3/4" diameter with a 3 1/2" aperture and a 5" diameter flange. Fixture to have a 60 degree beam spread distribution. Fixture to mount into 2x2 ceiling tile.	Lightheaded	2-120-T-05-SAS- XTM60-30-8315 / D4X-F-T-5-P-VOLT	1500lm 3000K 83CRI	14	0-10V to 1%	Various Locations
L5A	Recessed downlight with 3 1/2" aperture. Fixture to be constructed out of die-cast aluminum with a matte silver flange finish. Fixture to measure 4 1/8" tall x 3 3/4" diameter with a 3 1/2" aperture and a 5" diameter flange. Fixture to have a 60 degree beam spread distribution. Fixture to mount into gyp ceiling.	Lightheaded	2-120-T-05-SAS- XTM60-30-8310 / D4X-F-T-5-P-VOLT	1000lm 3000K 83CRI	10	0-10V to 1%	Various Locations



Tacoma Public Library	
Tacoma	
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Type Rev.	Description	Mfr.	Catalog	Source	Fixture Watts	Dim.	Location
L5B	Recessed downlight with 3 1/2" aperture. Fixture to be constructed out of die-cast aluminum with a matte silver finish. Fixture to measure 4 1/8" tall x 3 3/4" diameter with a 3 1/2" aperture and a 5" diameter flange. Fixture to have a 60 degree beam spread distribution. Fixture to mount into gyp ceiling. Fixture to replace existing recessed downlight and requires a 4.5" hole. L5B to replace existing downlight fixtures contractor to determine ceiling opening dimensions and if any patching is required.	Lightheaded	2-120-T-05-SAS- XTM60-30-8320 / D4X-F-T-7-P-VOLT	2000lm 3000K 83CRI	14	0-10V to 1%	Various Locations
L6	Large decorative pendant downlight. Fixture to be constructed out of a laminated fabric with a TBD finish. Fixture to measure 36" diameter x 12" tall. Bottom of fixture to be various heights to be coordinated with architect. Fixture to be provided with field adjustable aircraft cable.	Barbican	Gear Drum 16-77-36D-12H- HTO-LED72-VOLT- 3000K-ACB- FINISH-90CRI- DB(0-10V)	3000K 90CRI	72	0-10V	Living Room Space



Tacoma Public Library	
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Type Rev.	Description	Mfr.	Catalog	Source	Fixture Watts	Dim.	Location
L6A	Large decorative pendant downlight. Fixture to be constructed out of a laminated fabric with a TBD finish. Fixture to measure 48" diameter x 12" tall. Fixture to be provided with field adjustable aircraft cable. Suspension height to be coordinated with lighting design team.	Barbican	Gear Drum 16-77-48D-12H- HTO-LED72-VOLT- 3000K-ACB- FINISH-90CRI- DB(0-10V)	3000K 90CRI	72	0-10V	Living Room Space
L7	Pendant mounted linear downlight. Fixture to be constructed out of extruded aluminum with a white finish. Fixture to measure 3/16" wide x 31/4" tall x 12' length. Bottom of fixture to be flush with bottom of acoustic baffles. Fixture to be provided with field adjustable cable. Fixture to be provided with a louver.	Axis	B2SQDLED-800- 80-30-L-12-DMLED- FINISH-VOLT-DP- CIR-SUSPENSION	800lm/ft 3000K 80CRI	6	0-10V to 1%	
L7A	Pendant mounted linear downlight. Fixture to be constructed out of extruded aluminum with a white finish. Fixture to measure 3/16" wide x 31/4" tall x 8' length. Bottom of fixture to be flush with bottom of acoustic baffles. Fixture to be provided with field adjustable cable. Fixture to be provided with a louver.	Axis	B2SQDLED-800- 80-30-L-12-DMLED- FINISH-VOLT-DP- CIR-SUSPENSION	800lm/ft 3000K 80CRI	6	0-10V to 1%	
L8	Fixture designated not in use.						



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Type Rev.	Description	Mfr.	Catalog	Source	Fixture Watts	Dim.	Location
L9	Decorative pendant downlight. Fixture to be constructed out of laminated fabric with a TBD finish. Fixture to measure 18" diameter x 8" height. Bottom of TBD AFF. Fixture to be provided with a field adjustable cable. Suspension height to be coordinated with lighting design team.	Barbican	18D-8H-ACB-HTO- LED12-FINISH- VOLT-3000K- 90CRI	3000K 90CRI	12	0-10V	Kids Area
L10	Decorative pendant. Fixture to be constructed out of aluminum with a TBD finish. Fixture to measure 9" tall x 6" diameter with a 4.8" diameter canopy. Bottom of fixture to be 7' 6" AFF. Fixture to be provided with a field adjustable cable. Suspension height to be coordinated with lighting design team.	Pablo	Cielo Plus CIEL PLUS - FINISH	930lm 2700K 91CRI	13	0-10V	Teens Area
L11	Recessed 2x4 downlight. Fixture to be constructed out of cold rolled sheet steel with 0.125" PMMA satin blend. Fixture to measure 2' wide x 4' length x 5 9/16" tall.	Axis	SKPA-24-4000-80- 30-SO-RE-W- VOLT-DP-1- MOUNTING	4000lm 3000K 80CRI	30	0-10V to 1%	Various Locations
L12	Bathroom vanity downlight. Fixture to be constructed out of extruded aluminum with a TBD finish. Fixture to measure 2 1/2" wide 2 1/2" tall x 2' length. Fixture to mount above mirror. Fixture to have direct orientation (see fixture cut for mounting orientation).	Axis	ED2WD-300-80-30- UB-2-FINISH- VOLT-DP-CIR-FL	300lm/ft 3000K 80CRI	4	0-10V to 1%	Restrooms



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Tacoma	
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Type Rev.	Description	Mfr.	Catalog	Source	Fixture Watts	Dim.	Location
L12A	Bathroom vanity downlight. Fixture to be constructed out of extruded aluminum with a TBD finish. Fixture to measure 2 1/2" wide 2 1/2" tall x 4' length. Fixture to mount above mirror. Fixture to have direct orientation (see fixture cut for mounting orientation).	Axis	ED2WD-300-80-30- UB-4-FINISH- VOLT-DP-CIR-FL	300lm/ft 3000K 80CRI	8	0-10V to 1%	Restrooms
L13	Track mounted accent to mount to grid. Fixture to be constructed out of aluminum with a black finish. Fixture to measure 4 13/16" wide x 2 3/4" diameter x 4 3/4" tall. Provide accessory's as specified to be used at lighting designer's aiming session as needed.	A Line	FLX15 A-FLX15-30-60-T- BK-T-H	550lm 3000K 92CRI	15		1st floor Carnegie
T1	Linear recessed rack. Fixture to be constructed out of extruded aluminum with a black finish. Track to measure 5/8" wide x 1 3/8" tall x lengths as shown in drawings.	A Line	ATKLENGTH-BK				
L14	Pendant direct/indirect. Fixture to be constructed out of aluminum and steel with a TBD finish. Fixture to measure 24" diameter x 6.5" tall. Bottom of fixture TBD AFF. Fixture to be provided with a field adjustable cable. Suspension height to be coordinated with lighting design team.	Beta Calco	WARP2P24- LMA0490- LMB0120-CR80- CTA30-UD2-VOLT- DA01-FINISH- CANOPY	Uplight: 1200lm 3000K Downlight: 4900lm 3000K 80+CRI	54	0-10V to 1%	2nd floor Carnegie



Tacoma Public Library	
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Type Rev.	Description	Mfr.	Catalog	Source	Fixture Watts	Dim.	Location
L15	Pendant mounted adjustable accent spotlight. Fixture to be constructed out of extruded aluminum with a TBD finish. Fixture to measure 6" tall x 3" diameter with a 3" tall x 3" diameter canopy. Bottom of fixture before aiming TBD AFF. Fixture to be provided with a field adjustable cable. Provide accessory's as specified to be used at lighting designer's aiming session as needed. Suspension height to be coordinated with lighting design team.	Lightheaded	C3PA-R-6-FINISH- FINISH-B55-30- 9014-P1-VOLT-3C- HC-SL	1400lm 3000K 90CRI	11	0-10V to 1%	Childrens Area
L16	Pendant mounted back of house downlight. Fixture to be constructed out of extruded aluminum with a white finish. Fixture to measure 3/16" wide x 31/4" tall x 8' length. Bottom of fixture to be 10' AFF. Fixture to be provided with field adjustable cable.	Axis	B2SQDLED-800- 80-30-8-DMLED- FINISH-VOLT-DP- CIR-SUSPENSION	800lm/ft 3000K 80CRI	8	0-10V to 1%	
L17	Wall mounted cylinder downlight. Fixture to be constructed out of extruded aluminum with a TBD finish. Fixture to measure 3" diameter x 6" tall x 5.32 projection from wall. Bottom of fixture TBD AFF. Fixture to mount to HVAC unit in vestibule.	Lightheaded	C3W-R-6D-FINISH- FINISH-B55-30- 9014-P-VOLT-HC	1400lm 3000K 80CRI	11	0-10V to 1%	Entrance Vestibule



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Type Rev.	Description	Mfr.	Catalog	Source	Fixture Watts	Dim.	Location
L18	Surface mounted adjustable accent. Fixture to be constructed out of extruded aluminum with a TBD finish. Fixture to measure 3" diameter x 6" tall with a 4.75" diameter x 0.25 tall canopy. Fixture to mount to center of ceiling tile.	•	C3SA-R-6-FINISH- FINISH-60-30-8315- P-VOLT-3C		10	0-10V to 1%	Various Locations
L19	Undercabinet downlight. Fixture to be constructed out of extruded aluminum. Fixture to measure 1" wide x 1.3" tall. Fixture segment lengths to install full length of the cabinetry to be determined as per cabinetry structure. Electrical Contractor to coordinate with cabinetry maker to determine fixture install and cabling.	Liteline	LEDBAR-CCT LEGNTH-30	315lm/ft 3000K 80CRI	5	0-10V to 1%	Workshop



Tacoma Public Library	
Tacoma	Type:
BuildingWork	Bid Set
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Lighting fixtures will take between 6-8 weeks to arrive on site after the manufacturer receives the purchase order documentation. 6-8 weeks are standard lead times for most off-the-shelf lighting fixtures. Longer times will appl if customized, changes, or special requests are needed.

Lighting designer does not specify voltage and emergency lighting requirements, Electrical Engineer and/or Electrical Contractor to define, specify and document.

For multifamily projects, fixture efficacy required by local energy code is XXX

For lighting fixture mounting details refer to details in architectural documentation.

Dimming protocol is 0-10V TO 1%, unless otherwise noted (U.O.N.).

All standard finishes, U.O.N.

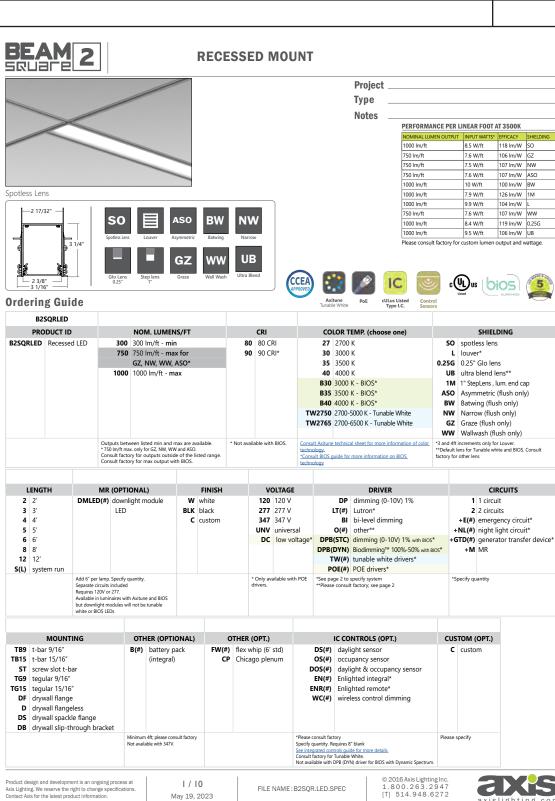
All sources to be LED and 90 CRI minimum.

Refer to Project Manual for specification sections defining Interior and Exterior Lighting System Components Refer to issued lighting fixture cuts for manufacture 's catalog pages. Lighting Manufacturer updates their catalog pages often. Contractor to verify that the most updated fixture cut is used in the submittal process.

For all installation related information refer to manufacturer's published instructions.



Tacoma Public Library	
Tacoma	Type: L1
BuildingWork	Bid Set
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Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

May 19, 2023

Tacoma Public Library	
Tacoma	Type: L1
BuildingWork	Bid Set
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#### RECESSED MOUNT

#### SPECIFICATIONS

#### CONSTRUCTION

Extruded aluminum (0.080" nominal) Housing

Up to 70% recycled content

**End Cap** Cast aluminum

Interior Brackets Die formed sheet steel (20 gauge)

White powder coated sheet steel (22 gauge) Reflectors Louvers Die formed semi-specular aluminum (22 gauge)

Extruded acrylic (0.070" nominal) Lenses

#### • ELECTRICAL

Lutron driver\* LDE1 - Hi-lume 1% EcoSystem with Soft-on, Fade-to-

Black \*Consult factory

Other drivers\*\* DALI - Digital Addressable Lighting Interface

DMX - Digital Multiplex Xitanium SR - For wireless sensor

BIOS STC - BIOS control 0-10V with static spectrum and BIOS DPB drivers\*

SkyBlue enabled from 100% to 1%

DYN- BIOS control 0-10V with dynamic spectrum and BIOS SkyBlue® with Bio-Dimming™ enabled 100% to 50%, light

output dimming from 49% to 1%.

**Tunable White** DALIDT6 - DALI Type 6 (Two DALI Addresses)
DALIDT8 - DALI Type 8 ( One DALI Address)
LTTW - Lutron T-Series Tunable White TW drivers'

**Power over Ethernet MOLEX** POE drivers

UL2108 certified for SMARTENGINE integral or remote driver O - Other (Consult factory)

Integral emergency battery pack **Emergency** 

or emergency circuit optional.

Input Voltage 120V, 277V, 347V, UNV, DC.

Flex Whip Shipped in a separate box for contractors to install

#### \*Choose driver from available options.

1 Incorporating these components may have limitations or affect the length of the luminaire. Please contact factory for more details.

#### • SYSTEM (S#)

BEAM2 SQUARE linear systems, with the use of a strong profile, allow for a nearly hair thin connection system of continuous runs. Lengths of 4', 8', 12' as well as custom lengths are available. Runs of BEAM2 SQUARE that are greater than 12' in length are designated as systems (S#). This means that the run is comprised of a combination of 4', 8' and/or 12' sections to be assembled on site using our joining system. For more information on systems and joining, please refer to the BEAM installation sheets available for download at www.axislighting.com.

#### WARRANTY

Axis Lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications. If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

#### OPTICS











#### **ULTRA BLEND LENS**

Frosted acrylic snap-in micro lens suitable for Tunable White and BIOS applications.

Frosted acrylic snap-in micro lens. Used for SO, ASO, BW, NW, GZ and WW shielding options.

#### LED SYSTEM

CCT Single

Color

CRI Minimum 80 or 90 color rendering index.

CRI BIOS Minimum 80 color rendering index with R9>75 for all CCTs.

Choice of 2700K, 3000K, 3500K and 4000K color temperature with a great color consistency (within 3-step MacAdam ellipse). Both within

fixture and fixture to fixture.

CCT BIOS BIOS Static (STC) Choice of 3000K, 3500K and

4000K.

BIOS SkyBlue® Dynamic (DYN) Choice of 3000K, 3500K, and 4000K with Bio-Dimming™

Consult BIOS guide for more information on BIOS technology.

CCT Axitune Systems

Consult Axitune technical sheet for more information on color technology

LED life Minimum 50.000h with 85% of lumen

maintenance in 25°C ambient temperature. in compliance with IES LM-80 testing

measurements.

Thermal Aluminum housing acting as the heat sink to Management

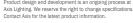
Dry and damp rated in operating ambient

temperatures of 0-40°C (32-104F).

#### APPROVALS

Environment

Meets CCEC requirements (Chicago plenum)



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FILE NAME: B2SOR, LED, SPEC





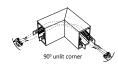
Tacoma Public Library	
Tacoma	Type: L1
BuildingWork	Bid Set
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## BEAM

#### **RECESSED MOUNT**

#### CORNERS

Unlit Corners - BEAM 2 SQUARE features a multitude of layout patterns with the use of a number of corners, 90° corner, T or X junctions.









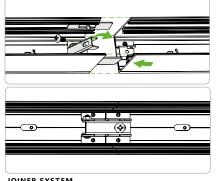
Lit Corners - Axis also offers lit 90° corners including ceiling to ceiling, wall to ceiling and ceiling to wall.



<sup>\*</sup>For StepLens please consult factory.

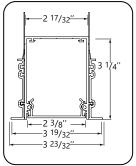
#### JOINERS

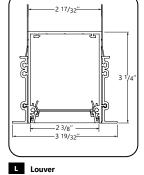
BEAM 2 SQUARE has steel joiners with wedge alignment for easy installation.

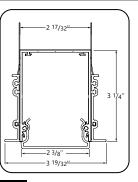


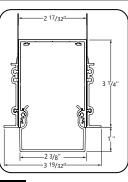
JOINER SYSTEM

#### • OPTIC SECTION VIEWS









0.25G 0.25" Glo lens

1M 1" Step lens

Spotless lens Batwing lens Asymmetric lens Wall Wash lens Narrow lens Ultra Blend lens Graze lens

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

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FILE NAME: B2SQR.LED.SPEC





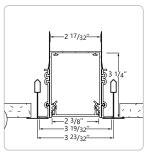
<sup>\*</sup>Consult the pattern spec sheet for more details.

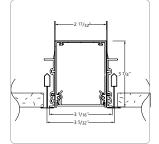
Tacoma Public Library	
Tacoma	Type: L1
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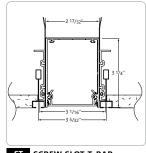


#### **RECESSED MOUNT**

#### • TB CEILING MOUNTING OPTIONS



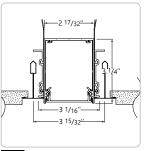


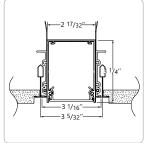


TB15 15/16" T-BAR

TB9 9/16" T-BAR

ST SCREW SLOT T-BAR



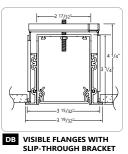


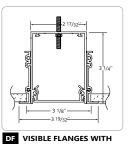
TG15 15/16" TEGULAR

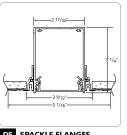
TG9 9/16" T-TEGULAR

## DRYWALL CEILING MOUNTING OPTIONS









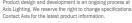
1/4-20 STUD MOUNTING

DS SPACKLE FLANGES

#### • OTHER MOUNTING OPTIONS

BEAM 2 SQUARE is also available with pendant, surface and wall mounted options.

• Specification sheets and installation sheets for all mountings for BEAM 2 SQUARE LED luminaires are available for download at www.axislighting.com



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FILE NAME: B2SQR.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L1
BuildingWork	Bid Set
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## SQUALE

#### **RECESSED MOUNT**

#### DMLED MODULE

Blank **LED Module**  Extruded aluminum (0.075" nominal)

2" diameter

Quantity For every 4' section, there may be up to a maximum of 4 x DMLED module. Spacing Each DMLED module is placed centered

on a blank section 6" in length.

For a series of modules within a given section length, they will be spaced evenly

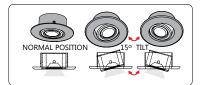
on a longer blank section.

Custom spacing may be available on

special request.

Tilt

15° each side.

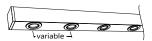












**Beam Angle** 30 nominal degrees

Input Watts Nominal Lumens

126 lumens Efficacy 42 lumens per watt Color Rendering Index (CRI)

25,000 hours at L<sub>70</sub> Life

Correlated color temperature (CCT) 3000K

More options are available upon request. Please consult factory.



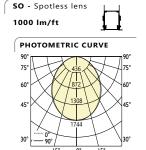


Tacoma Public Library	
Tacoma	Type: L1
BuildingWork	Bid Set
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# BEAM

#### **RECESSED MOUNT**

#### PHOTOMETRIC DATA



Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 34 W Efficacy: 118 lm/W
IES FILE: B2SQRLED-1000-80-35-SO-4-W.IES

TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION				
		Horizontal Angles			
Vertical Angle	0	22.5	45	67.5	90
0	1742	1742	1742	1742	1742
5	1731	1723	1720	1717	1713
15	1637	1620	1598	1581	1577
25	1462	1433	1397	1361	1347
35	1224	1190	1141	1096	1079
45	956	926	876	828	810
55	690	666	623	581	569
65	442	424	395	367	358
75	227	216	203	187	183
85	63	57	51	44	44
90	3	3	3	3	3

ZONAL LUMENS	
	Lumens
Zone	
0	
0-10	164
10-20	456
20-30	656
30-40	734
40-50	699
50-60	580
60-70	412
70-80	230
80-90	69
90	

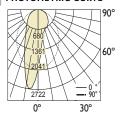
LUMINANCE DATA (cd/m²)				
	Hoi	Horizontal Angles		
Vertical Angle	0	45	90	
45	18485	16928	15660	
55	16438	14844	13550	
65	14298	12780	11567	
75	11985	10694	9680	
85	9901	8012	6837	

**GZ** - Graze lens

750 lm/ft



#### PHOTOMETRIC CURVE



Lumen/ft down: 750 lm/ft Total Lumens: 3212 lm (for 4ft) Input Watts: 30.3 W

Efficacy: 106 lm/W IES FILE: B2SQRLED-750-80-35-GZ-4.IES TESTED ACCORDING TO IES LM-79-2008

CANDELA	DISTRIBUTION
---------	--------------

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	2031	2031	2031	2031	2031
5	1991	1684	1471	1348	1323
15	1861	1159	893	809	795
25	1634	850	705	694	700
35	1349	668	620	632	639
45	1038	535	520	524	532
55	715	406	395	411	429
65	410	267	267	294	314
75	176	135	140	161	173
85	31	27	29	32	31
90	2	2	2	- 1	1

ZONAL	LUMENS
	Lumens

	Lumens
Zone	
0	
0-10	188
10-20	450
20-30	550
30-40	562
40-50	519
50-60	432
60-70	308
70-80	164
80-90	39
90	

#### LUMINANCE DATA (cd/m²)

	Horizontal Angles			
Vertical Angle	0	45	90	
45	20205	10119	10356	
55	17175	9493	10294	
65	13348	8695	10246	
75	9356	7446	9220	
85	4845	4659	4847	

• All IES files for other lamping are available for download at: www.axislighting.com

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

6/10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC



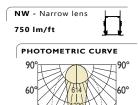


Tacoma Public Library	
Tacoma	Type: L1
BuildingWork	Bid Set
	8/4/23

## BEAM 2

#### **RECESSED MOUNT**

#### PHOTOMETRIC DATA



0° Lumen/ft down: 750 lm/ft Total Lumens: 3225 lm (for 4ft) Input Watts: 30.1 W

Efficacy: 107 Im/W
IES FILE: B2SQRLED-750-80-35-NW-4.IES
TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION					
		Hori	zontal A	ngles		
Vertical Angle	0	22.5	45	67.5	90	
0	2458	2458	2458	2458	245	

8					
0	2458	2458	2458	2458	2458
5	2440	2405	2313	2224	2197
15	2258	1979	1546	1303	1239
25	1925	1464	1019	868	838
35	1497	1066	753	686	678
45	1058	773	581	554	555
55	684	540	429	424	430
65	394	337	285	290	299
75	180	163	148	154	160
85	33	33	33	32	32
90	2	2	I	ı	ı

ZONAL	LUMENS
	Lumens
Zone	

	Lumens
Zone	
0	
0-10	207
10-20	453
20-30	538
30-40	556
40-50	519
50-60	433
60-70	310
70-80	167
80-90	41
90	

## LUMINANCE DATA (cd/m²)

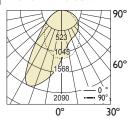
Vertical Angle	Horizontal Angles					
	0	45	90			
45	20605	11314	10803			
55	16414	10308	10324			
65	12851	9298	9742			
75	9563	7852	8515			
85	5141	5207	4984			

#### ASO - Asymmetric lens

750 lm/ft



_	_	_		_					_
P	н	ЭΤ	40	1E:	TR	ıc	cu	JRV	Е



Lumen/ft down: 750 lm/ft Total Lumens: 3247 lm (for 4ft) Input Watts: 30.3 W Efficacy: 107 lm/W IES FILE: TB2DLED-750-80-35-ASO-4.IES

IES FILE: TB2DLED-750-80-35-ASO-4.IES TESTED ACCORDING TO IES LM-79-2008

# CANDELA DISTRIBUTION Horizontal Angles Vertical 0 22 5 45 47 5

Angle	0	22.5	45	67.5	90
0	1243	1243	1243	1243	1243
5	1219	1137	1078	1043	1033
15	1135	937	852	822	815
25	977	77 I	732	734	738
35	780	635	642	670	684
45	585	510	534	572	596
55	410	382	402	467	508
65	259	249	269	347	386
75	131	127	142	194	214
85	27	27	33	40	38

2 3 3

2 2

## ZONAL LUMENS

	Lumens
Zone	
0	
0-10	119
10-20	356
20-30	572
30-40	651
40-50	578
50-60	455
60-70	313
70-80	164
80-90	39
90	

## LUMINANCE DATA (cd/m²)

	Horizontal Angles						
Vertical Angle	0	45	90				
45	11389	10400	11612				
55	9845	9647	12205				
65	8439	8765	12564				
75	6987	7563	11380				
85	4291	5165	5927				

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7 / I0 May 19, 2023

FILE NAME: B2SQR.LED.SPEC





Tacoma Public Library	_
Tacoma	Type: L1
BuildingWork	Bid Set
	8/4/23

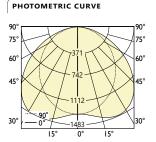
ZONAL LUMENS

# BEAM 2

#### **RECESSED MOUNT**

#### PHOTOMETRIC DATA





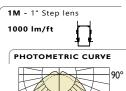
Lumen/ft 1000 lm/ft Luminaire Lumens: 4000 lm Input Watts: 40.1 W Efficacy: 100 lm/W IES FILE: B2SQDLED-1000-80-35-BW-4.IES

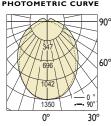
IES FILE: B2SQDLED-1000-80-35-BW-4.IES
TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION

	Horizontal Angles					Lumens	
Vertical Angle	0	22.5	45	67.5	90	Zone	
0	1166	1166	1166	1166	1166	0	
5	1158	1163	1174	1185	1190	0-10	112
15	1097	1131	1209	1291	1325	10-20	343
25	981	1052	1233	1404	1460	20-30	565
35	831	928	1179	1399	1467	30-40	721
45	669	773	1045	1207	1245	40-50	760
55	505	591	792	918	942	50-60	671
65	342	398	522	599	611	60-70	491
75	180	205	266	299	303	70-80	268
85	38	46	59	62	63	80-90	68
90	3	3	3	3	3	90	

LUMINANCE DATA (cd/m²)					
	Horizontal Angles				
Vertical Angle	0	45	90		
45	12934	20196	24063		
55	12031	18869	22435		
65	11071	16882	19744		
75	9513	14052	16015		
85	5950	9261	9810		





Lumen/ft down: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 31.7 W Efficacy: 126 lm/W IES FILE: TB2LED-750-80-35-1M-4.IES

TESTED ACCORDING TO IES LM-79-2008

	CANDELA	DISTRIBUTION	
٠.	1		

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1388	1388	1388	1388	1388
5	1377	1374	1374	1371	1373
15	1297	1292	1281	1268	1265
25	1147	1140	1121	1099	1093
35	947	947	931	917	914
45	725	739	744	747	750
55	513	542	573	592	598
65	325	370	418	446	453
75	171	224	283	315	321
85	57	115	177	206	212
90	16	77	139	169	173
95	15	70	127	155	159
105	12	57	100	132	137
115	П	42	80	102	112
125	8	31	65	85	95

ZONAL	LUMENS
	Lumens

Zone	
0	
0-10	131
10-20	365
20-30	525
30-40	595
40-50	585
50-60	518
60-70	413
70-80	292
80-90	181
90	
90-100	120
100-110	96
110-120	71
120-130	52
130-140	
140-150	
150-160	
160-170	
170-180	58
180	

## LUMINANCE DATA (cd/m²)

	Horizontal Angles			
Vertical Angle	0	45	90	
45	12846	6088	5113	
55	10826	4636	3936	
65	8796	3450	2971	
75	6739	2461	2161	
85	4405 1671 150			

1 All IES files for other lamping are available for download at: www.axislighting.com

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8 / I0 May 19, 2023

FILE NAME: B2SQR.LED.SPEC

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page 9 of 123

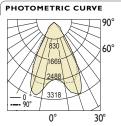
Tacoma Public Library	
Tacoma	Type: L1
BuildingWork	Bid Set
	8/4/23



#### **RECESSED MOUNT**

#### PHOTOMETRIC DATA





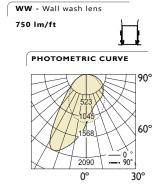
Lumen/ft: 1000 lm/ft Total Lumens: 4083 lm (for 4ft) Input Watts: 39.4 W Efficacy: 104 lm/W
IES FILE: B2SQRLED-1000-80-35-L-4.IES

TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION						
		Horizontal Angles					
Vertical Angle	0 22.5 45 67.5 90						
0	2341	2341	2341	2341	2341		
5	2475	2467	2440	2410	2380		
15	2605	2674	2911	3062	2978		
25	2280	2566	3119	3162	2970		
35	1584	2021	2389	1676	1444		
45	356	554	809	577	504		
55	41	62	87	170	261		
65	3	4	7	10	9		
75	- 1	- 1	- 1	2	2		
85	0	0	0	0	0		
90	0	0	0	0	0		

	Lumens
Zone	
0	
0-10	240
10-20	818
20-30	1296
30-40	1135
40-50	463
50-60	111
60-70	12
70-80	4
80-90	3
90	

LUMINANCE DATA (cd/m²)					
	Horizontal Angles				
Vertical Angle	0 45 90				
45	8451	19211	11969		
55	1210	2542	7644		
65	127	290	374		
75	45	65	136		
85	39	58	77		



Lumen/ft down: 750 lm/ft Total Lumens: 3247 lm (for 4ft) Input Watts: 30.3 W Efficacy: 107 lm/W
IES FILE: B2SQRLED-750-80-35-WW-4.IES TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION							
	Horizontal Angles						
Vertical Angle	0 22.5 45 67.5 90						
0	1243	1243	1243	1243	1243		
5	1219	1137	1078	1043	1033		
15	1135	937	852	822	815		
25	977	771	732	734	738		
35	780	635	642	670	684		
45	585	510	534	572	596		
55	410	382	402	467	508		
65	259	249	269	347	386		
75	131	127	142	194	214		
85	27	27	33	40	38		
90	2	3	3	2	2		

ZONAL LUMENS			
	Lumens		
Zone			
0			
0-10	119		
10-20	356		
20-30	572		
30-40	651		
40-50	578		
50-60	455		
60-70	313		
70-80	164		
80-90	39		
90			

LUMINANCE DATA (cd/m²)						
	Horizontal Angles					
Vertical Angle	0	45	90			
45	11389	10400	11612			
55	9845	9647	12205			
65	8439	8765	12564			
75	6987	7563	11380			
85	4291	5165	5927			

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9/10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC



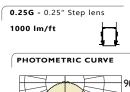


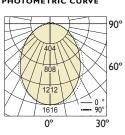
Tacoma Public Library	_
Tacoma	Type: L1
BuildingWork	Bid Set
	8/4/23



#### **RECESSED MOUNT**

#### • PHOTOMETRIC DATA





Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 33.7 W Efficacy: 119 lm/W IES FILE: B2SQRLED-1000-80-35-0.25G-4.IES

TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION										
	Horizontal Angles										
Vertical Angle	0 22.5 45 67.5 90										
0	1614	1614	1614	1614	1614						
5	1606	1603	1600	1597	1594						
15	1517	1506	1494	1479	1475						
25	1352	1333	1307	1279	1271						
35	1126	1109	1075	1039	1026						
45	877	864	832	799	788						
55	631	624	606	582	574						
65	405	408	405	396	394						
75	210	223	237	243	245						
85	63	83	107	122	128						
90	8	30	56	74	80						

8 26 47 63 68

8 125

115

19 37 55 60 48

14 29 41

13 25

40

34

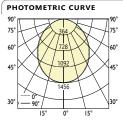
ZONAL	LUMENS
'	Lumens
Zone	
0	
0-10	152
10-20	422
20-30	607
30-40	680
40-50	651
50-60	548
60-70	405
70-80	251
80-90	115
90	
90-100	50
100-110	41
110-120	30
120-130	23
130-140	
140-150	
150-160	
160-170	
170-180	26
180	

LUMINANCE DATA (cd/m²)										
	Horizontal Angles									
Vertical Angle	0	45	90							
45	16952	16086	15230							
55	15036	14439	13678							
65	13081	13087	12734							
75	11075	12505	12937							
85	9910	16784	20013							

**UB -** Ultra Blend Lens

1000 lm/ft





Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 37.8 W Efficacy: 106 lm/W
IES FILE: B2SQRLED-1000-80-35-UB-4.IES

TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION											
	Horizontal Angles										
Vertical Angle	0 22.5 45 67.5 90										
0	1456	1456	1456	1456	1456						
5	1449	1448	1448	1447	1447						
15	1390 I	1386	1382	1384	1387						
25	1274	1269	1279	1290	1290						
35	1114	1113	1129	1128	1128						
45	921	932	937	926	922						
55	708	720	713	70 I	697						
65	480	491	480	47 I	470						
75	262	267	263	260	260						
85	80	78	75	71	71						
90	5	3	3	3	3						

ZONAL LUMENS					
	Lumens				
Zone					
0					
0-10	137				
10-20	391				
20-30	587				
30-40	698				
40-50	712				
50-60	632				
60-70	475				
70-80	280				
80-90	86				
90					

LUMINANCE DATA (cd/m²)									
	Horizontal Angles								
Vertical Angle	0	90							
45	16697	16972	16713						
55	15808	15937	15574						
65	14563	14560	14240						
75	12982	13027	12878						
85	11800	10987	10492						

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10 / 10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L2
BuildingWork	Bid Set
	8/4/23

## SkyePlane Regressed 2x2

## Recessed T-Bar & Drywall



Project \_\_\_\_\_\_

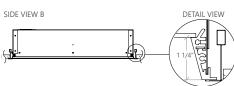
Type \_\_\_\_\_
Notes \_\_\_\_\_

PERFORMANCE AT 3500K

NOMINAL LUMEN OUTPUT	INPUT WATTS	EFFICACY				
3500 lm	33.06 W*	106 lm/W				
+ Daniel and 1.1 fact localization colors and distant						

Based on a 1x1 foot luminaire using one driver



















### **Ordering Guide**

	КРА		22										so		RE
PRO	DUCT ID	9	IZE		TOTAL NOM. LUMENS		CRI	COLOR TEMP. (choose one)			SHIELDING		SHIELDING POSITION		
SKPA	SkyePlane Regressed	22	2'X2'	3500	2100 lm - Min 3500 lm - Max at 90 CRI 3900 lm - Max at 80 CRI	80 90	80 CRI 90 CRI*	35 40 B30 B35	3000 K 3500 K 4000 K 3000 K - BIOS 3500 K - BIOS 4000 K - BIOS	TW2765 BTW3527 BTW4027	2700-5000 K - Tunable White 5 2700-6500 K - Tunable White 7 3500-2700 K - Tunable BIOS 7 4000-2700 K - Tunable BIOS	so	spotless lens	RE	regressed
				Consult fa	etween listed min and max are available. ttory for outputs outside of the listed range. ttory for max output with BIOS		* Not available Consult Asitune technical sheet for more information on color technology, with BIOS.  **Consult BIOS guide for more information on BIOS technology.**								
	w														

	W										
DO	DOOR FINISH VOLTAGE		DRIVER		CIRCUITS			UNTING/SUSPENSION	BA	BATTERY (OPTIONAL)	
W	white	277 347 UNV	120 V 277 V 347 V universal low voltage*	DPB(STC) DPB(DYN) TW(#)	dimming (0-10V) 1% Lutron bi-level dimming other** dimming (0-10V) 1% with BIOS* Bio-dimming** 100%-81% with BIOS* tunable white drivers* POE drivers*	+E(#) +NL(#) +GTD(#)	1 circuit emergency section* night light section* generator transfer device*	TB15 ST TG9 TG15	t-bar 9/16" t-bar 15/16" screw slot t-bar tegular 9/16" tegular 15/16" drywall flange	B(#)	battery pack
	* Only available with POE drivers.				* Specify quantity				Please	consult factory	

OTHE	R (OPTIONAL)		IC CONTROL (OPTIONAL)	CUS	TOM (OPTIONAL)
	flex whip (6' std) chicago plenum	OS(#) DOS(#) EN(#) ENR(#)	DS(#) daylight sensor OS(#) occupancy sensor DOS(#) daylight & occupancy sensor EN(#) enlighted integral* ENR(#) enlighted remote* WC(#) wireless control dimming		custom
		Consult factory f	actory ontrols guide for more details, or Tunable White. h DPB (DYN) driver for BIOS with Dynamic Spectrum	Please s	pecify

SPECIFY DRIVER NAME (if needed)

SPECIFY BATTERY NAME (if needed)

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I / 4 May 24, 2023

FILE NAME:SkyePlane-22-Regressed.SPEC





Tacoma Public Library	
Tacoma	Type: L2
BuildingWork	Bid Set
	8/4/23

# SkyePlane Regressed 2x2

# Recessed T-Bar & Drywall

• ELECTRICAL Lutron driver

LDE1 - Hi-lume 1% EcoSystem with Soft-on, Fade-to-

Other drivers\*\* DALI - Digital Addressable Lighting Interface

DMX - Digital Multiplex Xitanium SR - For wireless sensor

BIOS DPB drivers\* STC - BIOS control 0-10V with static spectrum and BIOS SkyBlue enabled from 100% to 1%.

DYN - BIOS control 0-10V with dynamic spectrum and BIOS SkyBlue® with Bio-Dimming™, which changes spectral qualities by removing the SkyBlue component when dimming from 100% to 81%, while light output remains relatively constant; bio-dimming reduces CCT to 2700K. Dimming from 80% to 1% will then reduce light

DALIDT6 - DALI Type 6 (Two DALI Addresses)
DALIDT8 - DALI Type 8 ( One DALI Address)
LTTW - Lutron T-Series Tunable White Tunable White TW drivers\*

Power over Ethernet MOLEX POE drivers\* IGOR UL2108 certified for **SMARTENGINE** 

integral or remote driver O - Other (Consult factory) **Emergency** Integral emergency battery pack

or emergency circuit optional

Input Voltage 120V, 277V, 347V, UNV, DC.

Flex Whip Shipped in a separate box for contractors to install

\*Choose driver from available options.

1 Incorporating these components may have limitations or affect the length of the luminaire. Please contact factory for more details.

● LED SYSTEM

Color

CRI Minimum 80 or 90 color rendering index.

CRI BIOS

Minimum 80 color rendering index with R9>75 for all CCTs.

**CCT Single** 

Choice of 2700K, 3000K, 3500K and 4000K color temperature with a great color consistency (within 3-step MacAdam ellipse). Both within

fixture and fixture to fixture.

CCT BIOS BIOS Static (STC) Choice of 3000K, 3500K and

> BIOS SkyBlue® Dynamic (DYN) Choice of 3000K, 3500K, and 4000K with Bio-Dimming™ BIOS Tunable White (BTW) Choice of 4000-2700K and 3500-2700K; does not use a

> bio-dimmer, it uses TW drivers, which allow independent control of CCT and intensity; e.g., BTW4027 provides combined SkyBlue + white light at 4000K, SkyBlue is removed at 2700K. Light output can be adjusted for each CCT.

Consult BIOS guide for more information on BIOS technology.

CCT Axitune Systems

Consult Axitune technical sheet for more information on color technology.

LED life

Minimum 50,000h with 85% of lumen maintenance in 25°C ambient temperature, in compliance with IES LM-80 testing

measurements.

Thermal Management Aluminum housing acting as the heat sink to

maximize life.

Environment

Dry and damp rated in operating ambient

temperatures of 0-40°C (32-104F).



oduct design and development is an ongoing process is Lighting. We reserve the right to change specification ontact Axis for the latest product information.

2/4 May 24, 2023

FILE NAME:SkyePlane-22-Regressed.SPEC



Tacoma Public Library	
Tacoma	Type: L2
BuildingWork	Bid Set
	8/4/23

CEILING SYSTEM

# SkyePlane Regressed 2x2

# Recessed T-Bar & Drywall

#### SPECIFICATIONS

#### CONSTRUCTION

Housing Die formed cold rolled sheet steel (20 gauge).

Door frame Extruded aluminum.

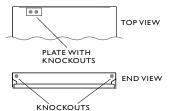
0.125" PMMA satin blend. Lens Reflectors High reflectance post painted.

Drywall Flange Kit Extruded aluminum (0.060" nominal).

Luminaire support Integrated Hold-Down clip

#### • STANDARD AND END MOUNT POWER FEED

Knockouts for BX cable connection are provided both on the top and on the ends of the luminaire. This allows for an end mount power feed solution if it is required. (BX CABLE BY OTHER)



#### WHITE FINISH

Aluminum paint and powder coated

#### WARRANTY

Axis Lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications.

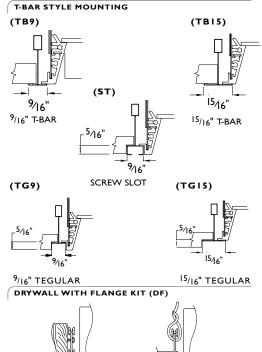
If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

#### APPROVALS

Certified to UL and CSA standards c(UL)us Chicago Plenum Certified (CCEA) Meets NYC requirements Suitable for damp locations. IC Rated (Insulated ceiling)



Drywall with Kit 17.9 lbs / 8.1 kg







WITH WOOD FRAME

WITHOUT WOOD FRAME

DRYWALL MOUNTING KIT - ACCESS FROM ABOVE - AVAILABLE IN TILE INSTALLATION ONLY



FIXTURE DIMENSIONS  $23^{-3}/4$ " ×  $23^{-3}/4$ " CUT HOLE DIMENSIONS

1 Installation sheets for all mounting options are available at: www.axislighting.com





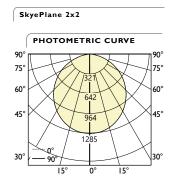


Tacoma Public Library	
Tacoma	Type: L2
BuildingWork	Bid Set
	8/4/23

# SkyePlane Regressed 2x2

Recessed T-Bar & Drywall

● PHOTOMETRIC DATA



CANDELA DISTRIBUTION							ZONAL	LUMENS
		Horiz	zontal A	ngles				Lumens
Vertical Angle	0	22.5	45	67.5	90		Zone	
0	1285	1285	1285	1285	1285		0	
5	1279	1278	1279	1278	1278		0-10	121
15	1227	1227	1229	1228	1227		10-20	347
25	1126	1127	1129	1129	1127		20-30	521
35	989	989	989	991	990		30-40	620
45	821	819	820	822	822		40-50	635
55	630	628	628	630	632		50-60	565
65	421	419	419	422	424		60-70	420
75	207	205	208	208	211		70-80	225
B5	35	35	36	37	37		80-90	50
90	I	- 1	- 1	- 1	- 1		90	

ENS	LUMINA	NCE D	ATA (cd	/m²)
ens		Ho	rizontal An	gles
	Vertical Angle	0	45	90
	45	3449	3446	3455
	55	3262	3251	3273
1	65	2958	2948	2978
7	75	2381	2382	2418
1	85	1199	1236	1270
0				

Total Lumens: 3504 lm Input Watts: 33.06 W Efficacy: 106 lm/W

80 CRI shown. For 90 CRI, divide wattage by 0.8 and multiply efficacy by 0.8. IES FILE: SKPL-22-3500-80-35-SO-RE-W-120-D

TESTED ACCORDING TO IES LM-79-2008

1 All IES files are available for download at: www.axislighting.com



**4 / 4** May 24, 2023

FILE NAME:SkyePlane-22-Regressed.SPEC



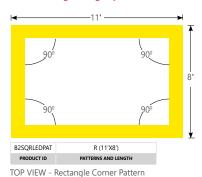
Tacoma Public Library	
Tacoma	Type: L3
BuildingWork	Bid Set
	8/4/23

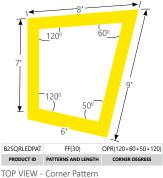
BEAM	2

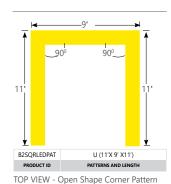
#### **RECESSED MOUNT -REGULAR LIT CORNER PATTERNS**

**Project** Туре \* Please see page 2 for example on how to specify Notes

various right angle patterns.







# IMPORTANT! – all corner patterns must be submitted with drawings indicating dimensions and angles degree.

#### Ordering Guide





	PRO	DDUCT ID			PAT	TERNS (SE	LECT ON	E)			(	ORNER	DEGREES(OPT	.)		LUM	ENS/FT
32SQRLI	EDPAT	Beam 2 Squai Recessed LED	e			shape (length gth) gth) gth)		total p	atten	n length	OPI(#	OPR(#) regular lit corner degrees OPI(#)* inside lit corner degrees* OPO(#)* outside lit corner degrees		rees*	750	300   300   lm/ft - min 750   750   lm/ft - max for GZ, NW, WW, ASO.*   1000   lm/ft - max	
				*Comes in 90 degre		,	FREE FO Minimu	DRM for v m 2'.	arious	angles.	degrees.	Min 30° iilable with	n only. Please confin	I UB direct	available. * 750 lm/ft i	max. only for ou	ed min and max are or GZ, NW, WW and A utputs outside of the
CRI	(	COLOUR TEMP		SHIELDI	NG	SPEC	IFY LENG	STH	F	INISH		VOLTA	.GE			DRIVE	R
80 80 C	CRI	27 2700 K 35 3500 K 30 3000 K 40 4000 K	UB 1M ASO BW NW GZ WW	spotless lens louver* 0.25" Glo len ultra blend len StepLens , lum asymmetric, fli batwing, flush rarrow, flush or wallwash, flush thy available in 3' and 4	s i. end cap ush only only only only only only only only	NL n EX e:	ominal xact			white custom	277 347 UNV	120V 277V 347V univers low volt	age*	LT(#) BI O(#) POE(#)	dimming Lutron <sup>9</sup> bi-level other ** POE dr	dimmir ivers*	ng
1	CIR 1 circu	CUITS	т	MOUNTII 39 t-bar 9/16"		B# batter	TTERY	ections		OT EF end	HER food		CONTROLS (C		.)		OM (OPTIONAL custom
2 +E(#) +NL(#)	2 circu emerg night l		TB TC ce * TG	t-bar 15/16 t-bar 15/16 t-bar 15/16 tegular 9/1 tegular 15/ tegular 15/ drywall flar drywall flar drywall spa	o" t-bar 6" '16" nge ngeless	J. Satter	, poeter T		FW	(#) flex	whip (6' std) ago plenum	OS(# DOS(# EN(# ENR(#	ccupancy s daylight & o f) Enlighted in f) Enlighted re wireless con	ensor ccupancy tegral * mote *			
Specify qua	antity			a., wan spa	ciac nange	Requires 120V Please consult							consult factory grated controls guide	e for more de		Please sp	ecify
is Lighting.\	We reserv	velopment is an ong e the right to chang est product informat	specificatio	ns.	I / 4 May 23, 20			IE:Bear	n2Sc	uareLEC	Recessed LO	© 1	2016 Axis Lighti .800.263.2	ng Inc. 2947			Xis



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Tacoma	Type: L3
BuildingWork	Bid Set
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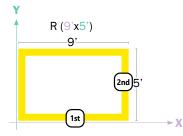


RECESSED MOUNT - REGULAR LIT CORNER PATTERNS

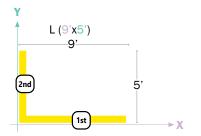
# **How to Specify 90 degree Corners and Patterns**

# **Example**

#### **Defining R - Rectangular shape**

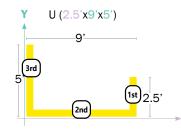


#### **Defining L shape**



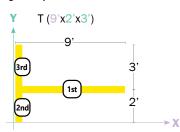
Note: The first number will always define the width, the second - the length.

#### **Defining U shape**



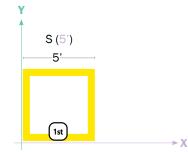
**Note:** The first number will always define the right arm length, the second - the width, and the third - the left arm length.

#### **Defining T shape**



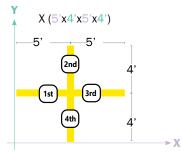
**Note:** The first number will always define the width, the second - the bottom arm length, and the third - the top arm length.

#### **Defining S - Square shape**



**Note:** The number will define the width. (All sides are the same length).

#### **Defining X shape**



**Note:** The first number will define length of the left arm, the second - the arm length to the right from the first, and so on untill the 4th arm.

Axis Lighting. We reserve the right to change specifications. Contact Axis for the latest product information. 2 / 4 May 23, 2023

FILE NAME:Beam2SquareLED Recessed LC





Tacoma Public Library	
Tacoma	Type: L3
BuildingWork	Bid Set
	8/4/23

#### **RECESSED MOUNT -**REGULAR LIT CORNER PATTERNS

#### • LIT CORNER FEATURES

The Lit Corner system allows continuous illumination all the way through the corner section

To optimize corner illumination, lit corners are created as integral components of the linear sections. Linear sections have mitered ends that connect to corresponding mitered ends of neighboring linear sections

Illuminated Corners are more complex. Because the corner is fully illuminated, the corner is not independent of the straight sections, but integrated into the straight segment's housing. The corner is mitered, allowing a seamless line of light.

There are three types of illuminated corner available:

locations required.

- 1. Regular Illuminated Corner This is a fully illuminated 90 degree corner that lies in the same plane, for example, the ceiling or wall
- 2. Inside Illuminated Corner. This corner runs up the wall, then across the ceiling. (Please use the "Inside & Outside lit corner patterns spec sheet" to specify and Inside lit corner).
- 3. Outside Illuminated Corner This corner would run across a ceiling then up a bulkhead. (Please use the "Inside & Outside lit corner patterns spec sheet" to specify and Outside lit corner).

(OPR) Regular lit Corner

TIP: Provide sketches illustrating corner types and

#### • ELECTRICAL

Lutron driver' LDE1 - Hi-lume 1% EcoSystem with Soft-on, Fade-to-

\*Consult factory

Other drivers DALI - Digital Addressable Lighting Interface

O - Other (Consult factory)

DMX - Digital Multiplex

Xitanium SR - For wireless sensor

Power over Ethernet MOLEX POE drivers\* IGOR

(consult factory for more information) UL2108 certified for integral or remote driver Emergency

Integral emergency battery pack or emergency circuit optional.

Input Voltage 120V, 277V, 347V, UNV.

1 Incorporating these components may have limitations or affect the length of the luminaire. Please contact factory for more details.

#### LED SYSTEM

CRI Minimum 80 or 90 color rendering index.

Choice of 2700K, 3000K, 3500K and 4000K color CCT

temperature with a great color consistency (within 3-step MacAdam ellipse). Both within

fixture and fixture to fixture.

LED life Minimum 50,000h with 85% of lumen

maintenance in 25°C ambient temperature, in compliance with IES LM-80 testing

measurements.

**Thermal** Aluminum housing acting as the heat sink to Management

maximize life.

**Environment** Dry and damp rated in operating ambient

temperatures of 0-40°C (32-104F).

Flex Whip Shipped in a separate box for contractors to install

#### WARRANTY

Axis Lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications. If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

#### APPROVALS

Certified to UL and CUL standards One Meets NYC requirements Meets ADA requirements. Suitable for damp locations.

(OPO) Outside lit Corner

Axis Lighting. We reserve the right to change sp Contact Axis for the latest product information.

3 / 4 May 23, 2023

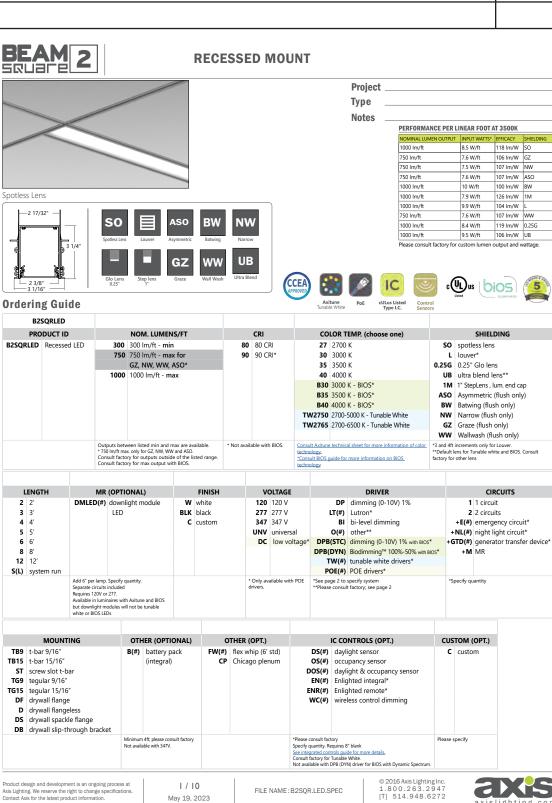
(OPI) Inside lit Corner

FILE NAME:Beam2SquareLED Recessed LC





Tacoma Public Library	
Tacoma	Type: L3A
BuildingWork	Bid Set
	8/4/23





May 19, 2023

Tacoma Public Library		
Tacoma	Type: L3A	
BuildingWork		Bid Set
		8/4/23

#### RECESSED MOUNT

#### SPECIFICATIONS

#### CONSTRUCTION

Extruded aluminum (0.080" nominal) Housing

Up to 70% recycled content

**End Cap** Cast aluminum

Interior Brackets Die formed sheet steel (20 gauge)

White powder coated sheet steel (22 gauge) Reflectors Louvers Die formed semi-specular aluminum (22 gauge)

Extruded acrylic (0.070" nominal) Lenses

#### • ELECTRICAL

Lutron driver\* LDE1 - Hi-lume 1% EcoSystem with Soft-on, Fade-to-

Black \*Consult factory

Other drivers\*\* DALI - Digital Addressable Lighting Interface

DMX - Digital Multiplex Xitanium SR - For wireless sensor

BIOS STC - BIOS control 0-10V with static spectrum and BIOS DPB drivers\*

SkyBlue enabled from 100% to 1%

DYN- BIOS control 0-10V with dynamic spectrum and BIOS

SkyBlue® with Bio-Dimming™ enabled 100% to 50%, light

output dimming from 49% to 1%. **Tunable White** 

DALIDT6 - DALI Type 6 (Two DALI Addresses)
DALIDT8 - DALI Type 8 ( One DALI Address)
LTTW - Lutron T-Series Tunable White TW drivers'

#### **Power over Ethernet MOLEX** POE drivers

UL2108 certified for SMARTENGINE integral or remote driver O - Other (Consult factory)

Integral emergency battery pack **Emergency** 

or emergency circuit optional.

Input Voltage 120V, 277V, 347V, UNV, DC.

Flex Whip Shipped in a separate box for contractors to install

#### \*Choose driver from available options.

1 Incorporating these components may have limitations or affect the length of the luminaire. Please contact factory for more details.

#### • SYSTEM (S#)

BEAM2 SQUARE linear systems, with the use of a strong profile, allow for a nearly hair thin connection system of continuous runs. Lengths of 4', 8', 12' as well as custom lengths are available. Runs of BEAM2 SQUARE that are greater than 12' in length are designated as systems (S#). This means that the run is comprised of a combination of 4', 8' and/or 12' sections to be assembled on site using our joining system. For more information on systems and joining, please refer to the BEAM installation sheets available for download at www.axislighting.com.

#### WARRANTY

Axis Lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications. If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

#### OPTICS











#### **ULTRA BLEND LENS**

Frosted acrylic snap-in micro lens suitable for Tunable White and BIOS applications.

Frosted acrylic snap-in micro lens. Used for SO, ASO, BW, NW, GZ and WW shielding options.

#### LED SYSTEM

CCT Single

Color

CRI Minimum 80 or 90 color rendering index.

CRI BIOS Minimum 80 color rendering index with R9>75 for all CCTs.

Choice of 2700K, 3000K, 3500K and 4000K color temperature with a great color consistency (within 3-step MacAdam ellipse). Both within

fixture and fixture to fixture.

CCT BIOS BIOS Static (STC) Choice of 3000K, 3500K and

4000K.

BIOS SkyBlue® Dynamic (DYN) Choice of 3000K, 3500K, and 4000K with Bio-Dimming™

Consult BIOS guide for more information on BIOS technology.

CCT Axitune Systems

Consult Axitune technical sheet for more information on color technology

LED life Minimum 50.000h with 85% of lumen

maintenance in 25°C ambient temperature. in compliance with IES LM-80 testing

measurements.

Thermal Management

Aluminum housing acting as the heat sink to

Dry and damp rated in operating ambient

temperatures of 0-40°C (32-104F).

#### APPROVALS

Environment

Meets CCEC requirements (Chicago plenum)

txis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

2 / 10 May 19, 2023

FILE NAME: B2SOR, LED, SPEC

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page 20 of 123

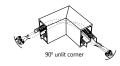
Tacoma Public Library	
Tacoma	Type: L3A
BuildingWork	Bid Set
	8/4/23

# BEAM

#### **RECESSED MOUNT**

#### CORNERS

Unlit Corners - BEAM 2 SQUARE features a multitude of layout patterns with the use of a number of corners, 90° corner, T or X junctions.









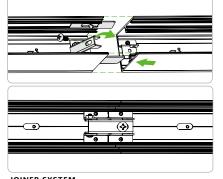
Lit Corners - Axis also offers lit 90° corners including ceiling to ceiling, wall to ceiling and ceiling to wall.



<sup>\*</sup>For StepLens please consult factory.

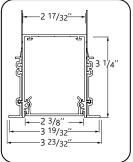
#### JOINERS

BEAM 2 SQUARE has steel joiners with wedge alignment for easy installation.

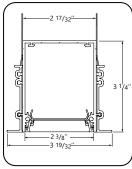


JOINER SYSTEM

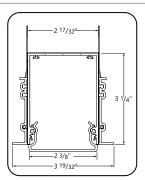
#### • OPTIC SECTION VIEWS



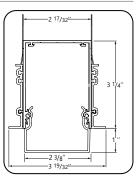




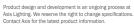




0.25G 0.25" Glo lens



1M 1" Step lens



3 / 10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC



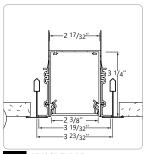


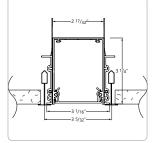
<sup>\*</sup>Consult the pattern spec sheet for more details.

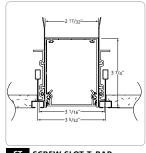
Tacoma Public Library	
Tacoma	Type: L3A
BuildingWork	Bid Set
	8/4/23

#### **RECESSED MOUNT**

#### • TB CEILING MOUNTING OPTIONS



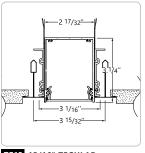


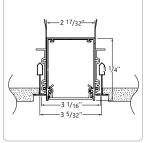


TB15 15/16" T-BAR

TB9 9/16" T-BAR

ST SCREW SLOT T-BAR

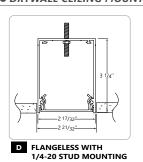


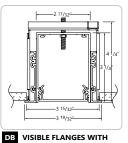


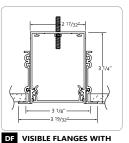
TG15 15/16" TEGULAR

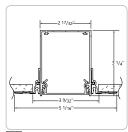
TG9 9/16" T-TEGULAR

#### **• DRYWALL CEILING MOUNTING OPTIONS**









SLIP-THROUGH BRACKET

DF VISIBLE FLANGES WITH 1/4-20 STUD MOUNTING

DS SPACKLE FLANGES

#### • OTHER MOUNTING OPTIONS

BEAM 2 SQUARE is also available with pendant, surface and wall mounted options.

1 Specification sheets and installation sheets for all mountings for BEAM 2 SQUARE LED luminaires are available for download at www.axislighting.com

4/10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L3A
BuildingWork	Bid Set
	8/4/23

# SQUALE

#### **RECESSED MOUNT**

#### DMLED MODULE

Blank **LED Module**  Extruded aluminum (0.075" nominal)

2" diameter

Quantity For every 4' section, there may be up to a maximum of 4 x DMLED module. Spacing Each DMLED module is placed centered

on a blank section 6" in length.

For a series of modules within a given section length, they will be spaced evenly

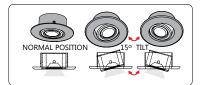
on a longer blank section.

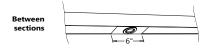
Custom spacing may be available on

special request.

Tilt

15° each side.

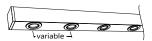








Several in a long blank section



**Beam Angle** 30 nominal degrees

Input Watts Nominal Lumens

126 lumens Efficacy 42 lumens per watt Color Rendering Index (CRI)

25,000 hours at L<sub>70</sub> Life

Correlated color temperature (CCT) 3000K

More options are available upon request. Please consult factory.



Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

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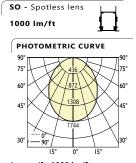
FILE NAME: B2SQR.LED.SPEC

Tacoma Public Library		
Tacoma	Type: L3A	
BuildingWork	Bid S	et
	8/4/2	23

# BEAM 2

#### **RECESSED MOUNT**

#### • PHOTOMETRIC DATA



Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 34 W Efficacy: 118 lm/W
IES FILE: B2SQRLED-1000-80-35-SO-4-W.IES

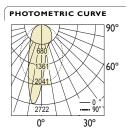
TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION					
	Horizontal Angles					
Vertical Angle	0 22.5 45 67.5 90					
0	1742	1742	1742	1742	1742	
5	1731	1723	1720	1717	1713	
15	1637	1620	1598	1581	1577	
25	1462	1433	1397	1361	1347	
35	1224	1190	1141	1096	1079	
45	956	926	876	828	810	
55	690	666	623	581	569	
65	442	424	395	367	358	
75	227	216	203	187	183	
85	63	57	51	44	44	
90	3	3	3	3	3	

ZONAL LUMENS					
	Lumens				
Zone					
0					
0-10	164				
10-20	456				
20-30	656				
30-40	734				
<b>40-50</b> 699					
50-60	<b>50-60</b> 580				
60-70	412				
70-80	230				
80-90	69				
90					

LUMINANCE DATA (cd/m²)						
	Horizontal Angles					
Vertical Angle	0 45 90					
45	18485	16928	15660			
55	16438	14844	13550			
65	14298	12780	11567			
75	11985	10694	9680			
85	9901	8012	6837			

**GZ** - Graze lens 750 lm/ft



Lumen/ft down: 750 lm/ft Total Lumens: 3212 lm (for 4ft) Input Watts: 30.3 W Efficacy: 106 lm/W IES FILE: B2SQRLED-750-80-35-GZ-4.IES TESTED ACCORDING TO IES LM-79-2008 CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	2031	2031	2031	203 I	2031
5	1991	1684	1471	1348	1323
15	1861	1159	893	809	795
25	1634	850	705	694	700
35	1349	668	620	632	639
45	1038	535	520	524	532
55	715	406	395	411	429
65	410	267	267	294	314
75	176	135	140	161	173
85	31	27	29	32	31
90	2	2	2	- 1	- 1

ZONAL	ZONAL LUMENS		
	Lumens		
Zone			
0			
0-10	188		
10-20	450		
20-30	550		
30-40	562		
40-50	519		
50-60	432		
60-70	308		
70-80	164		
80-90	39		
90			

LUMINANCE DATA (cd/m²)				
	Horizontal Angles			
Vertical Angle	0	45	90	
45	20205	10119	10356	
55	17175	9493	10294	
65	13348	8695	10246	
75	9356	7446	9220	
85	4845	4659	4847	

1 All IES files for other lamping are available for download at: www.axislighting.com

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

6/10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC



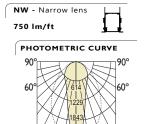


Tacoma Public Library	
Tacoma	Type: L3A
BuildingWork	Bid Set
	8/4/23

# BEAM 2

#### **RECESSED MOUNT**

#### • PHOTOMETRIC DATA



0° Lumen/ft down: 750 lm/ft Total Lumens: 3225 lm (for 4ft) Input Watts: 30.1 W Efficacy: 107 lm/W IES FILE: B2SQRLED-750-80-35-NW-4.IES

2458

TESTED ACCORDING TO IES LM-79-2008

#### CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	2458	2458	2458	2458	2458
5	2440	2405	2313	2224	2197
15	2258	1979	1546	1303	1239
25	1925	1464	1019	868	838
35	1497	1066	753	686	678
45	1058	773	581	554	555
55	684	540	429	424	430
65	394	337	285	290	299
75	180	163	148	154	160
85	33	33	33	32	32
90	2	2	- 1	- 1	- 1

ZONAL LUMENS			
	Lumens		
Zone			
0			
0-10	207		
10-20	453		
20-30	538		
30-40	556		
40-50	519		

167

41

70-80

80-90

90

ZONAL LUMENS		LUMI	LUMINANCE DATA (cd/m²)			
	Lumens		Horizontal Angles			
Zone		Vertical Angle	0	45	90	
0		45	20605	11314	10803	
0-10	207	55	16414	10308	10324	
10-20	453	65	12851	9298	9742	
20-30	538	75	9563	7852	8515	
30-40	556	85	5141	5207	4984	
40-50	519					
50-60	433					
60-70	310					

#### ASO - Asymmetric lens



30°



PHOTOMETRIC CUR	VE
	₹ 90°
523	
1568	60°
2090	- 0 ° - 90°
0°	30°

Lumen/ft down: 750 lm/ft Total Lumens: 3247 lm (for 4ft) Input Watts: 30.3 W Efficacy: 107 lm/W
IES FILE: TB2DLED-750-80-35-ASO-4.IES

TESTED ACCORDING TO IES LM-79-2008

#### CANDELA DISTRIBUTION Horizontal Angles

Vertical Angle	0	22.5	45	67.5	90
0	1243	1243	1243	1243	1243
5	1219	1137	1078	1043	1033
15	1135	937	852	822	815
25	977	771	732	734	738
35	780	635	642	670	684
45	585	510	534	572	596
55	410	382	402	467	508
65	259	249	269	347	386
75	131	127	142	194	214
85	27	27	33	40	38

2 3 3 2 2

#### ZONAL LUMENS

	Lumens
Zone	
0	
0-10	119
10-20	356
20-30	572
30-40	651
40-50	578
50-60	455
60-70	313
70-80	164
80-90	39
90	

LUMINANCE	DATA	(cd/m²)
1		

	Hor	rizontal An	gles
Vertical Angle	0	45	90
45	11389	10400	11612
55	9845	9647	12205
65	8439	8765	12564
75	6987	7563	11380
85	4291	5165	5927

1 All IES files for other lamping are available for download at: www.axislighting.com

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

7/10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC





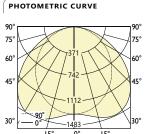
Tacoma Public Library		
Tacoma	Type: L3A	
BuildingWork	Bid S	et
	8/4/2	23

# SQUALE

#### **RECESSED MOUNT**

#### PHOTOMETRIC DATA





Lumen/ft 1000 lm/ft Luminaire Lumens: 4000 lm Input Watts: 40.1 W Efficacy: 100 lm/W IES FILE: B2SQDLED-1000-80-35-BW-4.IES

TESTED ACCORDING TO IES LM-79-2008

Vertical Angle 22.5 67.5 83 I 

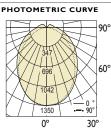
**CANDELA DISTRIBUTION** 

	1 -	
		Lumens
90	Zone	
1166	0	
1190	0-10	112
1325	10-20	343
1460	20-30	565
1467	30-40	721
1245	40-50	760
942	50-60	671
611	60-70	491
303	70-80	268
63	80-90	68
3	90	

ZONAL LUMENS

LUMINANCE DATA (cd/m²)					
	Horizontal Angles				
Vertical Angle	0	45	90		
45	12934	20196	24063		
55	12031	18869	22435		
65	11071	16882	19744		
75	9513	14052	16015		
85	5950	9261	9810		

# 1M - 1" Step lens 1000 lm/ft PHOTOMETRIC CURVE



Lumen/ft down: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 31.7 W Efficacy: 126 lm/W IES FILE: TB2LED-750-80-35-1M-4.IES

TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION					
	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1388	1388	1388	1388	1388
5	1377	1374	1374	1371	1373
15	1297	1292	1281	1268	1265
25	1147	1140	1121	1099	1093
35	947	947	931	917	914
45	725	739	744	747	750
55	513	542	573	592	598
65	325	370	418	446	453
75	171	224	283	315	321

75	171	224	283	315	321
85	57	115	177	206	212
90	16	77	139	169	173
95	15	70	127	155	159
105	12	57	100	132	137
115	-11	42	80	102	112
125	8	31	65	85	95

ZONAL LUMENS			
	Lumens		
Zone			
0			
0-10	131		

Zone	
0	
0-10	131
10-20	365
20-30	525
30-40	595
40-50	585
50-60	518
60-70	413
70-80	292
80-90	181
90	
90-100	120
100-110	96
110-120	71
120-130	52
130-140	
140-150	
150-160	
160-170	
170-180	58
180	

#### LUMINANCE DATA (cd/m²)

			` '	
	Horizontal Angles			
Vertical Angle	0	45	90	
45	12846	6088	5113	
55	10826	4636	3936	
65	8796	3450	2971	
75	6739	2461	2161	
85	4405	1671	1509	

All IES files for other lamping are available for download at: www.axislighting.com

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

8/10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC





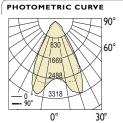
Tacoma Public Library	
Tacoma	Type: L3A
BuildingWork	Bid Set
	8/4/23



#### **RECESSED MOUNT**

#### • PHOTOMETRIC DATA





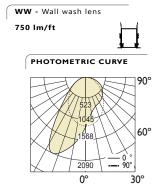
Lumen/ft: 1000 lm/ft Total Lumens: 4083 lm (for 4ft) Input Watts: 39.4 W Efficacy: 104 lm/W
IES FILE: B2SQRLED-1000-80-35-L-4.IES

TESTED ACCORDING TO IES LM-79-2008

CAN	NDEL	A DIS	TRIBU	ITION	ı
	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	2341	2341	2341	2341	2341
5	2475	2467	2440	2410	2380
15	2605	2674	2911	3062	2978
25	2280	2566	3119	3162	2970
35	1584	2021	2389	1676	1444
45	356	554	809	577	504
55	41	62	87	170	261
65	3	4	7	10	9
75	ı	- 1	- 1	2	2
85	0	0	0	0	0
90	0	0	0	0	0

ZONAL LUMENS		
Lumens		
Zone		
0		
0-10	240	
10-20	818	
20-30	1296	
30-40	1135	
40-50	463	
50-60	- 111	
60-70	12	
70-80	4	
80-90	3	
90		

LUMINANCE DATA (cd/m²)			
	Horizontal Angles		
Vertical Angle	0	45	90
45	8451	19211	11969
55	1210	2542	7644
65	127	290	374
75	45	65	136
85	39	58	77



Lumen/ft down: 750 lm/ft
Total Lumens: 3247 lm (for 4ft) Input Watts: 30.3 W
Efficacy: 107 lm/W IES FILE: B2SQRLED-750-80-35-WW-4.IES
TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION				
	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1243	1243	1243	1243	1243
5	1219	1137	1078	1043	1033
15	1135	937	852	822	815
25	977	771	732	734	738
35	780	635	642	670	684
45	585	510	534	572	596
55	410	382	402	467	508
65	259	249	269	347	386
75	131	127	142	194	214
85	27	27	33	40	38
90	2	3	3	2	2

ZONAL LUMENS		
	Lumens	
Zone		
0		
0-10	119	
10-20	356	
20-30	572	
30-40	65 I	
40-50	578	
50-60	455	
60-70	313	
70-80	164	
80-90	39	
90		

LUMINANCE DATA (cd/m²)			
	Horizontal Angles		
Vertical Angle	0	45	90
45	11389	10400	11612
55	9845	9647	12205
65	8439	8765	12564
75	6987	7563	11380
85	4291	5165	5927

1 All IES files for other lamping are available for download at: www.axislighting.com

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9/10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC





Tacoma Public Library		
Tacoma	Type: L3A	
BuildingWork	Bid S	et
	8/4/2	23



#### **RECESSED MOUNT**

#### • PHOTOMETRIC DATA



# 60° 1616

Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 33.7 W Efficacy: 119 lm/W IES FILE: B2SQRLED-1000-80-35-0.25G-4.IES

TESTED ACCORDING TO IES LM-79-2008

# CANDELA DISTRIBUTION Horizontal Angles 22.5 45 67.5 90

Angle	U	22.5	45	67.5	90
0	1614	1614	1614	1614	1614
5	1606	1603	1600	1597	1594
15	1517	1506	1494	1479	1475
25	1352	1333	1307	1279	1271
35	1126	1109	1075	1039	1026
45	877	864	832	799	788
55	631	624	606	582	574
65	405	408	405 396		394
75	210	223	237	243	245
85	63	83	107	122	128
90	8	30	56	74	80
95	8	26	47	63	68
105	7	19	37	55	60
115	7	14	29	41	48
125	8	13	25	34	40

# ZONAL LUMENS

	Lumens
Zone	
0	
0-10	152
10-20	422
20-30	607
30-40	680
40-50	651
50-60	548
60-70	405
70-80	251
80-90	115
90	
90-100	50
100-110	41
110-120	30
120-130	23
130-140	
140-150	
150-160	
160-170	
170-180	26
180	

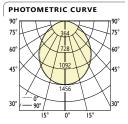
# LUMINANCE DATA (cd/m²)

	Horizontal Angles								
Vertical Angle	0	45	90						
45	16952	16086	15230						
55	15036	14439	13678						
65	13081	13087	12734						
75	11075	12505	12937						
85	9910	16784	20013						

**UB -** Ultra Blend Lens

1000 lm/ft





Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 37.8 W Efficacy: 106 lm/W
IES FILE: B2SQRLED-1000-80-35-UB-4.IES

TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION

	Horizontal Angles									
Vertical Angle	0	22.5	45	67.5	90					
0	1456	1456	1456	1456	1456					
5	1449	1448	1448	1447	1447					
15	1390	1386	1382	1384	1387					
25	1274	1269	1279	1290	1290					
35	1114	1113	1129	1128	1128					
45	921	932	937	926	922					
55	708	720	713	701	697					
65	480	491	480	471	470					
75	262	267	263	260	260					
85	80	78	75	71	71					
90	5	3	3	3	3					

ZONAL	LUMENS
	Lumens

	Lumens
Zone	
0	
0-10	137
10-20	391
20-30	587
30-40	698
40-50	712
50-60	632
60-70	475
70-80	280
80-90	86
90	

LUMINANCE	DATA	(cd/m²)

	Horizontal Angles							
Vertical Angle	0	45	90					
45	16697	16972	16713					
55	15808	15937	15574					
65	14563	14560	14240					
75	12982	13027	12878					
85	11800	10987	10492					

1 All IES files for other lamping are available for download at: www.axislighting.com

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10/10 May 19, 2023

FILE NAME: B2SQR.LED.SPEC





Tacoma Public Library	L4/L4A/
Tacoma	Type: L4B/L4C
BuildingWork	Bid Set
	8/4/23

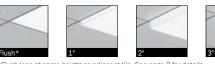
#### SkyeFall **Recessed Mount**





#### PERFORMANCE AT 3500K

NOMINAL LUMEN OUTPUT	INPUT WATTS	EFFICACY					
3000 lm	32.8 W	88 lm/W					
3000 lm	32.8 W	90 lm/W					
3000 lm	32.9 W	91 lm/W					
3000 lm	32.8 W	91 lm/W					
3000 lm	32.8 W	92 lm/W					
3000 lm	32.9 W	94 lm/W					
3000 lm	33 W	87 lm/W					
6" SkyeFall 3000 lm 33 W 87 lm/W 7" SkyeFall 3000 lm 33 W 88 lm/W							
	3000 lm 3000 lm 3000 lm 3000 lm 3000 lm 3000 lm 3000 lm 3000 lm 3000 lm	3000 lm   32.8 W   3000 lm   32.8 W   3000 lm   32.9 W   3000 lm   32.8 W   3000 lm   32.8 W   3000 lm   32.8 W   3000 lm   32.9 W   3000 lm   33.9 W					

















#### Ordering Guide

SK	FLED		2	2												
PRO	DUCT ID		SI	ZE		TOTAL N	OM. LUME	NS		CRI		COL	OR TEN	ИР. (choo	ose one	)
SKFLED	Recessed	LED	<b>22</b> 2'X	2'	1300 3800 4200		ı - Min ı - Max at 9 ı - Max at 8		80 90	80 CRI 90 CRI*	B35	2700 K 3000 K 3500 K 4000 K 3000 K - BIOS* 3500 K - BIOS* 4000 K - BIOS*	TW BTW	2765 2° 3527 35	700-650 600-2700	0 K - Tunable Whit 0 K - Tunable Whit K - Tunable BIOS K - Tunable BIOS
					Consult facto	ry for outpu	nin and max ar its outside of t output with BIC	ne listed range	* Not	available with BIO		Axitune technical sheet for BIOS guide for more infor				ology.
					1	N										
	SHI	IELDIN	G		FIN	IISH		VOLTAGE			DI	RIVER			С	IRCUITS
FL Flush* 1SF 1" SkyeFall 2SF 2" SkyeFall 3SF 3" SkyeFall 4SF 4" SkyeFall 5SF 5" SkyeFall 5SF 5" SkyeFall 6SF 6" SkyeFall 7SF 7" SkyeFall 8BF 4" SkyeFall 8BF		W wi	nite	277 347 UNV DC	347 V universal		DPB(DYN) TW(#)	Lutron bi-level cother** dimming Bio-dimr tunable POE driv	g (0-10V) 1% with BIOS ning™ 100%-81% with white drivers* vers*	BIOS*	+E(# +NL(#	t) nigh t) gene	cuit rgency section* t light section* erator transfer devi			
	MOUNT	ING		RATT	ERY (OPTIC	NAI)	OTHER	(OPTIONAL)		CONT	ROLS - R	EMOTE (OPTIONAL	1)	C	IISTOM	(OPTIONAL)
		battery pac	-		x whip (6' std)	)		aylight se	•	-,		custo				
TE T TG	ST screw TG9 tegul G15 tegul	r 15/16" v slot t- lar 9/16 lar 15/1	bar " 6"	-(")	<i>y</i> pac			nicago plenum		OS(#) o DOS(#) d ENR(#) e	ccupancy aylight & nlighted	sensor occupancy sensor			3350	
	<b>DF</b> dryw	all flang	je	Please co	nsult factory				*	Please consult fact	orv.Specify o	uantity. Remote only.		Pleas	e specify	

1/10 May 23, 2023

File Name:SkyeFall-LED.SPEC





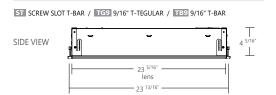
<sup>\*</sup>Flush lens at same height as adjacent tile. See page 2 for details.

Tacoma Public Library	L4/L4A/
Tacoma	Type: L4B/L4C
BuildingWork	Bid Set
	8/4/23

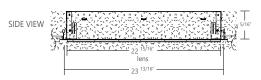
# SkyeFall Recessed Mount



# DIMENSIONS



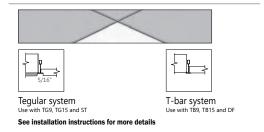
TB15 15/16" T-BAR / TG15 15/16" T-TEGULAR



Flush version shown - For SkyeFall version, see installation instruction



#### FLUSH LENS AT SAME HEIGHT AS ADJACENT TILE





oduct design and development is an ongoing process at its Lighting. We reserve the right to change specifications order: Axis for the latest product information 2 / 10 May 23, 2023

File Name:SkyeFall-LED.SPEC



Tacoma Public Library	L4/L4A/
Tacoma	Type: L4B/L4C
BuildingWork	Bid Set
	8/4/23

#### SkyeFall Recessed Mount

	EC		

Lutron driver LDE1 - Hi-lume 1% EcoSystem with Soft-on, Fade-to-

Other drivers\*\* **DALI** - Digital Addressable Lighting Interface

DMX - Digital Multiplex Xitanium SR - For wireless sensor

BIOS DPB drivers\* STC - BIOS control 0-10V with static spectrum and BIOS

SkyBlue enabled from 100% to 1%.

DYN - BIOS control 0-10V with dynamic spectrum and BIOS SkyBlue® with Bio-Dimming™, which changes spectral qualities by removing the SkyBlue component when dimming from 100% to 81%, while light output remains relatively constant; bio-dimming reduces CCT to 2700K. Dimming from 80% to 1% will then reduce light

output.

**Tunable White** DALIDT6 - DALI Type 6 (Two DALI Addresses) TW drivers\* DALIDT8 - DALI Type 8 (One DALI Address)

LTTW - Lutron T-Series Tunable White

Power over Ethernet MOLEX POE drivers\* IGOR UL2108 certified for SMARTENGINE integral or remote driver

O - Other (Consult factory) **Emergency** Integral emergency battery pack

or emergency circuit optional.

Input Voltage 120V, 277V, 347V, UNV, DC.

Flex Whip Shipped in a separate box for contractors to install

\*Choose driver from available options.

1 Incorporating these components may have limitations or affect the length of the luminaire. Please contact factory for more details.

LED SYSTEM

CRI Minimum 80 or 90 color rendering index.

CRI BIOS Minimum 80 color rendering index with R9>75 for all CCTs.

**CCT Single** Choice of 2700K, 3000K, 3500K and 4000K color Color temperature with a great color consistency (within 3-step MacAdam ellipse). Both within

fixture and fixture to fixture.

CCT BIOS BIOS Static (STC) Choice of 3000K, 3500K and

4000K.

BIOS SkyBlue® Dynamic (DYN) Choice of 3000K, 3500K, and 4000K with Bio-Dimming™ BIOS Tunable White (BTW) Choice of 4000-2700K and 3500-2700K; does not use a bio-dimmer, it uses TW drivers, which allow independent control of CCT and intensity; e.g., BTW4027 provides combined SkyBlue + white light at 4000K, SkyBlue is removed at 2700K. Light output can be adjusted for each CCT.

Consult BIOS guide for more information on BIOS technology.

**CCT Axitune** Systems

Consult Axitune technical sheet for more information on color technology.

**LED** life

Minimum 50,000h with 85% of lumen maintenance in 25°C ambient temperature, in compliance with IES LM-80 testing

Thermal Management Aluminum housing acting as the heat sink to

Dry and damp rated in operating ambient **Environment** temperatures of 0-40°C (32-104F).



blanco

3 / 10 May 23, 2023

File Name:SkyeFall-LED.SPEC



Tacoma Public Library	L4/L4A/
Tacoma	Type: L4B/L4C
BuildingWork	Bid Set
	8/4/23

# **SkyeFall** Recessed Mount

#### SPECIFICATIONS

#### CONSTRUCTION

**Housing** Die formed cold rolled sheet steel (20 gauge).

**Lens** Frosted acrylic lens

Reflectors High reflectance post painted.

Drywall Flange Kit Extruded aluminum (0.060" nominal).

Luminaire support Integrated Hold-Down clip

#### • WARRANTY

Axis Lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications.

If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

LED life

 $\label{eq:minimum} Minimum~50,000h~with~85\%~of~lumen~maintenance~in~25^{\circ}C~ambient~temperature,~in~compliance~with~IES~LM-80~testing~$ 

measurements.

#### • FINISH

Powder coated

#### APPROVALS

Certified to UL and CSA standards (Q) in Chicago Plenum Certified (CCEA)
Meets NYC requirements
Suitable for damp locations.
IC Rated (Insulated ceiling)

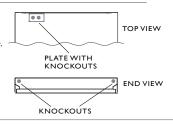
#### ● WEIGHT

#### Standard

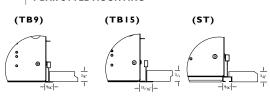
FL, 1SF, 2SF 15 lbs / 6.8 kg 3SF, 4SF, 5SF 18.5 lbs / 8.39 kg 6SF, 7SF 20 lbs / 9.07 kg **Drywall Kit** 2.5 lbs / 1.13kg

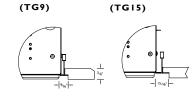
#### STANDARD AND END MOUNT POWER FEED

Knockouts for BX cable connection are provided both on the top and on the ends of the luminaire. This allows for an end mount power feed solution if it is required. (BX CABLE BY OTHER)



# • CEILING SYSTEM T-BAR STYLE MOUNTING





9/16" TEGULAR 15/16" TEGULAR

#### DRYWALL WITH FLANGE KIT (DF)





WITH WOOD FRAME

WITHOUT WOOD FRAME

#### DRYWALL MOUNTING KIT



FIXTURE DIMENSIONS 23 13/16" / 23 13/16"

CUT HOLE DIMENSIONS 24 9/16" / 24 9/16"

Installation sheets for all mounting options are available at: www.axislighting.com

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications 4 / 10 May 23, 2023

File Name:SkyeFall-LED.SPEC



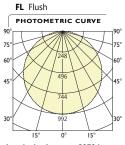


Tacoma Public Library	L4/L4A/	
Tacoma	Type: L4B/L4C	
BuildingWork	Bid Set	
	8/4/23	

# SkyeFall

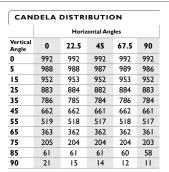
#### **Recessed Mount**

#### ● PHOTOMETRIC DATA - 3000 LUMENS



Luminaire Lumens: 2878 Im Input Watts: 32.8 W Efficacy: 88 lm/W
IES FILE: SKFLED-22-3000-80-35-F.ies

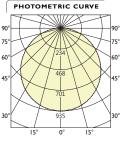
TESTED ACCORDING TO IES LM-79-2008



ZONAL LUMEN	
	Lumens
Zone	
0	
0-10	94
10-20	269
20-30	407
30-40	491
40-50	510
50-60	463
60-70	358
70-80	216
80-90	70
90	

LUMINANCE DATA (cd/m²)			
	Horizontal Angles		
Vertical Angle	0	45	90
45	2688	2683	2683
55	2597	2590	2589
65	2463	2456	2453
75	2273	2266	2256
85	2006	1993	1924

#### 1SF 1" SkyeFall



Luminaire Lumens: 2953 Im Input Watts: 32.8 W Efficacy: 90 lm/W

IES FILE: SKFLED-22-3000-80-35-1 SL.ies TESTED ACCORDING TO IES LM-79-2008

Horizontal Angles Vertical 0 22.5 45 67.5 90

CANDELA DISTRIBUTION

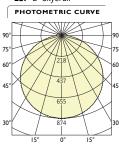
Angle	U	22.3	73	07.5	,,
0	935	935	935	935	935
5	933	932	932	931	928
15	902	903	903	901	900
25	842	843	843	841	840
35	754	756	756	754	75 I
45	641	644	645	643	639
55	509	514	515	512	507
65	365	371	372	369	363
75	219	225	226	223	216
85	86	91	92	87	81
90	50	48	48	42	35

ZONAL	LUMENS

	Lumens	
Zone		Ve An
0		45
0-10	89	55
10-20	255	65
20-30	388	75
30-40	472	85
40-50	496	
50-60	458	
60-70	365	
70-80	236	
80-90	101	

LUMINANCE DATA (cd/m²)			
	Horizontal Angles		
Vertical Angle	0	45	90
45	2560	2559	2552
55	2490	2493	2479
65	2396	2403	2378
75	2286	2304	2252
85	2360	2369	2244

#### 2SF 2" SkyeFall



Luminaire Lumens: 3008 lm Input Watts: 32.9 W Efficacy: 91 lm/W IES FILE: SKFLED-22-3000-80-35-2SL.ies

TESTED ACCORDING TO IES LM-79-2008

# CANDELA DISTRIBUTION Horizontal Angles

Angle	0	22.5	45	67.5	90
0	874	874	874	874	874
5	871	872	871	872	872
15	847	850	850	848	849
25	795	800	801	799	796
35	716	723	725	722	717
45	615	624	626	623	616
55	496	507	508	504	495
65	364	375	379	374	363
75	230	241	245	239	227
85	107	117	121	114	102
90	74	79	82	73	60

ZONAL	LUMENS
LUITAL	

	Lumens
Zone	
0	
0-10	83
10-20	240
20-30	368
30-40	452
40-50	480
50-60	450
60-70	369
70-80	252
80-90	129

	Horizontal Angles		
Vertical Angle	0	45	90
45	2376	2372	2379
55	2314	2308	2311
65	2230	2231	2221
75	2143	2140	2119
85	2227	2186	2125

5 / 10 May 23, 2023

File Name:SkyeFall-LED.SPEC



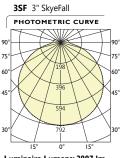


Tacoma Public Library	L4/L4A/
Tacoma	Type: L4B/L4C
BuildingWork	Bid Set
	8/4/23

# SkyeFall

#### **Recessed Mount**

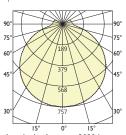
#### ● PHOTOMETRIC DATA



Luminaire Lumens: 2997 Im Input Watts: 32.8 W Efficacy: 91 lm/W IES FILE: SKFLED-22-3000-80-35-3SLies

TESTED ACCORDING TO IES LM-79-2008

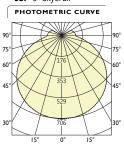
4SF 4" SkyeFall PHOTOMETRIC CURVE



Luminaire Lumens: 3029 Im Input Watts: 32.8 W Efficacy: 92 lm/W IES FILE: SKFLED-22-3000-80-35-4SL.ies

TESTED ACCORDING TO IES LM-79-2008

5SF 5" SkyeFall



Luminaire Lumens: 3079 lm Input Watts: 32.9 W Efficacy: 94 lm/W IES FILE: SKFLED-22-3000-80-35-5SL.ies

TESTED ACCORDING TO IES LM-79-2008

#### CANDELA DISTRIBUTION

		Horiz	ontal An	gles	
Vertical Angle	0	22.5	45	67.5	90
0	792	792	792	792	792
5	789	792	791	792	792
15	772	777	777	774	775
25	729	736	737	733	731
35	662	672	674	669	663
45	575	587	589	583	575
55	471	485	489	482	470
65	357	373	377	369	355
75	240	255	261	253	237
85	129	145	150	140	125
90	101	109	113	102	86

# ZONAL LUMENS

	Lumens
Zone	
0	
0-10	75
10-20	219
20-30	338
30-40	419
40-50	450
50-60	431
60-70	365
70-80	266
80-90	157
90	

### LUMINANCE DATA (cd/m²)

	Horizontal Angles		
Vertical Angle	0	45	90
45	2186	2184	2185
55	2151	2152	2145
65	2120	2124	2107
75	2127	2130	2100
85	2398	2352	2315

#### CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	756	756	756	756	756
5	753	755	755	757	757
15	740	746	746	742	743
25	702	710	711	706	704
35	640	652	654	648	641
45	559	574	577	570	560
55	463	480	484	476	462
65	357	375	381	371	355
75	247	265	272	262	244
85	142	160	166	156	137
90	113	127	133	120	99

ZONAL	LUMEN
	Lumens
7	

	Lumens
Zone	
0	
0-10	72
10-20	210
20-30	326
30-40	406
40-50	440
50-60	425
60-70	367
70-80	276
80-90	173
90	

LUMINANCE	DATA	(cd/m²)
1		

	Ho	rizontal An	gles
Vertical Angle	0	45	90
45	2094	2092	2096
55	2069	2069	2064
65	2051	2058	2039
75	2079	2084	2052
85	2368	2309	2296

CANDELA	DISTRIBUTION

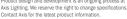
	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	702	702	702	702	702
5	700	703	703	705	706
15	692	699	698	695	696
25	661	672	672	668	664
35	609	623	626	619	611
45	538	556	560	552	539
55	452	474	478	469	452
65	356	378	386	375	355
75	256	279	288	277	254
85	159	183	191	180	157
90	132	152	160	148	123

ONAL	LUMENS	

ZONAL LONENS			
	Lumens		
Zone			
0			
0-10	67		
10-20	197		
20-30	308		
30-40	388		
40-50	426		
50-60	419		
60-70	370		
70-80	290		
80-90	197		

# LUMINANCE DATA (cd/m²)

	Horizontal Angles			
Vertical Angle	0	45	90	
45	1952	1947	1956	
55	1935	1930	1934	
65	1928	1929	1920	
75	1968	1963	1951	
85	2223	2157	2190	



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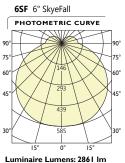


Tacoma Public Library	L4/L4A/
Tacoma	Type: L4B/L4C
BuildingWork	Bid Set
	8/4/23

# SkyeFall

#### **Recessed Mount**

#### ● PHOTOMETRIC DATA



Input Watts: 33 W Efficacy: 87 lm/W IES FILE: SKFLED-22-3000-80-35-6SL.ies

#### CANDELA DISTRIBUTION

	Horizontal Angles					
Vertical Angle	0	22.5	45	67.5	90	
0	584	584	584	584	584	
5	583	584	584	585	585	
15	578	582	581	578	579	
25	554	561	562	557	554	
35	513	524	526	519	512	
45	456	470	473	465	454	
55	386	403	408	399	383	
65	307	326	332	322	304	
75	225	245	252	242	221	
85	146	170	179	166	143	
90	126	145	154	142	120	

ZONALI	LUMENS
	Lumens
Zone	

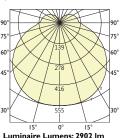
	Lumens
Zone	
0	
0-10	56
10-20	164
20-30	258
30-40	326
40-50	360
50-60	356
60-70	318
70-80	254
80-90	183
90	

#### LUMINANCE DATA (cd/m²)

	Horizontal Angles			
Vertical Angle	0	45	90	
45	1631	1613	1622	
55	1620	1603	1606	
65	1618	1600	1598	
75	1654	1630	1627	
85	1888	1844	1846	

TESTED ACCORDING TO IES LM-79-2008

#### **7SF** 7" SkyeFall PHOTOMETRIC CURVE



Luminaire Lumens: 2902 Im Input Watts: 33 W Efficacy: 88 Im/W IES FILE: SKFLED-22-3000-80-35-7SL.ies

TESTED ACCORDING TO IES LM-79-2008

#### CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	554	554	554	554	554
5	553	554	554	554	555
15	549	552	552	550	551
25	529	536	537	532	529
35	493	503	506	499	492
45	442	456	460	452	440
55	378	396	402	392	376
65	306	326	333	322	303
75	229	251	260	249	226
85	158	182	192	179	154
90	139	160	170	157	133

#### ZONAL LUMENS

	Lumens
Zone	
0	
0-10	53
10-20	156
20-30	246
30-40	313
40-50	349
50-60	350
60-70	318
70-80	261
80-90	196
90	

LUMINANCE	DATA	(cd/m²)

	Horizontal Angles		
Vertical Angle	0	45	90
45	1557	1537	1551
55	1556	1537	1545
65	1565	1548	1550
75	1621	1598	1600
85	1896	1825	1847



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7 / 10 May 23, 2023

File Name:SkyeFall-LED.SPEC

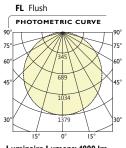


Tacoma Public Library	L4/L4A/
Tacoma	Type: L4B/L4C
BuildingWork	Bid Set
	8/4/23

# SkyeFall

#### Recessed Mount

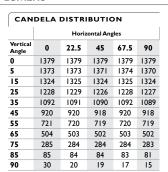
#### ● PHOTOMETRIC DATA - 4000 LUMENS



Luminaire Lumens: 4000 lm Input Watts: 45.4 W Efficacy: 88 lm/W IES FILE: SKFLED-22-4000-80-35-F.ies

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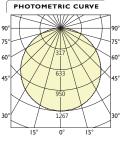
TESTED ACCORDING TO IES LM-79-2008



ZONAL LUMEN	
	Lumens
Zone	
0	
0-10	130
10-20	374
20-30	566
30-40	682
40-50	709
50-60	643
60-70	498
70-80	300
80-90	98
90	

LUMINANCE DATA (cd/m²)			
	Horizontal Angles		
Vertical Angle	0	45	90
45	3736	3730	3729
55	3609	3599	3598
65	3423	3414	3409
75	3160	3149	3135
85	2789	2770	2674

#### 1SF 1" SkyeFall



Luminaire Lumens: 4000 Im Input Watts: 44.4 W Efficacy: 90 Im/W

IES FILE: SKFLED-22-4000-80-35-1SF.ies

TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION				
	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1267	1267	1267	1267	1267
5	1264	1262	1262	1261	1258
15	1222	1224	1223	1220	1219
25	1140	1142	1142	1139	1137
35	1021	1024	1024	1021	1018
45	868	873	874	871	866
55	690	696	698	694	687
65	495	502	504	500	491
75	297	305	306	302	292
	117	122	10.4	110	110

123

118

110

57 47

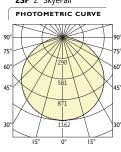
124

65 65

ZONAL LUMENS	
	Lumens
Zone	
0	
0-10	120
10-20	345
20-30	526
30-40	639
40-50	672
50-60	620
60-70	495
70-80	319
80-90	137
90	

LUMINANCE DATA (cd/m <sup>2</sup>			
	Horizontal Angles		
Vertical Angle	0	45	90
45	3467	3467	3457
55	3373	3377	3358
65	3245	3255	3221
75	3097	3120	3050
85	3196	3209	3039

#### 2SF 2" SkyeFall



Luminaire Lumens: 4000 lm Input Watts: 43.9 W Efficacy: 91 lm/W IES FILE: SKFLED-22-4000-80-35-2SF.ies

TESTED ACCORDING TO IES LM-79-2008

# CANDELA DISTRIBUTION Horizontal Angles Vertical 0 22 5 45 67

85

116

Vertical Angle	0	22.5	45	67.5	90
0	1162	1162	1162	1162	1162
5	1158	1159	1159	1159	1160
15	1127	1130	1131	1128	1128
25	1057	1064	1065	1062	1059
35	952	962	964	960	954
45	818	829	832	828	818
55	659	674	676	671	659
65	484	499	504	497	482
75	306	321	325	318	302
85	142	156	161	152	136
90	99	105	109	97	80

ZONAL	LUMENS

ZONAL LONENS		
	Lumens	
Zone		
0		
0-10	110	
10-20	319	
20-30	490	
30-40	601	
40-50	638	
50-60	599	
60-70	491	
70-80	335	
80-90	171	

#### LUMINANCE DATA (cd/m²)

	Horizontal Angles			
Vertical Angle	0	45	90	
45	3159	3154	3163	
55	3077	3069	3074	
65	2966	2967	2954	
75	2850	2846	2817	
85	2962	2907	2826	

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications 8 / 10 May 23, 2023

File Name:SkyeFall-LED.SPEC





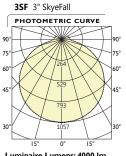
Tacoma Public Library	L4/L4A/
Tacoma	Type: L4B/L4C
BuildingWork	Bid Set
	8/4/23

# SkyeFall

#### Recessed Mount

Vertical Angle 

#### PHOTOMETRIC DATA



Luminaire Lumens: 4000 Im Input Watts: 43.9 W Efficacy: 91 lm/W IES FILE: SKFLED-22-4000-80-35-3SFies

TESTED ACCORDING TO IES LM-79-2008

# CANDELA DISTRIBUTION

CANDELA DISTRIBUTION

22.5

Horizontal Angles

45 67.5

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	998	998	998	998	998
5	995	998	997	1000	1000
15	977	985	984	979	981
25	926	938	939	933	929
35	846	861	864	856	847
45	739	758	762	752	740
55	612	633	639	628	610
65	47 I	495	503	490	468
75	326	350	359	346	322
85	187	211	219	206	181
90	150	167	176	158	131

ZONAL LUMENS

ZONAL LUMENS

Zone

0-10

10-20

20-30

30-40

40-50

60-70

70-80

80-90

Lumens

	Lumens
Zone	
0	
0-10	95
10-20	277
20-30	431
30-40	536
40-50	581
50-60	562
60-70	484
70-80	364
80-90	229
90	

# LUMINANCE DATA (cd/m²)

	Horizontal Angles		
Vertical Angle	0	45	90
45	2917	2915	2917
55	2871	2872	2863
65	2830	2835	2812
75	2839	2843	2803
85	3201	3139	3089

LUMINANCE DATA (cd/m²) Horizontal Angles

Vertical

Angle 45

4SF	4" SkyeFall	

PHOTOMETRIC CURVE	
90°	lo O
75°	0
60° 250 60	°
45°	0
30° 1000	l°
Luminaire Lumens: 3999 Im	

Input Watts: 43.4 W Efficacy: 92 lm/W IES FILE: SKFLED-22-4000-80-35-4SF.ies

TESTED ACCORDING TO IES I M-79-2008

#### 5SF 5" SkveFall

Joi 5 Skycrum				
PHOTOMETRIC CURVE				
90°	90°			
75°	75°			
60°	60°			
45° 458	45°			
687				
30°	30°			
15° 0° 15°				

Luminaire Lumens: 4000 lm Input Watts: 42.5 W Efficacy: 94 lm/W IES FILE: SKFLED-22-4000-80-35-5SL.ies

TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION					
	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	912	912	912	912	912
5	909	913	913	915	917
15	899	908	907	902	904
25	859	873	874	867	862
35	791	810	813	804	794
45	699	722	727	717	700
55	587	615	621	609	587
65	462	492	501	487	461
75	332	363	374	359	330
85	207	237	248	234	203
90	172	197	208	192	160

ZONAL	LUMENS
	I. I

	Lumens
Zone	
0	
0-10	87
10-20	256
20-30	401
30-40	504
40-50	553
50-60	544
60-70	481
70-80	377
80-90	257
00	

LUMIN	IANCE	DATA	(cd/m²)
			-1

	Horizontal Angles			
Vertical Angle	0 45 90			
45	2536	2529	2541	
55	2513	2507	2512	
65	2505	2506	2494	
75	2556	2550	2534	
85	2888	2802	2845	

9/10 May 23, 2023

File Name:SkyeFall-LED.SPEC



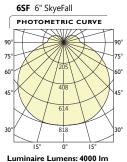


Tacoma Public Library	L4/L4A/
Tacoma	Type: L4B/L4C
BuildingWork	Bid Set
	8/4/23

# SkyeFall

#### **Recessed Mount**

#### ● PHOTOMETRIC DATA



Luminaire Lumens: 4000 lm Input Watts: 45.9 W Efficacy: 87 lm/W IES FILE: SKFLED-22-4000-80-35-6SF.ies

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### CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	817	817	817	817	817
5	816	817	816	818	818
15	808	813	813	809	810
25	775	785	786	778	774
35	717	732	735	725	715
45	638	657	662	650	634
55	540	563	570	557	535
65	430	456	465	450	424
75	314	342	352	338	309
85	204	238	250	232	200
90	176	203	215	199	168

ZONAL I	LUMENS
	Lumens
Zone	

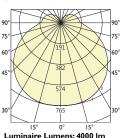
	Lumens
Zone	
0	
0-10	78
10-20	229
20-30	360
30-40	455
40-50	503
50-60	498
60-70	445
70-80	355
80-90	255
90	

#### LUMINANCE DATA (cd/m²)

	Horizontal Angles			
Vertical Angle	0	45	90	
45	2280	2255	2268	
55	2265	2241	2246	
65	2262	2237	2234	
75	2312	2279	2275	
85	2639	2578	2582	

TESTED ACCORDING TO IES LM-79-2008

# 7SF 7" SkyeFall PHOTOMETRIC CURVE



Luminaire Lumens: 4000 lm Input Watts: 45.4 W Efficacy: 88 lm/W IES FILE: SKFLED-22-4000-80-35-75Lies

TESTED ACCORDING TO IES LM-79-2008

#### CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	763	763	763	763	763
5	762	764	763	764	764
15	756	761	761	758	759
25	729	738	740	733	730
35	679	694	698	688	678
45	609	629	634	622	607
55	522	546	554	540	518
65	421	449	459	444	417
75	316	346	358	343	312
85	218	251	265	246	212
90	192	220	234	216	183

#### ZONAL LUMENS

	Lumens
Zone	
0	
0-10	73
10-20	215
20-30	339
30-40	432
40-50	481
50-60	483
60-70	439
70-80	360
80-90	269
90	

LUMINANCE	DATA	(cd/m²)
The second secon		

	Horizontal Angles			
Vertical Angle	0	45	90	
45	2146	2119	2137	
55	2144	2119	2129	
65	2157	2134	2137	
75	2234	2203	2205	
85	2614	2516	2546	



10 / 10 May 23, 2023

File Name:SkyeFall-LED.SPEC



Tacoma Public Library	L5/L5A/
Tacoma	Type: L5B
BuildingWork	Bid Set
	8/4/23

#### AURORA





#### DEEP AURORA





#### MIRO





# AURORA+MIR⊡™

Legacy Downlights | Premium LED

Our top-selling Aurora + Miro luminaires feature regressed LED modules and optics for glare-free downlighting.

#### LISTINGS





California Title 24 JA8

Damp Location

Aurora Miro Premium LED Specs p. 1/8

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Tacoma Public Library	L5/L5A/
Tacoma	Type: L5B
BuildingWork	Bid Set
	8/4/23

# AUR⊙RA+MIR⊡™

#### Legacy Downlights | Premium LED

#### TRIM FEATURES

- Ø 3 1/2" [89mm] Aurora & Deep Aurora Aperture
- 3 1/8" [79mm] Miro Aperture
- Deep Aurora lamp regression 2 1/4" above the ceiling plane for excellent glare control
- 20° vertical tilt with Aurora & Miro
- · Clear media standard
- · Diffusion media standard with warm dimming
- Accepts up to 2 media
- · Die-cast aluminum fixture
- Powder coated and plated trim ring finishes
- Trim clips designed for 5/8" ceiling thickness

#### **HOUSING FEATURES**

- Non-Insulated and Chicago Plenum ceilings rated to a max ambient temperature of 45°C (113°F)
- Insulated and Emergency housings rated to a max ambient temperature of 40°C (104°F)
- Airtight in accordance with ASTM E283
- · Bi-directional mounting
- 14"-25" adjustable hanger bars
- 18 Ga. galvanized steel junction box with multiple KO
- 20 Ga. black powder coated steel baseplate
- 0.5" [13mm] 1.25" [32mm] trimless ceiling thickness.
   Consult factory for varying ceilings
- Chicago Plenum In accordance with CCEA (City of Chicago Environmental Air), Chicago electrical code section 18-27-300.22®
- California Title 24 JA8

#### EMERGENCY HOUSING FEATURES

- 6.4V DC LiFePO4 lithium iron phosphate backup battery
- 10W initial battery output while in emergency mode
- Up to 90 minutes of emergency power
- 12 hour battery recharge time
- 5 year battery life
- Integrated test button

#### **FLANGE FINISHES**

White	
Chrome Plated	
Black	
Matte Silver	

#### REFLECTOR FINISHES

Black Open	
Nickel Satin	



Bronze

Gold Plated

Matte Nickel

#### PERFORMANCE SUMMARY

Color Accuracy (SDCM)	≤1 x 2	
L70 Estimate (h)	50,0	000
Color Rendering (CRI)	83	98
Lumen Series	3	3
Source Lumens	1000	700
LED Wattage	10	9
Lumen Series	Ę	5
Source Lumens	1500	1000
LED Wattage	14	12
Lumen Series	7	7
Source Lumens	2000	1300
LED Wattage	20	17
Lumen Series	9	9
Source Lumens	2700	2100
LED Wattage	24	24

#### **COLOR TEMPERATURES**



#### **BEAM SPREADS**



Aurora Miro Premium LED Specs p. 2/8

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Tacoma Public Library	L5/L5A/
Tacoma	Type: L5B
BuildingWork	Bid Set
	8/4/23

# AURORA+MIR⊡™

Aurora + Deep Aurora | Premium LED | Order Form | Tag Type

#### **PRODUCT NOTES:**

- 1. 2-125 Deep Aurora is not compatible with D4B-F and D4B-FEM housings.
- 2. Trimless trims do not require a flange finish. Pinhole trims excluded.
- $\textbf{3.} \ \mathsf{CC} \ \mathsf{custom} \ \mathsf{color} \ \mathsf{requires} \ \mathsf{consultation} \ \mathsf{with} \ \mathsf{Lightheaded} \ \mathsf{sales} \ \mathsf{personnel}.$
- 4. TL, TLW & TLW-XX is not available in 5, 7, 9 series.
- **5.** TLW-XX wood trimless flange type is matched to trim finish. XX refers to trim finish code and must be specified at time of housing order.
- **6.** TLW-XX wood trimless ceiling thickness to be specified at time of housing order. Requires consultation with lightheaded sales personnel.
- 7. BM27 color temp. is only available in 9807, 9810, 9813 CRI, lumens, series.
- 8. LE and S dimming is only available in 120V.
- 9. 347V dimming is only available in P dimming.
  10. 347V is not available with D4B-FEM or D4B-FDFEM housings.
- California Title 24 JA8

SELECT A TRIM	171 LUMENS SERVES	[12] ELANCE TYPE
	[7] LUMENS SERIES  8310 83 CRI, 1000lm, 3S	[12] FLANGE TYPE  [Blank] DRB Driver
[1] TRIM	9807 98 CRI, 700lm, 3S	<b>T</b> Trimmed
<b>2-120</b> Aurora	8315 83 CRI, 1500lm, 5S	☐ <b>TL</b> Trimless <sup>4</sup>
<b>2-125</b> Deep Aurora <sup>1</sup>	9810 98 CRI, 1000lm, 55	TLW-XX Wood Trimless 4, 5, 6
[2] FLANGE TYPE	8320 83 CRI, 2000lm, 7S	TEW-XX Wood Hilliess
<b>T</b> Trimmed	9813 98 CRI, 1300lm, 7S	[13] LUMENS SERIES
TL Trimless 2, 4	8327 83 CRI, 2700lm, 9S	<b>3</b> 1000lm Max.
TLW Wood Trimless 2, 4	9821 98 CRI, 2100lm, 9S	■ 5 1800lm Max. ●
	3021 30 CKI, 2100IIII, 33	<b>7</b> 2300lm Max.
[3] FLANGE FINISH	[8] OPTIONAL MEDIA (2 MAX.)	<b>9</b> 2700lm Max.
[Blank] Trimless/Wood Trimless <sup>2</sup>	[Blank] No Media	[14] DIMMING
01 White	EL Elongating	<b>P</b> 0-10V Dimming (1%)
O2 Chrome Plated	FRO Frosted	S Phase Dimming (5%) <sup>8</sup>
<b>04</b> Black	HC Honeycomb	P1 eldoLED Dimming (1%)
O5 Matte Silver	PER Perimeter Frosted	D Dali (1%)
06 Bronze	SL Solite Softening	LE Lutron Hi-lume Forward Phase
☐ 09 Gold Plated☐ 11 Matte Nickel	SPDL Spread	2-wire Dimming (1%) 8
CC Custom Color <sup>3</sup>		LH Lutron Hi-lume EcoSystem
Custom Color-	[9] TRIM OPTIONS	Soft-on Fade-to-Black (1%)
[4] REFLECTOR FINISH	Blank] No Options	
BLO Black Open	EXT Extension Clips (Max. 2")	[15] VOLTAGE
NICS Nickel Satin	SELECT A HOUSING/DRIVER	120 120V
SAS Satin Silver		277 277V
WHO White Open	[10] HOUSING/DRIVER 13	<b>347</b> 347V <sup>9, 10</sup>
CC Custom Color <sup>3</sup>	D4X-F Non I/C	[16] HOUSING OPTIONS
[5] MODULE & BEAM SPREAD	D4X-FD Deep Non-I/C	[Blank] No Options
XTM28 28° Beam	D4X-FEM Non-I/C Emergency	RCF Round Aperture Collar
<b>XTM40</b> 40° Beam	D4X-FDEM Deep Emergency	■ BP Black Painted Interior
<b>XTM60</b> 60° Beam	R4P-F 4" New Construction Plate	WP White Painted Interior
_ miles so beam	D4X-IC1A I/C Airtight #1	
[6] COLOR TEMPERATURE	D4X-IC2A I/C Airtight #2	
<b>27</b> 2700K	D4X-CP Chicago Plenum	
■ 30 3000K ●	<b>DRX</b> Remodel Driver	
<b>35</b> 3500K	[11] TRIM SHAPE	
<b>40</b> 4000K	[Blank] DRB Driver	
BM27 Beauty 2700K <sup>7</sup>	R Round	
VB30 Vibrant 3000K	L R Rouliu	

Aurora Miro Premium LED Specs p. 3/8

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Tacoma Public Library	L5/L5A/
Tacoma	Type: L5B
BuildingWork	Bid Set
	8/4/23

# AURORA+MIR⊡™

Miro	Premium LED	Order Form	Tag Type
1 111 0	I I CITII GITT LLD	Oldel I ollii	I lug Type

#### PRODUCT NOTES:

- 1. 2-520 Miro Reflector finish has lamp holder painted black.
- 2. 2-520 Miro WHO reflector finish has lamp holder painted white.
- $\textbf{3.} \ \mathsf{Trimless} \ \mathsf{trims} \ \mathsf{do} \ \mathsf{not} \ \mathsf{require} \ \mathsf{a} \ \mathsf{flange} \ \mathsf{finish}. \ \mathsf{Pinhole} \ \mathsf{trims} \ \mathsf{excluded}.$
- 4. CC custom color requires consultation with Lightheaded sales personnel.
- 5. TL, TLW & TLW-XX is not available in 5, 7, 9 series.
- **6.** TLW-XX wood trimless flange type is matched to trim finish. XX refers to trim finish code and must be specified at time of housing order.
- 7. TLW-XX wood trimless ceiling thickness to be specified at time of housing order. Requires consultation with lightheaded sales personnel.
- 8. BM27 color temp. is only available in 9807, 9810, 9813 CRI, lumens, series.
- 9. LE and S dimming is only available in 120V.
- 10. 347V dimming is only available in P dimming.
- 11. 347V is not available with D4B-FEM housing.
- 12. California Title 24 JA8

SELECT A TRIM	[7] LUMENS SERIES	[11] TRIM SHAPE
[1] TRIM	8310 83 CRI, 1000lm, 3S	Blank] DRB Driver
<b>2-520</b> Miro <sup>1, 2</sup>	🔲 <b>9807</b> 98 CRI, 700lm, 3S 🛑	S Square
_	8315 83 CRI, 1500lm, 5S	[12] FLANGE TYPE
[2] FLANGE TYPE	9810 98 CRI, 1000lm, 5S	[Blank] DRB Driver
<b>T</b> Trimmed	8320 83 CRI, 2000lm, 7S	T Trimmed
TL Trimless 3, 5	9813 98 CRI, 1300lm, 7S	TL Trimless 5
<b>TLW</b> Wood Trimless 3, 5	8327 83 CRI, 2700lm, 9S	TLW-XX Wood Trimless 5, 6, 7
[3] FLANGE FINISH	9821 98 CRI, 2100lm, 9S	ILW-XX Wood Infilless
[Blank] Trimless/Wood Trimless 3		[13] LUMENS SERIES
O1 White	[8] OPTIONAL MEDIA (2 MAX.)	🔲 <b>3</b> 1000lm Max. 🌑
02 Chrome Plated	Blank] No Media	🔲 <b>5</b> 1800lm Max. 🌑
O4 Black	<b>EL</b> Elongating	<b>7</b> 2300lm Max.
<b>05</b> Matte Silver	FRO Frosted	<b>9</b> 2700lm Max.
☐ <b>06</b> Bronze	HC Honeycomb	[14] DIMMING
O9 Gold Plated	PER Perimeter Frosted	<b>P</b> 0-10V Dimming (1%)
11 Matte Nickel	SL Solite Softening	<b>S</b> Phase Dimming (5%) 9
CC Custom Color <sup>4</sup>	SPDL Spread	
	[9] TRIM OPTIONS	P1 eldoLED Dimming (1%) D Dali (1%)
[4] REFLECTOR FINISH	[Blank] No Options	LE Lutron Hi-lume Forward Phase
BLO Black Open 1	EXT Extension Clips (Max. 2")	2-wire Dimming (1%) <sup>9</sup>
NICS Nickel Satin 1	EXT Extension Clips (Max. 2 )	LH Lutron Hi-lume EcoSystem
SAS Satin Silver	SELECT A HOUSING/DRIVER	Soft-on Fade-to-Black (1%)
<b>WHO</b> White Open ●²		Soft-off Fade-to-Black (1/6)
<b>CC</b> Custom Color⁴	[10] HOUSING/DRIVER	[15] VOLTAGE
[5] MODULE & BEAM SPREAD	<b>D4X-F</b> Non I/C	<b>120</b> 120V
XTM28 28° Beam	D4X-FEM Non-I/C Emergency	<b>277</b> 277V
XTM40 40° Beam	R4P-F 4" New Construction Plate	347 347V 10, 11
XTM60 60° Beam	D4X-IC1A I/C Airtight #1	[16] HOUSING OPTIONS
	D4X-IC2A I/C Airtight #2	[Blank] No Options
[6] COLOR TEMPERATURE	D4X-CP Chicago Plenum	SCF Square Aperture Collar
27 2700K	<b>DRX</b> Remodel Driver	BP Black Painted Interior
■ 30 3000K ●		WP White Painted Interior
<b>35</b> 3500K		**F Willte Failited litterior
<b>40</b> 4000K		
BM27 Beauty 2700K <sup>8</sup>		
■ VB30 Vibrant 3000K		

Aurora Miro Premium LED Specs p. 4/8

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Tacoma Public Library	L5/L5A/
Tacoma	Type: L5B
BuildingWork	Bid Set
	8/4/23

#### **CEILING CUTOUTS**

**AURORA & DEEP AURORA - TRIMMED & TRIMLESS** 



Ø 4.5" [115 mm]

MIRO TRIMMED, TRIMLESS & WOOD TRIMLESS



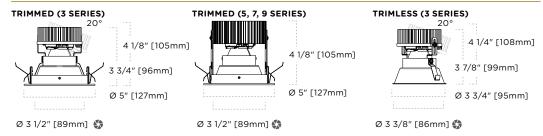
3.875" [99 mm]

#### **AURORA & DEEP AURORA WOOD TRIMLESS**



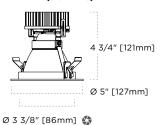
Ø 3.938" [100 mm]

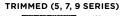
#### **AURORA DIMENSIONS**

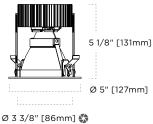


#### **DEEP AURORA DIMENSIONS**

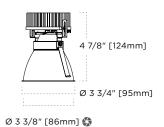
#### TRIMMED (3 SERIES)







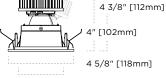
#### **TRIMLESS (3 SERIES)**



#### MIRO DIMENSIONS

3 1/8" [79mm] 🗱

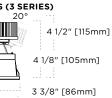




#### HOUSING COLLAR DIMENSIONS

TRIMMED (5, 7, 9 SERIES)		
	4 3/8" [112mm]	
<u> </u>		
<u> </u>	4 5/8" [118mm]	
3 1/8" [79mm] 🛟		

	TRIMLESS (3
	Man.
m]	7#7
-	حد لقل / م



COLLAR HEIGHT	
_	
9/16" [15mm]	
5/8" [16mm]	

3 1/8" [79mm] 🗳

1/2" [13mm] - 1 1/4" [32mm]

Aurora Miro Premium LED Specs p. 5/8

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**CEILING TYPE** Trimmed Trimmed + Aperture Collar Trimless Collar

Wood Trimless Collar

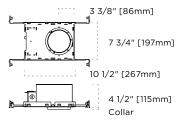




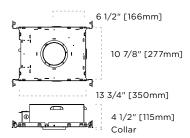
Tacoma Public Library	L5/L5A/
Tacoma	Type: L5B
BuildingWork	Bid Set
	8/4/23

#### NON-INSULATED TRIMMED, TRIMLESS & WOOD TRIMLESS HOUSING DIMENSIONS

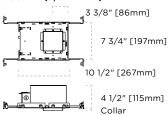
#### **ROUND (3, 5 SERIES)**



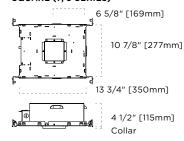
#### **ROUND (7, 9 SERIES)**



#### **SQUARE (3, 5 SERIES)**

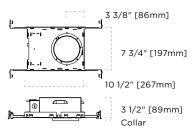


#### SQUARE (7, 9 SERIES)

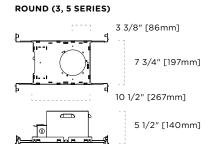


#### NON-INSULATED SHALLOW HOUSING DIMENSIONS

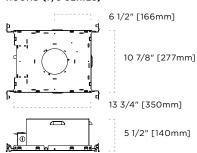
#### **ROUND (3 SERIES)**



#### NON-INSULATED DEEP HOUSING DIMENSIONS



#### **ROUND (7, 9 SERIES)**



Aurora Miro Premium LED Specs p. 6/8

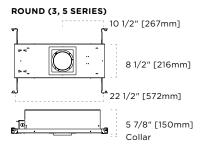
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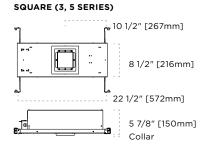




Tacoma Public Library	L5/L5A/
Tacoma	Type: L5B
BuildingWork	Bid Set
	8/4/23

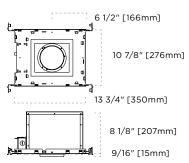
#### INSULATED AIRTIGHT TYPE 1 TRIMMED, TRIMLESS & WOOD TRIMLESS HOUSING DIMENSIONS



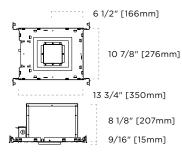


#### INSULATED AIRTIGHT TYPE 2 TRIMMED, TRIMLESS & WOOD TRIMLESS HOUSING DIMENSIONS

#### ROUND (3, 5 SERIES)

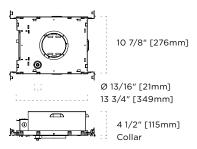


#### SQUARE (3, 5 SERIES)

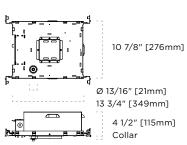


#### **EMERGENCY TRIMMED & TRIMLESS HOUSING DIMENSIONS**

#### ROUND (3, 5, 7, 9 SERIES)



#### **SQUARE (3, 5, 7, 9 SERIES)**



**Aurora Miro Premium LED Specs** p. 7/8
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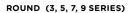
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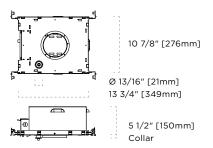




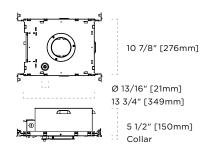
Tacoma Public Library	L5/L5A/
Tacoma	Type: L5B
BuildingWork	Bid Set
	8/4/23

#### **DEEP EMERGENCY HOUSING DIMENSIONS**



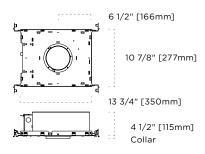


#### **SQUARE (3, 5, 7, 9 SERIES)**

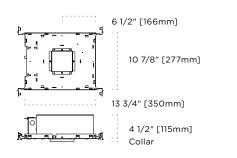


#### CHICAGO PLENUM HOUSING DIMENSIONS

#### **ROUND (3 SERIES)**

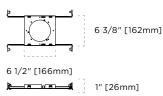


#### SQUARE (3 SERIES)

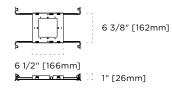


#### NEW CONSTRUCTION PLATE DIMENSIONS

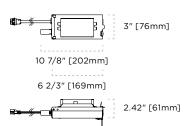
#### ROUND



#### SQUARE



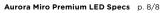
#### REMODEL DRIVER DIMENSIONS



#### CERTIFICATIONS







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Tacoma Public Library	
Tacoma	Type: L6/L6A
BuildingWork	Bid Set
	8/4/23

Barbican Specification Sheet

Gear Drum • 16-77

Generated: Jun 20th 2023



#### Barbican

#### **Gear Drum**

The Gear Drum is the only double shade light fixture in the drum family. The outer shade is without a bottom lens, creating a skirted appearance.











Please find an overall listing of all product options. Barbican specializes in producing products on a per request basis. Please feel free to use our online builder to determine conditional options, or confer with your lighting rep, or reach out to sales@barbican.ca for more information.



Diame	ter	Height		Diffuse	r	Source Voltage Temperat		Source Voltage		ture	
36D	36"	12H	12"	НТО	Opal	LED72	72 Watts   36D 48D 60D	120V	120 Volts	2700K	2700 °K
48D	48"	18H	18"			LED108	108 Watts 48D	277V	277 Volts	3000K	3000 °K
60D	60"	24H	24"			LED144	144 Watts   600			3500K	3500 °K
										4000K	4000 °K

Mountir	ng	Finish (Cano	pies, Stems)	Colour Rendering Index		
ACW	Aircraft Cable WHITE Power Cord	WHT	White	90CRI	90 CRI	
ACB	Aircraft Cable BLACK Power Cord	BLK	Black			
SM	Stem Mount	ВА	Brushed Aluminum			
		RAL	RAL (North American)			

#### **Dimming Drivers**

DB(0-10V) DB(0-10V)

Materials Choose from our large materials collection using our online product builder.

Laminated Fabrics

Please visit our website to view our full material galleries, where you will find natural stone, natural wood, metallized finish, printed patterns and our Artisan Collection



https://barbican.ca sales@barbican.ca 1-800-663-5781

Tacoma Public Library	
Tacoma	Type: L6/L6A
BuildingWork	Bid Set
	8/4/23



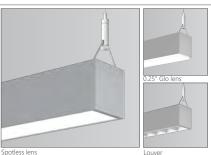


1-800-663-5781

Tacoma Public Library	_ 1 7 / 7 A
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23



### **PENDANT MOUNT - DIRECT**





Project
Type
Notes

#### PERFORMANCE PER LINEAR FOOT AT 3500K

NOMINAL LUMEN OUTPUT	INPUT WATTS*	EFFICACY	SHIELDING
1000 lm/ft	8.4 W/ft	118 lm/W	SO
1000 lm/ft	9.9 W/ft	104 lm/W	L
1000 lm/ft	10 W/ft	100 lm/W	BW
750 lm/ft	7.6 W/ft	106 lm/W	GZ
750 lm/ft	7.6 W/ft	107 lm/W	ww
750 lm/ft	7.6 W/ft	107 lm/W	ASO
1000 lm/ft	7.9 W/ft	126 lm/W	1M
1000 lm/ft	8.4 W/ft	119 lm/W	0.25G
1000 lm/ft	9.5 W/ft	106 lm/W	UB
750 lm/ft	7.5 W/ft	107 lm/W	NW

Please consult factory for custom lumen output and wattage.











**Ordering Guide** 

	0										
B25	QDLED										
PRO	DUCT ID		NOM. LUMENS/FT		CRI		COLO	OR TEMP. (	choose one)		SHIELDING
2SQDLED	Pendant Direct	300	300 lm/ft - min	80	80 CRI	27	2700 K	TW2750	2700-5000 K - Tunable White	so	spotless lens
		750	750 lm/ft - max for	90	90 CRI*	30	3000 K	TW2765	2700-6500 K - Tunable White	L	louver*
			GZ, NW, WW, ASO*			35	3500 K	BTW3527	3500-2700 K - Tunable BIOS	0.25G	0.25" Glo lens
		1000	1000 lm/ft - max			40	4000 K	BTW4027	4000-2700 K - Tunable BIOS	UB	ultra blend lens
						B30	3000 K - BIOS*			1M	StepLens , lum. end cap
						B35	3500 K - BIOS*			ASO	asymmetric, flush only
						B40	4000 K - BIOS*			BW	batwing, flush only
										NW	narrow, flush only
										GZ	graze, flush only
										ww	wallwash, flush only
		* 750 lm/f Consult fa	etween listed min and max are available. t max. only for GZ, NW, WW and ASO. ctory for outputs outside of the listed range. ctory for max output with BIOS.	* No	t available with BIOS.		It Axitune technical sh ult BIOS guide for moi		ormation of color technology. n BIOS technology		lable in 3' and 4' increment. lable with Black finish.

	LENGTH		MR (OPTIONAL)		FINISH	١	OLTAGE		DRIVER		CIRCUITS
2	2'	DMLED(#)	downlight module	AP	aluminum paint	120	120 V	DP	dimming (0-10V) 1%	1	1 circuit
3	3'		LED	w	white	277	277 V	LT(#)	Lutron*	2	2 circuits
4	4'			BLK	black	347	347 V	BI	bi-level dimming	+E(#)	emergency circuit*
5	5'			c	custom	UNV	universal	O(#)	other**	+NL(#)	night light circuit*
6	6'					DC	low voltage*	DPB(STC)	dimming (0-10V) 1% with BIOS*	+GTD(#)	generator transfer device*
8	8'							DPB(DYN)	Bio-dimming™ 100%-81% with BIOS*	+M	MR
12	12'							TW(#)	tunable white drivers*		
S(L)	system run							POE(#)	POE drivers*		
		Separate circuits Requires 120V o Available in lumi				* Only a drivers.	vailable with POE		o specify system ult factory; see page 2	*Specify quan	ntity

M	OUNTING/SUSPENSION	В	ATTERY (OPTIONAL)		C CONTROLS (OPT.)	CU	STOM (OPT.)
CT9(#) CT15(#) CTS(#) SA(#) CASL(#)	dywall+cable length (36" std.) TB/TG 9/16+cable length (36" std.) TB/TG15/16+cable length (36" std.) screw slot+cable length (36" std.) screw slot+cable length (36" std.) drywall+stem length >48" (18" std.) drywall cable sloped ceiling drywall stem sloped ceiling	B(#)	battery pack (integral)	OS(#) DOS(#) EN(#) ENR(#)	daylight & occupancy sensor Enlighted integral*	C	custom
	it guide for full specification code.	Minimu	m 4ft; please consult factory	Specify quantity Consult factory	factory sontrols guide for more details, Requires 8" blank for Turable White. th DPB (DYN) driver for BIOS with Dynamic	Please	specify

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications. Contact Axis for the latest product information.

I / I0 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	<b>T</b>
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23



#### **PENDANT MOUNT - DIRECT**

#### SPECIFICATIONS

#### CONSTRUCTION

Housing Extruded aluminum (0.075" nominal)

Up to 70% recycled content

**End Cap** Cast aluminum

**Interior Brackets** Reflectors Louvers

Lenses

Die formed sheet steel (20 gauge) White powder coated sheet steel (22 gauge) Die formed semi-specular aluminum (22 gauge)

Extruded acrylic (0.070" nominal)

Hanger adjustable slide mount

Suspension Y shape aircraft cable or Ø 1/2" stem Cable Grips Quick connecting / release

## ELECTRICAL

Lutron driver LDE1 - Hi-lume 1% EcoSystem with Soft-on, Fade-to-

Other drivers\*\* **DALI** - Digital Addressable Lighting Interface

DMX - Digital Multiplex Xitanium SR - For wireless sensor

BIOS **DPB** drivers\* STC - BIOS control 0-10V with static spectrum and BIOS SkyBlue enabled from 100% to 1%.

DYN - BIOS control 0-10V with dynamic spectrum and BIOS SkyBlue® with Bio-Dimming™, which changes spectral qualities by removing the SkyBlue component when dimming from 100% to 81%, while light output remains relatively constant; bio-dimming reduces CCT to 2700K. Dimming from 80% to 1% will then reduce light

Tunable White DALIDT6 - DALI Type 6 (Two DALI Addresses) TW drivers\*

DALIDT8 - DALI Type 8 ( One DALI Address)
LTTW - Lutron T-Series Tunable White

Power over Ethernet MOLEX POE drivers\* **IGOR** UL2108 certified for

SMARTENGINE integral or remote driver O - Other (Consult factory)

**Emergency** Integral emergency battery pack or emergency circuit optional.

Input Voltage 120V. 277V. 347V. UNV. DC. Flex Whip Shipped in a separate box for contractors to install

\*Choose driver from available options.

1 Incorporating these components may have limitations or affect the length of the luminaire. Please contact factory for more details.

#### OPTICS







SO Spotless lens UB Ultra Blend lens

**ULTRA BLEND LENS** 

Frosted acrylic snap-in micro lens suitable for Tunable White and BIOS applications.

#### SPOTLESS LENS

Frosted acrylic snap-in micro lens

#### PARABOLIC LOUVERS

Die formed semi-specular aluminum (22 gauge)

#### GLO LENS

0.25" frosted acrylic drop lens. Patented design.

#### **● LED SYSTEM**

CRI Minimum 80 or 90 color rendering index.

CRI BIOS

Minimum 80 color rendering index with R9>75

CCT Single Color

Choice of 2700K, 3000K, 3500K and 4000K color temperature with a great color consistency (within 3-step MacAdam ellipse). Both within

fixture and fixture to fixture.

CCT BIOS

BIOS Static (STC) Choice of 3000K, 3500K and

4000K.

BIOS SkyBlue® Dynamic (DYN) Choice of 3000K, 3500K, and 4000K with Bio-Dimming™

BIOS Tunable White (BTW) Choice of 4000-2700K and 3500-2700K; does not use a bio-dimmer, it uses TW drivers, which allow independent control of CCT and intensity; e.g., BTW4027 provides combined SkyBlue + white light at 4000K, SkyBlue is removed at 2700K. Light output can be adjusted for each CCT.

Consult BIOS guide for more information on BIOS technology.

**CCT Axitune** Systems

Consult Axitune technical sheet for more information on color technology.

LED life

Minimum 50,000h with 85% of lumen maintenance in 25°C ambient temperature, in compliance with IES LM-80 testing

measurements.

Thermal Management Aluminum housing acting as the heat sink to

maximize life.

Environment Dry and damp rated in operating ambient temperatures of 0-40°C (32-104F).

Product design and development is an ongoing pro s Lighting. We reserve the right to change s ntact Axis for the latest product information

2/10 May 19, 2023

FILE NAME: B2SOD.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23



#### **PENDANT MOUNT - DIRECT**

#### • SYSTEM (S#)

BEAM2 SQUARE linear systems, with the use of a strong profile, allow for a nearly hair thin connection system of continuous runs. Lengths of 4', 8', 12' as well as custom lengths are available. Runs of BEAM2 SQUARE that are greater than 12' in length are designated as systems (S#). This means that the run is comprised of a combination of 4', 8' and/or 12' sections to be assembled on site using our joining system. For more information on systems and joining, please refer to the BEAM installation sheets available for download at www.axislighting.com.

#### ● WARRANTY

Axis Lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications. If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

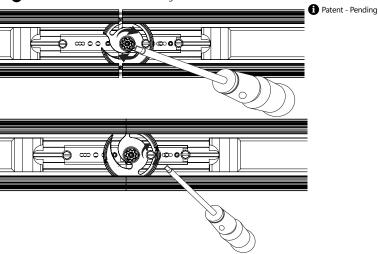
#### InstaJoiner

BEAM2 SQUARE SurroundLite luminaires feature InstaJoiner, a unique, patent-pending joining system developed by Axis offering fast, single-screw tightening.

**NOTE:** Mount each system segment individually.

#### Do not assemble system prior to mounting

1 Allow a minimum of 6" between end of long runs and wall.



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May 19, 2023



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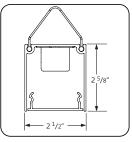
FILE NAME: B2SQD.LED.SPEC

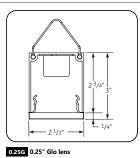
Tacoma Public Library	
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23

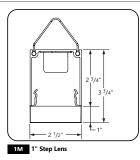


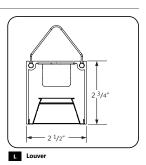
#### **PENDANT MOUNT - DIRECT**

#### SECTION VIEWS





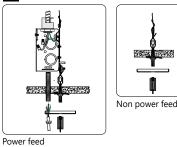


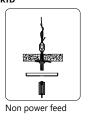


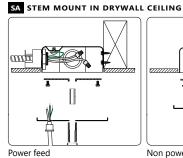
Spotless lens Narrow lens Graze lens Wallwash lens Batwing lens

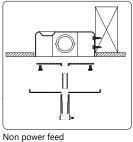
#### • MOUNTING OPTIONS

### CT TILE CEILING - ON GRID

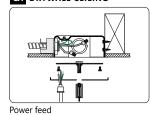


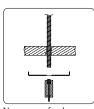






CA DRYWALL CEILING



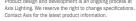


Non power feed

### • OTHER MOUNTING OPTIONS

BEAM 2 SQUARE is also available with surface, wall and recessed wall mounted options.

• Specification sheets and installation sheets for all mountings for BEAM 2 SQUARE LED luminaires are available for download at www.axislighting.com



4/10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23



#### **PENDANT MOUNT - DIRECT**

#### DMLED MODULE

Blank **LED Module** Quantity

Spacing

Extruded aluminum (0.075" nominal)

2" diameter

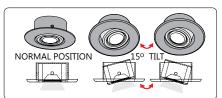
For every 4' section, there may be up to a maximum of 4 x DMLED modules. Each module is placed centered on a blank section 6" in length.

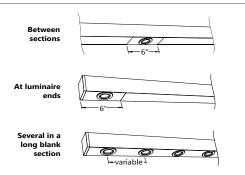
For a series of modules within a given section length, they will be spaced evenly on a longer blank section.

Custom spacing may be available on

special request.

Tilt 15° each side.





**Beam Angle** 30 nominal degrees Input Watts 3W **Nominal Lumens** 126 lumens Efficacy 42 lumens per watt Color Rendering Index (CRI) 80 25,000 hours at L<sub>70</sub> Life 3000K Correlated color temperature (CCT)

More options are available upon request. Please consult factory.



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5/10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC



Tacoma Public Library	
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23

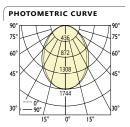


#### **PENDANT MOUNT - DIRECT**

#### PHOTOMETRIC DATA

SO - Spotless lens 1000 lm/ft





Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 34 W Efficacy: 118 lm/W IES FILE: B2SQDLED-1000-80-35-SO-4.IES

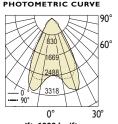
TESTED ACCORDING TO IES LM-79-2008

CAN	IDELA	DIST	RIBUT	ION	
		Hori	zontal A	ngles	
Vertical Angle	0	22.5	45	67.5	90
0	1742	1742	1742	1742	1742
5	1731	1723	1720	1717	1713
15	1637	1620	1598	1581	1577
25	1462	1433	1397	1361	1347
35	1224	1190	1141	1096	1079
45	956	926	876	828	810
55	690	666	623	581	569
65	442	424	395	367	358
75	227	216	203	187	183
85	63	57	51	44	44
90	3	3	3	3	3

	Lumens
Zone	
0	
0-10	164
10-20	456
20-30	656
30-40	734
40-50	699
50-60	580
60-70	412
70-80	230
80-90	69
90	

UMENS	LUMI	LUMINANCE DATA (cd/m²)			
Lumens		Horizontal Angles			
	Vertical Angle	0	45	90	
	45	18485	16928	15660	
164	55	16438	14844	13550	
456	65	14298	12780	11567	
656	75	11985	10694	9680	
734	85	9901	8012	6837	
699					

L louver	
1000 lm/ft	
PHOTOMET	RIC CURVE
	90°



Lumen/ft: 1000 lm/ft Total Lumens: 4083 lm (for 4ft) Input Watts: 39.4 W Efficacy: 104 lm/W IES FILE: B2SQDLED-1000-80-35-L-4.IES

TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION								
	Horizontal Angles							
Vertical Angle	0 22.5 45 67.5 90							
0	2341	2341	2341	2341	2341			
5	2475	2467	2440	2410	2380			
15	2605	2674	2911	3062	2978			
25	2280	2566	3119	3162	2970			
35	1584	2021	2389	1676	1444			
45	356	554	809	577	504			
55	41	62	87	170	261			
65	3	4	7	10	9			
75	ı	- 1	- 1	2	2			
85	0	0	0	0	0			
90	0	0	0	0	0			

ZONAL LUMENS			
	Lumens		
Zone			
0			
0-10	240		
10-20	818		
20-30	1296		
30-40	1135		
40-50	463		
50-60	111		
60-70	12		
70-80	4		
80-90	3		
90			

LUMINANCE DATA (cd/m²)					
	Horizontal Angles				
Vertical Angle	0	45	90		
45	845 I	19211	11969		
55	1210	2542	7644		
65	127	290	374		
75	45	65	136		
85	39	58	77		

1 All IES files for other lamping are available for download at: www.axislighting.com

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

6/10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23



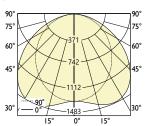
#### **PENDANT MOUNT - DIRECT**

85

#### • PHOTOMETRIC DATA



### PHOTOMETRIC CURVE



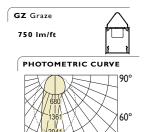
Lumen/ft 1000 lm/ft Luminaire Lumens: 4000 lm Input Watts: 40.1 W Efficacy: 100 lm/W IES FILE: B2SQDLED-1000-80-35-BW-4.IES

TESTED ACCORDING TO IES LM-79-2008

CANI	DELA D	ISTRIB	UTION			ZONALI	LUME
		Horiz	ontal Ang	les			Lum
Vertical Angle	0	22.5	45	67.5	90	Zone	
0	1166	1166	1166	1166	1166	0	
5	1158	1163	1174	1185	1190	0-10	- 113
15	1097	1131	1209	1291	1325	10-20	34
25	981	1052	1233	1404	1460	20-30	56.
35	831	928	1179	1399	1467	30-40	72
45	669	773	1045	1207	1245	40-50	76
55	505	591	792	918	942	50-60	67
65	342	398	522	599	611	60-70	49
75	180	205	266	299	303	70-80	26

59 62 63

ENS	LUMINANCE DATA (cd/m²)					
ens	.	Horizontal Angles				
	Vertical Angle	0	45	90		
	45	12934	20196	24063		
2	55	12031	18869	22435		
3	65	11071	16882	19744		
5	75	9513	14052	16015		
1	85	5950	9261	9810		
^						



30° Lumen/ft 750 lm/ft Total Lumens: 3212 lm (for 4ft) Input Watts: 30.3 W Efficacy: 106 lm/W IES FILE: B2SQDLED-750-80-35-GZ-4.IES

TESTED ACCORDING TO IES LM-79-2008

2722

ZONAL LUMENS						
Lumens						
Zone						
0						
0-10	188					
10-20	450					
20-30	550					
30-40	562					
40-50	519					
50-60	432					
60-70	308					
70-80	164					
80-90	39					
90						

80-90

68

LUMINANCE DATA (cd/m²)					
	Horizontal Angles				
Vertical Angle	0	45	90		
45	20205	10119	10356		
55	17175	9493	10294		
65	13348	8695	10246		
75	9356	7446	9220		
85	4845	4659	4847		

1 All IES files for other lamping are available for download at: www.axislighting.com



7/10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23

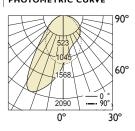


#### **PENDANT MOUNT - DIRECT**

#### PHOTOMETRIC DATA



#### PHOTOMETRIC CURVE



Lumen/ft: 750 lm/ft Total Lumens: 3247 lm (for 4ft) Input Watts: 30.3 W Efficacy: 107 lm/W
IES FILE: B2SQDLED-750-80-35-WW-4.IES

TESTED ACCORDING TO IES LM-79-2008

#### CANDELA DISTRIBUTION

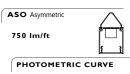
	Horizontal Angles					
Vertical Angle	0	22.5	45	67.5	90	
0	1243	1243	1243	1243	1243	
5	1219	1137	1078	1043	1033	
15	1135	937	852	822	815	
25	977	771	732	734	738	
35	780	635	642	670	684	
45	585	510	534	572	596	
55	410	382	402	467	508	
65	259	249	269	347	386	
75	131	127	142	194	214	
85	27	27	33	40	38	
90	2	3	3	2	2	

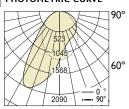
### ZONAL LUMENS

	Lumens
Zone	
0	
0-10	119
10-20	356
20-30	572
30-40	651
40-50	578
50-60	455
60-70	313
70-80	164
80-90	39
90	

#### LUMINANCE DATA (cd/m²)

	Horizontal Angles				
Vertical Angle	0 45 90				
45	11389	10400	11612		
55	9845	9647	12205		
65	8439	8765	12564		
75	6987	7563	11380		
85	4291	5165	5927		





Lumen/ft down: 750 lm/ft Total Lumens: 3247 lm (for 4ft) Input Watts: 30.3 W Efficacy: 107 lm/W IES FILE: B2SQDLED-750-80-35-ASO-4.IES

TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION

' I	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1243	1243	1243	1243	1243
5	1219	1137	1078	1043	1033
15	1135	937	852	822	815
25	977	771	732	734	738
35	780	635	642	670	684
45	585	510	534	572	596
55	410	382	402	467	508
65	259	249	269	347	386
75	131	127	142	194	214
85	27	27	33	40	38
90	2	3	3	2	2

ZONAL	L	.u	М	EI	N:	
		L	un	ner	าร	

	Lumens
Zone	
0	
0-10	119
10-20	356
20-30	572
30-40	651
40-50	578
50-60	455
60-70	313
70-80	164
80-90	39
90	

LUM	INANCE DATA (cd/m²)
	Horizontal Angles

	Horizontal Angles				
Vertical Angle	0	45	90		
45	11389	10400	11612		
55	9845	9647	12205		
65	8439	8765	12564		
75	6987	7563	11380		
85	4291	5165	5927		

1 All IES files for other lamping are available for download at: www.axislighting.com



8/10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





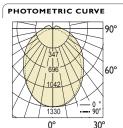
Tacoma Public Library	
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23



#### **PENDANT MOUNT - DIRECT**

#### PHOTOMETRIC DATA





Lumen/f: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 31.7 W Efficacy: 126 lm/W IES FILE: B2SQDLED-1000-80-35-1M-4.IES

TESTED ACCORDING TO IES LM-79-2008

### CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1388	1388	1388	1388	1388
5	1377	1374	1374	1371	1373
15	1297	1292	1281	1268	1265
25	1147	1140	1121	1099	1093
35	947	947	931	917	914
45	725	739	744	747	750
55	513	542	573	592	598
65	325	370	418	446	453
75	171	224	283	315	321
85	57	115	177	206	212
90	16	77	139	169	173
95	15	70	127	155	159
105	12	57	100	132	137
115	П	42	80	102	112
125	8	31	65	85	95

ZONAL I	LUMENS
	Lumens
Zone	

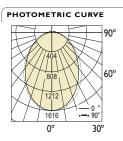
Zone	
0	
0-10	131
10-20	365
20-30	525
30-40	595
40-50	585
50-60	518
60-70	413
70-80	292
80-90	181
90	
90-100	120
100-110	96
110-120	71
120-130	52
130-140	
140-150	
150-160	
160-170	
170-180	58

180

#### LUMINANCE DATA (cd/m²)

	Horizontal Angles				
Vertical Angle	0	45	90		
45	12846	6088	5113		
55	10826	4636	3936		
65	8796	3450	2971		
75	6739	2461	2161		
85	4405	1671	1509		





Lumen/f: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 33.7 W Efficacy: 119 lm/W IES FILE: B2SQDLED-1000-80-35-0.25G-4.IES

TESTED ACCORDING TO IES LM-79-2008

CAN	NDEL	A DIS	TRIBU	ITION	
		Hori	zontal A	ngles	
Vertical Angle	0	22.5	45	67.5	90
0	1614	1614	1614	1614	1614
5	1606	1603	1600	1597	1594
15	1517	1506	1494	1479	1475
25	1352	1333	1307	1279	1271
35	1126	1109	1075	1039	1026
45	877	864	832	799	788
55	631	624	606	582	574
65	405	408	405	396	394
75	210	223	237	243	245
85	63	83	107	122	128

65	405	408	405	396	394
75	210	223	237	243	245
85	63	83	107	122	128
90	8	30	56	74	80
95	8	26	47	63	68
105	7	19	37	55	60
115	7	14	29	41	48
125	8	13	25	34	40

ZONAL	LUMENS
	Lumens
Zone	
0	
0-10	152
10-20	422
20-30	607
30-40	680
40-50	651

30-40	680
40-50	651
50-60	548
60-70	405
70-80	251
80-90	115
90	
90-100	50
100-110	41
110-120	30
120-130	23
130-140	
140-150	
150-160	
160-170	

170-180 26 180

LUMINANCE	DATA	(cd/m²)

	Ho	rizontal An	gles
Vertical Angle	0	45	90
45	16952	16086	15230
55	15036	14439	13678
65	13081	13087	12734
75	11075	12505	12937
85	9910	16784	20013

1 All IES files for other lamping are available for download at: www.axislighting.com



9 / I0 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





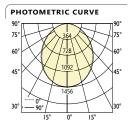
Tacoma Public Library	
Tacoma	Type: L7/L7A
BuildingWork	Bid Set
	8/4/23



#### **PENDANT MOUNT - DIRECT**

#### • PHOTOMETRIC DATA





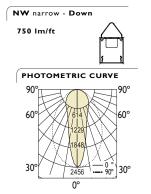
Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 37.8 W Efficacy: 106 lm/W IES FILE: B2SQDLED-1000-80-35-UB-4.IES

TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION				
		Horizontal Angles			
Vertical Angle	0	22.5	45	67.5	90
0	1456	1456	1456	1456	1456
5	1449	1448	1448	1447	1447
15	1390	1386	1382	1384	1387
25	1274	1269	1279	1290	1290
35	1114	1113	1129	1128	1128
45	921	932	937	926	922
55	708	720	713	701	697
65	480	491	480	471	470
75	262	267	263	260	260
85	80	78	75	71	71
90	5	3	3	3	3

ZONAL L	UMENS
	Lumens
Zone	
0	
0-10	137
10-20	391
20-30	587
30-40	698
40-50	712
50-60	632
60-70	475
70-80	280
80-90	86
90	

LUMI	NANCE	DATA (	d/m²)
	Hor	izontal An	gles
Vertical Angle	0	45	90
45	16697	16972	16713
55	15808	15937	15574
65	14563	14560	14240
75	12982	13027	12878
85	11800	10987	10492



Lumen/ft: 750 lm/ft Total Lumens: 3225 lm (for 4ft) Input Watts: 30.1 W Efficacy: 107 lm/W IES FILE: B2SQDLED-750-80-35-NW-4.IES

IES FILE: B2SQDLED-750-80-35-NW-4.IES
TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION				
		Hori	zontal A	ngles	
Vertical Angle	0	22.5	45	67.5	90
0	2458	2458	2458	2458	2458
5	2440	2405	2313	2224	2197
15	2258	1979	1546	1303	1239
25	1925	1464	1019	868	838
35	1497	1066	753	686	678
45	1058	773	581	554	555
55	684	540	429	424	430
65	394	337	285	290	299
75	180	163	148	154	160
85	33	33	33	32	32
90	2	2	- 1	I	I

ONAL	LUMEN
	Lumens
Zone	
0	
0-10	207
10-20	453
20-30	538
30-40	556
40-50	519
50-60	433
60-70	310
70-80	167
80-90	41
90	

LUMINANCE DATA (cd/m²)						
	Horizontal Angles					
Vertical Angle	0	45	90			
45	20605	11314	10803			
55	16414	10308	10324			
65	12851	9298	9742			
75	9563	7852	8515			
85	5141	5207	4984			

1 All IES files for other lamping are available for download at: www.axislighting.com

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information. I0 / I0 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L8
BuildingWork	Bid Set
	8/4/23

Fixture Designated Not In Use



Tacoma Public Library	
Tacoma	Type: L9
BuildingWork	Bid Set
	8/4/23

**Barbican Specification Sheet** 

Chip • 16-8201

Generated: Jun 20th 2023



#### Barbican

## Chip

The Chip, is a fun twist on the standard drum and is fully enclosed & washable, making it ideal for your commercial, hospitality or health care environment.











Please find an overall listing of all product options. Barbican specializes in producing products on a per request basis. Please feel free to use our online builder to determine conditional options, or confer with your lighting rep, or reach out to sales@barbican.ca for more information.



Diamet	er	Heigh	nt	Mounting			Diffuse	r	Source	•	
18D	18"	8H	8"	ACW	Aircraft Cable WHITE Power Cord		НТО	Opal	LED1	2 12 Watts	
				ACB	Aircraft Cable BLACK Power Cord						
Finish	(Cano	pies, S	tems)		Voltage Te		Tempera	ture	Colou	r Rende	ring Index
,	WHT	White			120V	120 Volts	2700K	2700 °K	9	0CRI 9	90 CRI

Finish (Canopies, Stems)		Voltage		Tempera	ture	Colour Rend	dering Index
WHT	White	120V	120 Volts	2700K	2700 °K	90CRI	90 CRI
BLK	Black 277V 277 Volts			3000K	3000 °K		
ВА	Brushed Aluminum	3500K	3500 °K				
RAL	RAL (North American)			4000K	4000 °K		

#### **Dimming Drivers**

DB(0-10V) DB(0-10V)



Please visit our website to view our full material galleries, where you will find natural stone, natural wood, metallized finish, printed patterns and our Artisan Collection.



https://barbican.ca sales@barbican.ca 1-800-663-5781

Tacoma Public Library	
Tacoma	Type: L9
BuildingWork	Bid Set
	8/4/23





https://barbican.ca sales@barbican.ca 1-800-663-5781

Tacoma Public Library	
Tacoma	Type: L10
BuildingWork	Bid Set
	8/4/23

# **CIELO** PLUS PENDANT

Through its minimal form and glare-free, flat panel LED technology, Cielo enables light to act as its expressive element and defining feature. Boasting a robust 930 lumens of warm dimmable light, Cielo Plus maintians a compact and classic shape that integrates into any environment, regardless of style. Cielo Plus is offered in two refined machine-trace finishes in silver and brass as well as two textured painted finishes in white and black. Cielo can be suspended individually, in a series, or in chandlier groupings to provide warm and balanced illumination. The larger the grouping, the bolder the display. Cielo offers full range dimming and is composed of energy efficient LEDs rated for up to 50K hours.

#### FIXTURE TYPE

Pendant

#### LIGHT SOURCE

LED Flat-Panel

#### LIGHT CONTROL

Hard-wired, dimmable Compatible with TRIAC and ELV dimmers 0-10V available upon request

#### **FEATURES**

Energy efficient flat panel technology Full-range dim Available in multiple color combinations Glare-free illumination

#### SPECIFICATIONS

Voltage: 120V or 240V 50-60Hz Power Consumption: 12.8W Color temperature: 2700K Luminosity: 930 Lumens Luminaire efficacy: 72 Lumens/Watt Color Rendition Index: 91 CRI Title 20 compliant 50K hour lifespan Cable length: 10' (305cm) (Field Cuttable)

### CERTIFICATIONS



PRODUCT CODES		
Cielo Plus (Black):	CIEL PLUS BLK/BLK	
Cielo Plus (White):	CIEL PLUS WHT/WHT	
Cielo Plus (Silver):	CIEL PLUS SLV	
Cielo Plus (Brass):	CIEL PLUS BRA	

#### PACKAGING WEIGHT AND DIMENSIONS

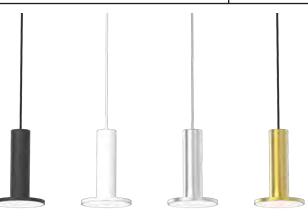
TACKACING WEIGHT AND DIMENSIONS					
Cielo Plus:	3.65LBS	11" X 7.5" X 7.5"			
	1.7KGS	28cm X 19cm X 19cm			

#### NOTES

Custom requests can be considered on volume orders



blanca



#### **FINISHES**





### **DIMENSIONS**

CIELO PLUS



Tacoma Public Library	
Tacoma	Type: L10
BuildingWork	Bid Set
	8/4/23

# **CIELO PLUS CHANDELIER**

#### **DESCRIPTION**

Cielo chandelier's grouping of LED pendants provides perfectly balanced and warm illumination in a simple and expressive silhouette. Cielo Chandelier is available in 3, 5, 7 and 13 Cielo pendant configurations to accent any residential, commercial or hospitality setting. Cielo features a fully dimmable and energy efficient flat panel technology that is rated for up to a 50K hour lifespan. Now available in brand new Hi-Bright model boasting 930 lumens of glare free illumination.

#### FIXTURE TYPE

Pendant

#### LIGHT SOURCE

LED Flat-Panel

#### LIGHT CONTROL

Hard-wired, dimmable Compatible with TRIAC/ELV and 0-10V dimmers 0-10V dimming available upon request

#### **FEATURES**

Energy efficient flat panel technology Full-range dim Available in multiple color combinations Glare-free illumination

#### **SPECIFICATIONS**

Voltage: 120V or 240V 50-60Hz Power Consumption: 12.8W per lamp Color temperature: 2700K Luminosity: 930 Lumens Luminaire efficacy: 72 Lumens/Watt Color Rendition Index: 91 CRI Title 20 compliant 50K hour lifespan Cable length: 10' (305cm) (Field Cuttable)

### CERTIFICATIONS





#### **PRODUCT CODES**

Cielo Plus (Black):	CIEL PLUS BLK/BLK
Cielo Plus (White):	CIEL PLUS WHT/WHT
Cielo Plus (Silver):	CIEL PLUS SLV
Cielo Plus (Brass):	CIEL PLUS BRA
Cielo Chandelier (3/5/7):	CIEL HB CHND 3/5/7
Cielo Chandelier (13):	CIEL HB CHND 13

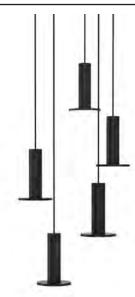
PACKAGING WEIGHT AND DIMENSIONS				
Cielo:	3.65LBS	11" X 7.5" X 7.5"		
	1.7KGS	28cm X 19cm X 19cm		
Chandelier canopy 17":	15LBS	22" X 22" X 6"		
	6.8KGS	56cm X 56cm X 15cm		
Chandelier canopy 26":	30LBS	32" X 32" X 6"		
	13.6KGS	81cm X 81cm X 15cm		

#### NOTES

Custom requests can be considered on volume orders

## **Pablo**

blanca





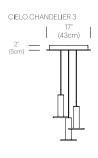


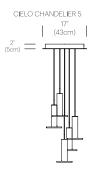


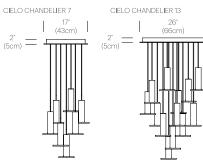


**DIMENSIONS** 

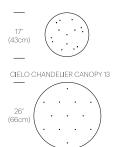
CIELO PLUS CHANDELIER













Tacoma Public Library	
Tacoma	Type: L11
BuildingWork	Bid Set
	8/4/23

#### **SkyePlane** Regressed **2x4** Recessed T-Bar & Drywall **Project** Type Notes PERFORMANCE AT 3500K NOMINAL LUMEN OUTPUT INPUT WATTS 66.69 W\* 127 lm/W \* Based on a 1x1 foot luminaire using one driver SIDE VIEW A SIDE VIEW B **Ordering Guide** SKPA so TOTAL NOM. LUMENS PRODUCT ID SIZE CRI SHIELDING SHIELDING POSITION TW2750 2700-5000 K - Tunable White SO spotless lens RE regressed SKPA SkyePlane 24 2'X4' 3600 3600 lm - Min 80 80 CRI 30 3000 K 90 90 CRI\* 35 3500 K TW2765 2700-6500 K - Tunable White 6800 lm - Max at 90 CRI Regressed 7600 7600 lm - Max at 80 CRI **40** 4000 K BTW3527 3500-2700 K - Tunable BIOS **B30** 3000 K - BIOS\* **BTW4027** 4000-2700 K - Tunable BIOS B35 3500 K - BIOS\* **B40** 4000 K - BIOS\* Consult Axitune technical sheet for more information on color technology. \*Consult BIOS guide for more information on BIOS technology w DOOR FINISH VOLTAGE DRIVER CIRCUITS MOUNTING/SUSPENSION BATTERY (OPTIONAL) W white 120 120 V **DP** dimming (0-10V) 1% 1 1 circuit TR9 t-har 9/16" B(#) battery pack TB15 t-bar 15/16" 277 277 V LT Lutron +E(#) emergency section\* **347** 347 V BI bi-level dimming +NL(#) night light section\* ST screw slot t-bar **UNV** universal **O(#)** other\*\* +GTD(#) generator transfer device **TG9** tegular 9/16" DC low voltage\* DPB(STC) dimming (0-10V) 1% with BIOS\* **TG15** tegular 15/16" **DPB(DYN)** Bio-dimming™ 100%-81% with BIOS\* **DF** drywall flange TW(#) tunable white drivers\* POE(#) POE drivers\* \* Only available with POE drivers \* Specify quantity \*See page 2 to specify system \*\*Please consult factory; see page 2 SPECIFY DRIVER NAME (if needed) CUSTOM (OPTIONAL) OTHER (OPTIONAL) IC CONTROL REMOTE (OPTIONAL) FW(#) flex whip (6' std) DS(#) daylight sensor CP chicago plenum OS(#) occupancy sensor SPECIFY BATTERY NAME (if needed) DOS(#) daylight & occupancy sensor EN(#) enlighted integral \* ENR(#) enlighted remote \*

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications. Contact Axis for the latest product information.

I / 4 May 24, 2023

Consult factory for Tunable White.
Not available with DPB (DYN) driver for BIOS with Dynamic Spectrum

WC(#) wireless control dimming

FILE NAME:SkyePlane-24-Regressed.SPEC





Tacoma Public Library	
Tacoma	Type: L11
BuildingWork	Bid Set
	8/4/23

# **SkyePlane** Regressed **2x4**

## Recessed T-Bar & Drywall

ELECTRICAL

Other drivers\*\*

LDE1 - Hi-lume 1% EcoSystem with Soft-on, Fade-to-Lutron driver

**DALI** - Digital Addressable Lighting Interface

DMX - Digital Multiplex Xitanium SR - For wireless sensor

BIOS DPB drivers\* STC - BIOS control 0-10V with static spectrum and BIOS SkyBlue enabled from 100% to 1%.

DYN - BIOS control 0-10V with dynamic spectrum and BIOS SkyBlue® with Bio-Dimming™, which changes spectral qualities by removing the SkyBlue component when dimming from 100% to 81%, while light output remains relatively constant; bio-dimming reduces CCT to 2700K. Dimming from 80% to 1% will then reduce light

output.

DALIDT6 - DALI Type 6 (Two DALI Addresses) DALIDT8 - DALI Type 8 ( One DALI Address) Tunable White TW drivers\*

LTTW - Lutron T-Series Tunable White

Power over Ethernet MOLEX POE drivers\* IGOR UL2108 certified for SMARTENGINE

integral or remote driver O - Other (Consult factory)

Emergency Integral emergency battery pack or emergency circuit optional.

120V, 277V, 347V, UNV, DC. Input Voltage

Flex Whip Shipped in a separate box for contractors to install

\*Choose driver from available options.

incorporating these components may have limitations or affect the length of the luminaire. Please contact factory for more details

● LED SYSTEM

CRI Minimum 80 or 90 color rendering index.

CRI BIOS

Minimum 80 color rendering index with R9>75

**CCT Single** 

Choice of 2700K, 3000K, 3500K and 4000K color temperature with a great color consistency (within 3–step MacAdam ellipse). Both within

fixture and fixture to fixture.

CCT BIOS

BIOS Static (STC) Choice of 3000K, 3500K and

BIOS SkyBlue® Dynamic (DYN) Choice of 3000K, 3500K, and 4000K with Bio-Dimming™ BIOS Tunable White (BTW) Choice of 4000-2700K and 3500-2700K; does not use a bio-dimmer, it uses TW drivers, which allow independent control of CCT and intensity; e.g., BTW4027 provides combined SkyBlue + white light at 4000K. SkyBlue is removed at 2700K. Light output can be adjusted for each CCT.

Consult BIOS guide for more information on

BIOS technology.

**CCT Axitune** Systems

Consult Axitune technical sheet for more information on color technology.

LED life

Minimum 50,000h with 85% of lumen maintenance in 25°C ambient temperature, in compliance with IES LM-80 testing

measurements.

Thermal

Aluminum housing acting as the heat sink to

Management maximize life.

Environment

Dry and damp rated in operating ambient temperatures of 0-40°C (32-104F).



2/4 May 24, 2023

FILE NAME:SkyePlane-24-Regressed.SPEC



Tacoma Public Library		
Tacoma	Type: L11	
BuildingWork		Bid Set
		8/4/23

**● CEILING SYSTEM** 

# SkyePlane Regressed 2x4

## Recessed T-Bar & Drywall

#### • SPECIFICATIONS

#### CONSTRUCTION

Housing Die formed cold rolled sheet steel (20 gauge).

Door frame Extruded aluminum.

 Lens
 0.125" PMMA satin blend.

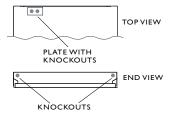
 Reflectors
 High reflectance post painted.

 Drywall Flange Kit
 Extruded aluminum (0.060" nominal).

Luminaire support Integrated Hold-Down clip

#### • STANDARD AND END MOUNT POWER FEED

Knockouts for BX cable connection are provided both on the top and on the ends of the luminaire. This allows for an end mount power feed solution if it is required. (BX CABLE BY OTHER)



• WHITE FINISH

Paint powder coated

#### WARRANTY

Axis Lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications.

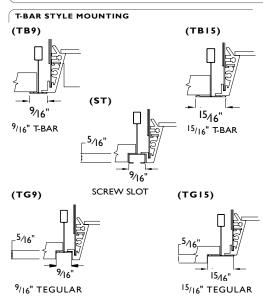
If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

#### ● APPROVALS

Certified to UL and CSA standards culous Chicago Plenum Certified (CCEA) Meets NYC requirements Suitable for damp locations. IC Rated (Insulated ceiling)

● WEIGHT

Drywall with Kit 31 lbs / 14.06 kg



#### DRYWALL WITH FLANGE KIT (DF)



WITH WOOD FRAME

#### DRYWALL MOUNTING KIT



Installation sheets for all mounting options are available at: www.axislighting.com





FILE NAME:SkyePlane-24-Regressed.SPEC



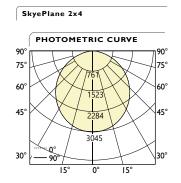


Tacoma Public Library	
Tacoma	Type: L11
BuildingWork	Bid Set
	8/4/23

# SkyePlane Regressed 2x4

Recessed T-Bar & Drywall

#### ● PHOTOMETRIC DATA



CA	NDEL	ZONAL	LUM				
		Horiz	zontal A		Lum		
/ertical Angle	0	22.5	45	67.5	90	Zone	
)	3045	3045	3045	3045	3045	0	
5	3031	303 I	3030	303 I	3030	0-10	28
15	2913	2914	2917	2919	2919	10-20	82
25	2680	2683	2693	2700	2700	20-30	12
35	2358	2363	2373	2388	2392	30-40	14
<b>1</b> 5	1965	1970	1982	2000	2009	40-50	15
55	1513	1519	1532	1552	1565	50-60	13
55	1016	1022	1037	1057	1071	60-70	10
75	502	507	523	539	551	70-80	55
35	87	91	98	107	113	80-90	12
90	5	7	6	5	5	90	

ENS	LUMINANCE DATA (cd/m²)								
ens		Horizontal Angles							
	Vertical Angle	0	45	90					
	45	3923	3956	4012					
	55	3724	3772	3853					
88	65	3394	3464	3578					
!3	75	2737	2851	3006					
40 85	85	1406	1589	1825					

Total Lumens: 8447 lm Input Watts: 66.69 W Efficacy: 127 lm/W

80 CRI shown. For 90 CRI, divide wattage by 0.8 and multiply efficacy by 0.8. IES FILE: SKPL-24-8500-80-35-SO-RE-W-120-D

TESTED ACCORDING TO IES LM-79-2008

1 All IES files are available for download at: www.axislighting.com



4 / 4 May 24, 2023

ILE NAME:SkyePlane-24-Regressed.SPEC



Tacoma Public Library  Tacoma	<b>Type:</b> L12/L12A
BuildingWork	Bid Set
	8/4/23

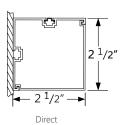
# EDGE 2 | WALL MOUNT - DIRECT AND INDIRECT

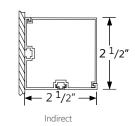






Type \_\_\_\_\_\_Notes









Oluci	IIIs uulub													
										UB				
	PRODUCT ID NOM. LUMENS/FT		CRI		CRI COLOR TEMP.			SHIELDING		LENGTH		FINISH		
ED2WD	Edge 2 Wall Direct LED	250	250 lm/ft- Min		80	80 CRI	27	2700 K	UB	Ultra Blend	2	2'	AP	aluminum paint
ED2WI	Edge 2 Wall Indirect LED	1000	1000 lm/ft - Max	Direct	90	90 CRI	30	3000 K		Lens	3	3'	W	white
		1100	1100 lm/ft - Max	Indirect			35	3500 K			4	4'	BLK	black
							40	4000 K			5	5'	С	custom
											6	6'		
											7	7'		
											8	8'		
											12	12'		
											S(L)	system run		
Outputs between listed min and max are available. Consult factory for outputs outside of the listed range.									ner lengths and related blease consult factory.					

GROOVE FINISH		VOLTAGE		DRIVER			CIRCUITS		
AP	aluminum paint	120	120 V	DP	dimming (0-10V) 1% - integral*	1	1 circuit		
W	white	277	277 V	LT	Lutron-remote (1) - remote**	2	2 circuits		
BLK	black	347	347 V*	BI	bi-level dimming - remote**	+E(#)	emergency circuit *		
c	custom	UNV	universal	0	other (2) - remote*	+NL(#)	night light circuit *		
		DC	low voltage**	POE(#)	POE drivers (1)				
See page 2 for more details		* Remote driv ** Only availa	rer only. ble with POE drivers.	* Not available w ** Remote driver (1) Specify syster (2) Please consult		* Specify quan	stity		

FL		
END CAP	BATTERY - REMOTE (OPTIONAL)	CUSTOM (OPTIONAL)
FL flat standard	B(#) remote battery pack	C custom
For close end cap only	Remote only	Please specify

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specification Contact Axis for the latest product information I / 4 December 14, 2022

FILE NAME: EDGE2-Wall.SPEC





Tacoma Public Library	T 1 40/1 40A
Tacoma	<b>Type:</b> L12/L12A
BuildingWork	Bid Set
	8/4/23

#### EDGE 2 **WALL MOUNT - DIRECT AND INDIRECT**

#### SPECIFICATIONS

#### CONSTRUCTION

Housing Extruded aluminum (0.075" nominal) Up to 70% recycled content

**End Cap** Cast aluminum

Die formed sheet steel (20 gauge) Interior Brackets Reflectors

White powder coated sheet steel (22 gauge) Extruded acrylic (0.070" nominal) Lenses

#### ELECTRICAL

**DP** driver EDGE 2 features integral driver technology. 0-10V

dimming standard.

Power over Ethernet MOLEX
POE drivers\* IGOR
(consult factory for SMARTE more information) UL2108 certified for

SMARTENGINE O - Other (Consult factory) ntegral or remote driver

Emergency Remote emergency battery pack or emergency circuit

Input Voltage 120V, 277V, 347V, UNV.

Incorporating these components may have limitations or effect the length of the luminaire, please contact factory for more details.

#### LED SYSTEM

CRI Minimum 80 or 90 color rendering index.

CCT Choice of 2700K, 3000K, 3500K and 4000K color

temperature with a great color consistency (within 3-step MacAdam ellipse). Both within

fixture and fixture to fixture.

LED life Minimum 50.000h with 85% of lumen

maintenance in 25°C ambient temperature, in compliance with IES LM-80 testing

measurements.

**Thermal** Aluminum housing acting as the heat sink to

maximize life. Management

Environment Dry and damp rated in operating ambient

temperatures of 0-40°C (32-104F).

#### WEIGHT

4.7 lbs / 2.1 kg Direct 4 ft Direct 8 ft 9.2 lbs / 4.2 kg Direct 12 ft 13.9 lbs / 6.3 kg

#### • OPTICS



**UB** Ultra Blend Lens

#### • SYSTEM (S#)

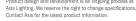
EDGE 2 linear systems, with the use of a strong profile, allow for a nearly hair thin connection system of continuous runs. Lengths of 2', 3', 4', 8', 12' as well as custom lengths are available. Runs of EDGE 2 that are greater than 12' in length are designated as systems (S#). This means that the run is comprised of a combination of 4', 8' and/or 12' sections to be assembled on site using our joining system. For more information on systems and joining, please refer to the EDGE 2 installation sheets available for download at www.axislighting.com.

#### WARRANTY

Axis Lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications. If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

#### GROOVE FINISH





2/4 December 14, 2022

FILE NAME: EDGE2-Wall.SPEC

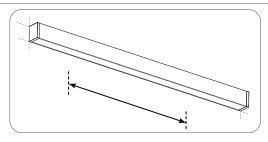




Tacoma Public Library	
Tacoma	<b>Type:</b> L12/L12A
BuildingWork	Bid Set
	8/4/23

# EDGE 2 | WALL MOUNT - DIRECT AND INDIRECT

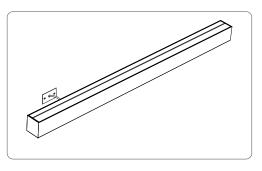
#### MOUNTING SPACING

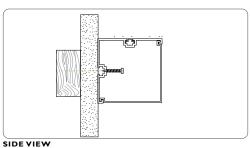


EDGE 2 LED 4' (32" C.C.) EDGE 2 LED 8' (80" C.C.) EDGE 2 LED 12' (128" C.C.)

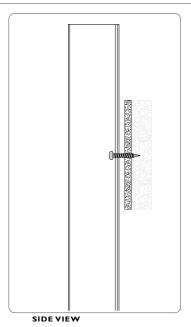
NOTE: Use stud if possible for mounting

#### HORIZONTAL MOUNTING DETAILS





#### ● VERTICAL MOUNTING DETAILS



### • OTHER MOUNTING OPTIONS

EDGE 2 is also available as Pendant or Surface.

1 Specification sheets and installation sheets for all mountings for EDGE 2 luminaires are available for download at www.axislighting.com



**3 / 4** December 14, 2022

FILE NAME: EDGE2-Wall.SPEC



Tacoma Public Library	T 1 40/1 40A
Tacoma	<b>Type:</b> L12/L12A
BuildingWork	Bid Set
	8/4/23

#### EDGE 2 **WALL MOUNT - DIRECT AND INDIRECT**

#### • PHOTOMETRIC DATA

Indirect - I I 00 lm/ft



PHOTOMETRIC CURVE



Lumen/ft: 1100 lm/ft Total Lumens: 4493 lm (for 4ft) Input Watts: 30.8 W Efficacy: 146 lm/W IES FILE: ED2WI-1100-80-35-UB-4.IES

CANDELA DISTRIBUTION					
	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	35	35	35	35	35
5	30	29	29	30	31
15	22	19	18	19	23
25	17	12	10	10	16
35	10	8	6	3	8
45	21	9	6	3	0
55	19	9	7	3	7
65	16	9	7	5	14
75	30	8	8	8	21
85	21	8	9	13	29
90	5	22	19	16	32
95	47	44	41	36	36
105	164	127	105	112	114
115	278	243	214	204	208
125	395	364	335	304	304
135	536	489	457	437	434
145	648	604	580	552	555
155	760	719	692	668	672
165	840	810	786	775	780

868 862 861

**180** 892 892 892 892 892

864

ZONAL LUMENS		
	Lumens	
Zone		
0		
0-10	3	
10-20	14	
20-30	32	
30-40	60	
40-50	99	
50-60	147	
60-70	195	
70-80	240	
80-90	272	
90-100	322	
100-110	404	
110-120	477	
120-130	518	
130-140	522	
140-150	476	
150-160	383	
160-170	247	
170-180	85	

LUMI	LUMINANCE DATA (cd/m²)			
	Horizontal Angles			
Vertical Angle	0	45	90	
45	372	109	0	
55	413	151	159	
65	474	217	433	
75	1497	388	1060	
85	3130	1330	4197	

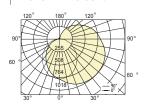
TESTED ACCORDING TO IES LM-79-2008

80 CRI shown. To calculate watts and efficacy at 90 CRI, apply a multiplier of 0.8.

#### Direct - 1000 lm/ft



PHOTOMETRIC CURVE



Lumen/ft: 1000 lm/ft Total Lumens: 4011 lm (for 4ft) Input Watts: 28 W

Efficacy: 143 lm/W IES FILE: ED2WD-1000-80-35-UB-4.IES

CANDELA DISTRIBUTION

879 175

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	793	793	793	793	793
5	782	800	818	832	839
15	747	806	864	906	926
25	680	772	877	955	983
35	580	714	862	971	1012
45	484	632	823	967	1018
55	361	545	766	941	1011
65	258	445	694	898	981
75	161	345	599	827	924
85	57	262	515	738	840
90	9	235	484	701	797
95	19	214	460	673	772
105	29	191	421	613	696
115	16	165	369	534	600
125	15	138	309	442	495
135	19	99	232	337	387
145	8	81	174	242	272
155	14	58	117	159	186
165	18	34	64	89	102
175	25	27	28	30	32
180	28	28	28	28	28

ZONAL	LUMEN
	1

ZONAL LONLING		
	Lumens	
Zone		
0		
0-10	75	
10-20	220	
20-30	341	
30-40	424	
40-50	465	
50-60	463	
60-70	427	
70-80	362	
80-90	289	
90-100	245	
100-110	215	
110-120	174	
120-130	130	
130-140	87	
140-150	52	
150-160	28	
160-170	11	
170-180	3	

LUMINANCE	DATA	(cd/m²)
1		

	Horizontal Angles			
Vertical Angle	0	45	90	
45	8737	14853	18374	
55	8038	17043	22489	
65	7791	20943	29626	
75	7954	29551	45576	
85	8315	75433	123015	

TESTED ACCORDING TO IES LM-79-2008

80 CRI shown. To calculate watts and efficacy at 90 CRI, apply a multiplier of 0.8.

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications Contact Axis for the latest product information.

4/4 December 14, 2022

FILE NAME: EDGE2-Wall.SPEC





Tacoma Public Library	
Tacoma	<b>Type:</b> L13
BuildingWork	Bid Set
	8/4/23



### FLX15

### LED Light Fixture, 1220-1480 Lumens, 15 Watts

Track, Surface and Suspended

Job Information		
Project Name		
Туре		
Location		
Quantity		
Date		

#### Description

15W FLEX series is a high performance LED luminaire with powerful output of 1480 lumens, 95 CRI and smooth sharp cylindrical body with no visible heat sink. Lower energy consumption with crisp, precise CCT, beam control with excellent CRI for various lighting applications, from residential to retail lighting.

#### **Features**

#### Body

Constructed of aluminum, the body features an aesthetically pleasing smooth cylindrical shape.

LED Characteristics
High powered 15W CREE® CXA1512
LED array maintains uniform intensity
with a typical luminous flux up to 1480
lumens, with a typical CRI of 95.

#### Beam Spread

Fixture lens options available in 15°, 25°, 40° and 60° beam spread.

#### **Mounting Options**

Mounting Options
Multiple mounting options for various
applications. Available mounting options
include direct mounting onto a 4"
octagonal junction box for flushmount
and pendant applications, direct
mounting onto a 3½" or 4" octagonal
junction box for exception to poliporitions. junction box for monopoint applications, and 1- or 2-circuit track connectors for track applications (compatible with A-Line, 2- and 3-circuit Powergean H-style, L-style and Liteline tracks).

## Operating Conditions For indoor use only.

#### Quickship Made-To-Order

Made-To-Order products ship within seven business days of an order being released.



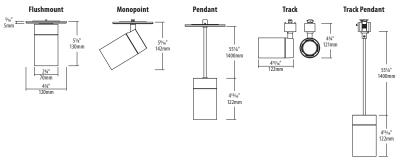
SPECIFICATION			
Approved Location	Dry / Indoor		
Beam Angle	15° / 25° / 40° / 60°		
ССТ	2700 K / 3000 K / 3500 K / 4000 K		
Certification	cETLus		
Class II	Yes		
Color	BK/SL/WH		
CRI	95		
Dimming	Yes		
Dimming Tech	TRIAC/ELV		
Input	100-135V AC, 60Hz		
Lumens	Up to 1480		
Lumens per Watt	Up to 98		
Power Factor	0.95		
Projected Life	70% @ 50,000 hrs		
Warranty	5 years		
Wattage	15W		

CCT	LUMENS
2700 K	1,220
3000 K	1,280
3500 K	1,340
4000 K	1,480

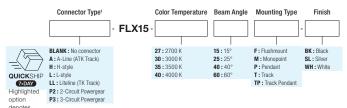




#### **Technical Drawings**



#### **Ordering Guide**





Available for Mounting Type "T" and "TP" only.

Quickship option is available on orders of 100 pieces or less, and will ship within 7 business days. Options must be selected from Quickship section to qualify. Accessories are sold separately. For additional options please consult your Liteline representative. Due to our continued efforts to improve our products, product specifications are subject to change without notice.

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Tacoma Public Library		
Tacoma	Type: L13	
BuildingWork		Bid Set
		8/4/23

#### **Accessories**



#### FLX15-BD-xx1

FLX15-SNO-xx1

Barn doors accessory to facilitate shaping of the light beam. Available in Black (BK), Silver (SL) and White (WH).

Oval snoot to reduce glare and shape the coverage of the illuminated area. Available in Black (BK), Silver (SL)



#### FLX15-HC-xx

Honeycomb louver to reduce glare from light source. Available in Black (BK), Silver (SL) and White (WH).



#### FLX15-SN-××

Snoot to reduce glare and focuses projected light from light source. Available in Black (BK), Silver (SL) and White (WH),



#### FLX15-EXT-××<sup>2</sup>

4" Extender. Available in Black (BK), Silver (SL) and White (WH).



#### FLX15-LINEAR-LENS

Linear spread lens



### and White (WH). FLX15-SL-LENS

Not recommended for use with Mounting Options "F", "P" and "TP". Not recommended for use with Mounting Options "M" and "T".

#### Ordering Guide (Complete with assembled accessories – must select at least one accessory)



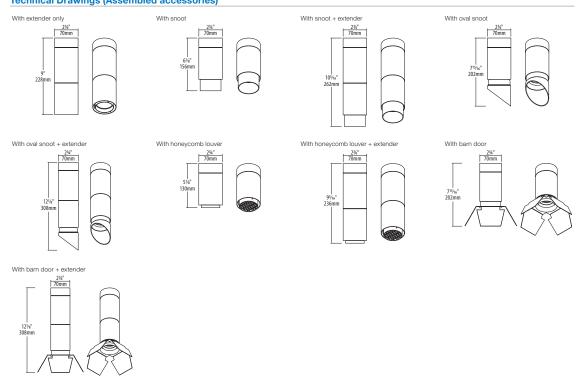
blanca

Notes:

'Available for Fixture Type "T" and "TP" only. Only for Fixture Type "F", "TP" and "P". Only for Fixture Type "TP" and "P". Only available with Rod Mounting Accessories. Quickship option is available on orders of 100 pieces or less, and will ship within 7 business days. Options must be selected from Quickship section to qualify. Accessories are sold separately. For additional options please consult your Liteline representative.

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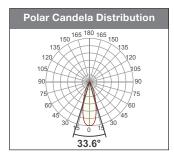
#### **Technical Drawings (Assembled accessories)**



Tacoma Public Library		
Tacoma	Type: L13	
BuildingWork		Bid Set
		8/4/23

#### **Photometry**

FLX15-3040: FLEX fixture, 15W, 3000 K, 40° beam spread.



Beam Details				
D	Lux	FC	L	W
<b>D</b> 4'	<b>Lux</b> 1829	<b>FC</b> 170	<b>L</b> 2.4'	<b>W</b> 2.4'
			2.4' 4.8'	
4'	1829	170		2.4'
4' 8'	1829 457	170 42	4.8'	2.4' 4.8'

Zon	ai Lumen Si	ummary
Zone	Lumens	% Luminaire
0-30	463.0	37.70%
0-40	673.0	54.80%
0-60	956.0	77.85%
60-90	147.0	11.97%
70-100	93.4	7.61%
90-120	53.1	4.32%
0-90	1103.0	89.82%
90-180	81.7	6.65%
0-180	1228.0	100.00%



Tacoma Public Library	
Tacoma	Type: T1
BuildingWork	Bid Set
	8/4/23







Job Information		
Project Name		
Туре		
Location		
Quantity		
Date		

#### Description

The ATK series is an extruded aluminum track for use with A-Line track fixtures. Available in 2', 4', 6', 8' and 12' nominal length.

#### **Features**

#### Extrusion

Constructed of 0.06" extruded aluminum with 0.045" PVC bus bar support holding 12 gauge round bus bars. Polarity groove is located on face of track to indicate location of grounding

Track & Power Feeds

#### Electrical

Single circuit power distribution system designed to supply lighting unit flexibly. Single hot and neutral conductors are rated for max. 20 Amps at 120V. Copper electrical conductors are concealed in thermo-plastic, low-profile track section.

#### Compatibility

Track system is compatible with all A-Line® and Juno® style track fixtures, accessories and connectors.

#### Mounting

Single Circuit Extruded Aluminum Track, 2-12 Feet

This track is surface mounted using the supplied mounting hardware.
Suspended mounting is available with accessories (ordered separately).

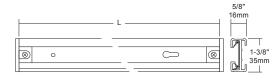
#### Labels



SPECIFICATION	
larrantu	E Voore

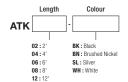


### **Technical Drawings**



Part No.	(Excluding end caps)
ATK02	201/8" (511mm)
ATK04	441/8" (1121mm)
ATK06	681/s" (1730mm)
ATK08	921/s" (2340mm)
ATK12	140%" (3559mm)

#### **Ordering Guide**



#### Example: ATK04-BN

Accessories should be ordered separately. For additional options please consult your A-Line Lighting representative. Juno is a registered trademark of Juno Lighting Group. Due to our continued efforts to improve our products, product specifications are subject to change without notice.

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Tacoma Public Library	
Tacoma	Type: T1
BuildingWork	Bid Set
	8/4/23

#### **Accessories**



#### ATKC01

Single circuit 'l' connector.



#### ATKP02

Single circuit 'L' and 'I' power feed connector.



#### ATKP03

Single circuit 'T' power feed connector.



#### ATKP04-1C

Single circuit 'X' power feed connector.



#### ATKC05

Single circuit flexible connector.



### ATKP06

Single circuit live end conduit feed.



#### ATKP08

Single circuit center feed.



#### ATKP09

Single circuit live end power feed.



#### ATKP10

Single circuit wired end power feed, with 15' plug-in cord.



### ATKP11

Single circuit live end power feed with canopy cover.



#### ATK0-ENDCAP-1C

Single circuit track end cap.



#### ATKPCL-06-1C

Single circuit live end narrow current limiter, 1~14 amp options

ATK02-PDW1

single circuit track.

ATK02-PDW5

ATK04-PDW1

single circuit track.

ATK04-PDW5

single circuit track.

2' Precision Pro Channel, 1/2" drywall, for

2' Precision Pro Channel, %" drywall, for single circuit track.

4' Precision Pro Channel, 1/2" drywall, for

4' Precision Pro Channel, %" drywall, for



#### ATKPCL-09-1C

Single circuit dual live end canopy current limiter, 1~14 amp options



Single circuit live end canopy current limiter, 1~14 amp options



### 12" Suspension rod system.



#### ATKXW18

18" Suspension rod system.



#### ATKXW24

24" Suspension rod system.



#### ATKXW36

36" Suspension rod system.



ATKXW48 48" Suspension rod system.



#### ATKA310

A-Line track pendant adapter, chain.



### ATKA31A

A-Line track pendant adapter, cord.



### ATKA320

A-Line track hook. 7lb maximum weight.



#### ATKA321

A-Line track receptacle, accepts 3-prong plugs.



#### ATKA250S

43/4" Sloped ceiling canopy kit.



Stem rod kit to suspend track system from ceiling, 6" ~ 72" options.



#### ATKM420

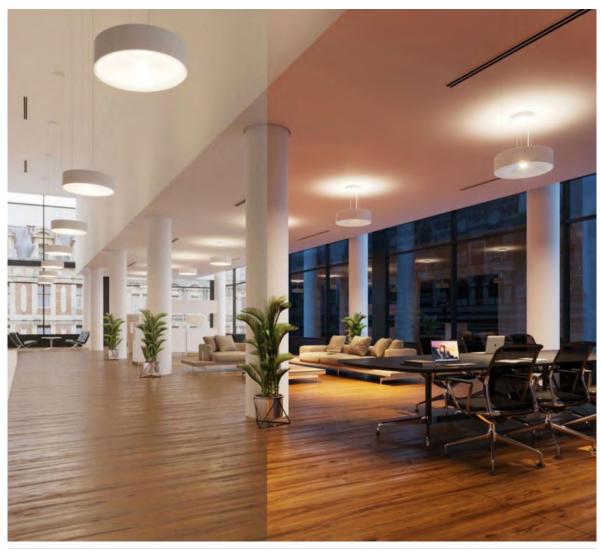
Track suspension kit, 180" AC.

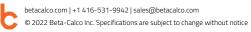


Tacoma Public Library	
Tacoma	Type: L14
BuildingWork	Bid Set
	8/4/23

### WARP™ - SUSPENDED

Project Name:	Fixture Type:
Fixture Code:	Ouantities:





Jun 13, 2023 12:20 AM Page 1 of 8



Tacoma Public Library	
Tacoma	Type: L14
BuildingWork	Bid Set
	8/4/23

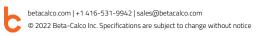
### WARP™ - SUSPENDED















Tacoma Public Library		
Tacoma	Type: L14	
BuildingWork		Bid Set
		8/4/23

### WARP™ - SUSPENDED

Our revolutionary triple circuit luminaire delivers high efficiency diffused, spot and indirect light, allowing you to transition from general ambient to mood lighting. Available in two sizes 18" (457mm) & 24" (610mm), the **WARP** family offers two styles of pendant plus a ceiling mounted version. The color temperature of each light source can be individually selected to deliver an effect best suited to the application. New to the WARP are a wide array of contemporary decorative colors to accent your architectural scene.

#### **GENERAL SPECIFICATION**

Body

Aluminum and steel.

Suspension

Steel cables.

#### Integral emergency system

Emergency option provides a 1.5 hour (3 hours for EU) emergency lighting facility. The self contained system includes the inverter module, NiCad batteries, LED charge indicator and test switch (NA only). Integral emergency EU luminaires have a 10.5" (270mm) DIA x 2" (48mm) height canopy with LED charge indicator. Not available with a 347V supply.

#### Diffuser

Acrylic.

### Drivers

HPF electronic drivers for 120-277V, 347V, (EU-240V)

#### **Delivered lumens**

Delivered lumens & LPW based on 4000K (min 80 CRI).

#### Approvals

Damp Location (Indoor use only).

#### Designed by

Serge Cornelissen.

#### **MOUNTING & OPTICS**



hlanca



Suspended Direct Suspended Direct/Indirect

#### Canopy finish

Powder coated.

#### Power cable

Silver braided.

#### Remote emergency

Emergency option provides a 1.5 hour (3 hours for EU) emergency lighting facility. The remote system includes the inverter module, NiCad batteries and a remote wall/ceiling LED charge indicator and test switch (NA only) Maximum distance between wall/ceiling plate and luminaire is 15' (4.5m). Test switch fits a single gang box (not supplied).

#### Mechanical

Luminaires mount directly to a J box (by others - North America only).

#### L70 @25°C

> 50,000 hrs.

### Design

US Pat. No. D893,083.





Tacoma Public Library		
Tacoma	Type: L14	
BuildingWork		Bid Set
		8/4/23

### WARP™ - SUSPENDED

#### **HOW TO ORDER**

#### A. LUMINAIRE

**WARP1P18** 18", Direct, 3300 lms Direct **WARP1P24** 24", Direct, 4900 lms Direct **WARP2P18** 18", Direct/Indirect, 3300 WARP2P24 24", Direct/Indirect, 4900

Ims Direct, 2400 Ims Indirect Ims Direct, 2400 Ims Indirect

B. LUMENS (DIRECT)

**LMA0200** 2000 lm IMA0490 4900 lm IMA0330 3300 lm

C. LUMENS (INDIRECT)

LMB0000 Not required LMB0120 1200 lm LMB0180 1800 lm LMB0240 2400 lm

D. CRI

CR80 CRI 80+

E. CCT

**CTA30** 3000K CTA35 3500K CTA40 4000K

F. UPLIGHT DIFFUSER

**UDO** Not required **UD2** Opal diffuser **UD1** Clear diffuser

**G. VOLTAGE** 

**V3** 347V <sup>2</sup> V1 120/277\/ V2 240V 1

### H. DIMMING

**DA01** 0-10V Dimming 1.0% DA20 DALI Dimming 0.1% 1 DA21 DALI Dimming 1.0% 1 **DA02** 0-10V Dimming 0.1% <sup>1</sup> DA30 DSI/switchDim 12

#### I. FIXTURE FINISH

FA01 White FA02 Black Metallic - Textured FA20 Silver Metallic - Textured FA25 Gold Metallic

FA44 Midnight Blue Metallic - Textured FA45 Copper Metallic FA46 Charcoal Metallic - Textured FA47 Bronze Metallic - Textured FA52 Champagne Metallic FA53 Red Metallic - Textured

J. CANOPY FINISH

CF01 White CF02 Black Metallic - Textured CF20 Silver Metallic - Textured CF25 Gold Metallic

CF44 Midnight Blue Metallic - Textured CF46 Charcoal Metallic - Textured CF47 Bronze Metallic - Textured CF45 Copper Metallic CF52 Champagne Metallic CF53 Red Metallic - Textured

**K. EMERGENCY** 

**EO** Not required E1 Emergency system - Integral E2 Emergency system - Remote



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<sup>1</sup> Not available in North America.

<sup>&</sup>lt;sup>2</sup> Available with DA01 dimming only.

<sup>&</sup>lt;sup>1</sup> Not available with V3.

<sup>&</sup>lt;sup>2</sup> Not available in North America.

Tacoma Public Library		
Tacoma	Type: L14	
BuildingWork		Bid Set
		8/4/23

### WARP™ - SUSPENDED

#### L. DOWNLIGHT SPOT

**DL27** Downlight 28W, 2700K (1730 **DL30** Downlight 28W, 3000K (1799 **DL35** Downlight 28W, 3500K (1854 **DL00** Not required delivered lms) delivered lms) delivered lms)

**DL40** Downlight 28W, 4000K (1858 delivered lms)

**CIRCUITS** 

CS1 Single Circuit <sup>1</sup> CS2 Dual Circuit 2 CS3 Triple Circuit <sup>3</sup>



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<sup>&</sup>lt;sup>1</sup> The entire fixture will be on one circuit, 1 power cable will be supplied.

<sup>&</sup>lt;sup>2</sup> Spot light will be on a separate circuit from the main fixture. One power cable will be supplied. If the Spot light is not selected, then Direct and Indirect will be on a separate circuit.

<sup>&</sup>lt;sup>3</sup> Direct, Indirect and Spot light will all be on separate circuits. Two power cables will be supplied.

Tacoma Public Library	
Tacoma	Type: L14
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### WARP™ - SUSPENDED

#### TECHNICAL DATA

#### LUMINAIRE

Code	WARP1P18	WARP1P24	WARP2P18	WARP2P24
Diameter (A)	18"	24"	18"	24"
Light Direction	Direct	Direct	Direct/Indirect	Direct/Indirect
Wattage	22W	34W	43W	54W
Delivered Ims (Direct)	3300	4900	3300	4900
Delivered Ims (Indirect)			2400	2400
LPW	146	145	131	132
Height (B)	6"	6.5"	6"	6.5"

#### FIXTURE FINISH



#### **CANOPY FINISH**





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Tacoma Public Library	
Tacoma	Type: L15
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#### **OPTIONAL ACCESSORIES**









SYMMETRICAL SNOOT

ASYMMETRICAL SNOOT

SYMMETRICAL FROSTED ACRYLIC

SYMMETRICAL FROSTED ACRYLIC

# LED PIPE TH

#### C3P | Standard LED

Our LED Pipe™ family of cylinders provide architects and lighting designers with almost limitless design possibilities. Whether you need to light a space with inaccessible ceilings, disappear among the pipes and ducts of an openceiling design, focus attention on a specific architectural detail or make a dramatic statement, you can solve almost any lighting problem with a LED Pipe™.

#### LISTINGS







Wet Location



California Title 24 JA8



Downlight Uplight +
Downlight





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Tacoma	Type. L 10	
BuildingWork		Bid Set
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# LED PIPE THE

#### C3P | Standard LED

#### **FEATURES**

- Downlight and Uplight/Downlight available
- Damp location standard
- · Wet location optional (downlight only)
- Ø 2 5/8" [67mm] aperture
- 65° tilt from nadir & 350° rotation (adjustable pendant)
- · Single media ready
- · Various Media lens options available, downlight only (damp and wet location)
- Softening or frosted media lens options available, uplight only (damp location)
- · Clear flush mounted lens (wet location)
- Stem mount with 30° hang straight, optional cord mount (fixed pendant only)
- Rigid stem mount (adjustable pendant)
- Extruded aluminum cylinder body
- Machine aluminum components
- · Powder coated finishes
- Mounts to 4" octagonal junction box (by others)

#### CERTIFICATIONS







#### **COLOR TEMPERATURES**

3000K-1800K	3000k
(Warm Dim)	3500K
2700K	4000k

#### **FINISHES**

Anthracite Metallic	Nano White
Espresso Metallic	Slate Grey Metallic
Glimmer Gold	Terra Metallic
Ink Black Metallic	

WIRE COLORS (DAMP LOCA	ATION)	
Clear Metallic Braid		Fabric Grey
Fabric Black		Fabric Red
Fabric Gold	Ŏ	Fabric White
WIRE COLORS (WET LOCA	TION)	

Black White
-------------

#### PERFORMANCE SUMMARY

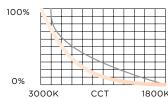
Color Accuracy (SDCM)	<3	
L70 Estimate (h)	50,000	
Color Rendering (CRI)	80	90
Lumen Series (3)	8014	9010
Source Lumens	1400	1000
LED Wattage	11	11
Lumen Series (5)	8018	9014
Source Lumens	1800	1400
LED Wattage	16	16
Lumen Series (7)	8023	9018
Source Lumens	2300	1800
LED Wattage	22	22

#### PERFORMANCE SUMMARY—WARM DIMMING

Color Rendering (CRI)	95
Lumen Series (3)	9510
Source Lumens	1000
LED Wattage	12

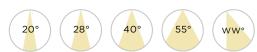
#### WARM DIMMING METRICS

Warm Dimming - MR16 Halogen

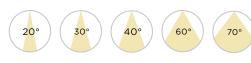


\*Consult factory for additional lower lumen options.

#### **BEAM SPREADS (DOWNLIGHT)**



#### BEAM SPREADS (UPLIGHT + DOWNLIGHT)



LED Pipe 3in Pendant Standard LED Specs p. 2/13

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## LED PIPE ...

C3P | Standard LED | Downlight | Integral Driver | Order Form

#### Tag Type

ORDER CODE FORMAT: [1]-[2]-[3]-[4]-[5]-[6]-[7]-[8]-[9]-[10]-[11]-[12]-[13]-[14]-[15]
ORDER CODE EXAMPLE: C3P-R-W-6-21-21-B20-27-8014-LE-120-3C-FR-S1-21

- 1. Not available with wet location.
- 2. Only available in 5S & SCM mounting.
- 3. [Blank] clear media lens mounted to regressed trim aperture.
- **4.** W clear glass lens is flush mounted to the trim aperture and is wet location listed when selected. Not available with C3PA Cylinder or BWW Beam Spread
- 5. Not available with C3PA 3" adjustable pendant
  6. Field interchangeable beam spread options require consultation with
- Lightheaded personnel.
- 7. BWW wall wash optic is aimable after installation.
- $\pmb{8.}\ 8023$  and 9018 CRI, lumens are only available in 12" Layout.
- 9. LE & S dimming are only available in 120V.
- **10.** LE, LH & P1 dimming require the ceiling canopy to be 5.75" in diameter & 3" deep. Refer to dimensional data.
- 11. 48" cord length standard. Cord color is white with 21 Nano White finish Cord color is black for all other finishes. Refer to additional color options.
- 12. 3C ceiling canopy requires C3-R-3CMP junction box mounting plate (can be provided separately). Must be installed with junction box (not included) prior to ceiling installation.
- 13. 48" stem length standard. For additional stem length consult factory.
- 14. CCM & SCM mounts over 4" octagonal junction box (by others). Comes with 2 conduit feed covers & 3 blank covers. Consult factory for additional conduit accessories.
- $\textbf{15.} \ \, \textbf{Optional media replaces clear media when selected.} \ \, \textbf{Not available with BWW wall wash.}$
- 16. Accessories are not available with wet location option.
- 17. Finish required for S1& S2 snoots.
- Wet Location.
- 3000K-1800K Warm Dimming.
- Title 24 JA8 qualified, consult factory for complete listing

#### **SELECT A CYLINDER** [7] MODULE & BEAM SPREAD 6 [12] MOUNTING B20 20° Beam 3C Cord, Small Canopy 11, 12 [1] CYLINDER ☐ **B28** 28° Beam (Includes C3-R-3CMP Mounting Plate) C3P 3" Fixed Pendant **B40** 40° Beam **5C** Cord, Large Canopy 11 C3PA 3" Adjustable Pendant 1,2 **B55** 55° Beam 55 Stem, Large Canopy 13 C3P 3" Wall Wash Pendant BWW Wall Wash 7 CCM Cord, Surface Conduit mount [2] CYLINDER SHAPE to surface 4" octagonal j-box. 1, 11, 14 **181 COLOR TEMPERATURE** R Round SCM Stem, Surface Conduit mount **27** 2700K to surface 4" octagonal j-box. 1, 13, 14 **[3] GLASS 30** 3000K [Blank] Clear Lens <sup>3</sup> **35** 3500K [13] OPTIONAL MEDIA (1 MAX.) 15 W Clear Lens ♠⁴ **40** 4000K [Blank] No Media 3018 3000-1800K FR Frosted **[4] LAYOUT** ☐ HC Honeycomb 6 6" Cylinder Length **191 LUMENS SERIES** PF Perimeter Frosted 12 12" Cylinder Length ⁵ 8014 80 CRI, 1400lm, 3S SL Softening 9010 90 CRI, 1000lm, 3S SPDL Spread **FINISH** 9510 95 CRI, 1000lm, 3S 🛑 🌑 21 Nano White 8018 80 CRI, 1800lm, 5S [14] OPTIONAL ACCESSORIES 16 23 Anthracite Metallic 24 Ink Black Metallic **9014** 90 CRI, 1400lm, 5S S1 Snoot Symmetric (1.25") 17 **8023** 80 CRI, 2300lm, 7S <sup>8</sup> S2 Snoot Asymmetric (1.5") 17 25 Slate Grey Metallic 9018 90 CRI, 1800 lm, 7S 8 A1 Frosted Acrylic Trim (0.5") 26 Espresso Metallic A2 Frosted Acrylic Trim (2.0") **27** Terra Metallic [10] DIMMING 28 Glimmer Gold LE Lutron Hi-lume Forward Phase [15] ACCESSORIES FINISH 17 21 Nano White23 Anthracite Metallic CC Custom Color 2-wire Dimming (1%) 9, 10 ■ LH Lutron Hi-lume EcoSystem **161 REFLECTOR FINISH** Soft-on Fade-to-Black (1%) 10 24 Ink Black Metallic ☐ 21 Nano White 25 Slate Grey Metallic **P** 0-10V Dimming (10%) 23 Anthracite Metallic 24 Ink Black Metallic 26 Espresso Metallic ■ P1 0-10V Dimming (1%) <sup>10</sup> 27 Terra Metallic28 Glimmer Gold S Phase Dimming (10%) 9 25 Slate Grey Metallic 26 Espresso Metallic **[11] VOLTAGE** CC Custom Color **120** 120V 27 Terra Metallic 28 Glimmer Gold ■ 277 277 CC Custom Color

LED Pipe 3in Pendant Standard LED Specs p. 3/13

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Tacoma Public Library		
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BuildingWork		Bid Set
		8/4/23

## LED PIPE ...

C3P | Standard LED | Downlight | Remodel Driver | Order Form

ORDER CODE FORMAT: [1]-[2]-[3]-[4]-[5]-[6]-[7]-[8]-[9]-[10]-[11]-[12]-[13]-[14]-[15]-[16]-[17]-[18] ORDER CODE EXAMPLE: C3P-R-W-6-21-21-B20-27-8014-RM-3C-FR-S1-21-DRB-C3-3-LH-120

- 1. [Blank] clear media lens mounted to regressed trim aperture
- 2. W clear glass lens is flush mounted to the trim aperture and is wet location listed when selected. Not available with C3PA Cylinder or BWW Beam Spread.
- 3. Field interchangeable beam spread options require consultation with Lightheaded personnel.
- 4. BWW wall wash optic is aimable after installation.
- 5. 3018 warm dim color temperature is only available in 9510 CRI, Lumens.
- 6. 8023 and 9018 CRI, lumens are only available in 12" Layout.
- 7. Remodel driver sold separately.
- 8. 48" cord length standard. Cord color is white with 21 Nano White finish. Cord color is black for all other finishes. Refer to additional color options.
- 9. Optional media replaces clear media when selected. Not available with BWW wall wash.
- 10. Accessories are not available with wet location option.
- 11. Finish required for S1& S2 snoots.
- 12. LH is not available with 7 series
- 13. S dimming is only available in 120V
- Wet Location.
- 3000K-1800K Warm Dimming
- Title 24 JA8 qualified, consult factory for complete listing.

#### [7] MODULE & BEAM SPREAD 3 [13] OPTIONAL ACCESSORIES 10 SELECT A CYLINDER **B20** 20° Beam S1 Snoot Symmetric (1.25") 11 [1] CYLINDER **B28** 28° Beam S2 Snoot Asymmetric (1.5")11 C3P 3" Fixed Pendant 🦲 A1 Frosted Acrylic Trim (0.5") **B40** 40° Beam C3P 3" Wall Wash Pendant **B55** 55° Beam A2 Frosted Acrylic Trim (2.0") BWW Wall Wash 4 **[2] CYLINDER SHAPE** [14] ACCESSORIES FINISH 17 R Round 23 Anthracite Metallic [8] COLOR TEMPERATURE **[3] GLASS 27** 2700K [Blank] Clear Lens 1 **30** 3000K 24 Ink Black Metallic 35 3500K ☐ 25 Slate Grev Metallic **40** 4000K 26 Espresso Metallic [4] LAYOUT **3018** 3000-1800K ● <sup>5</sup> 27 Terra Metallic 6 6" Cylinder Length 28 Glimmer Gold 12 12" Cylinder Length [9] LUMENS SERIES CC Custom Color 8014 80 CRI, 1400lm, 3S **[5] FINISH** 9010 90 CRI, 1000lm, 3S **[15] DRIVER** 21 Nano White 9510 95 CRI, 1000lm, 3S | 5 DRB-C3 Remodel Driver 23 Anthracite Metallic 8018 80 CRI, 1800lm, 5S 24 Ink Black Metallic [16] LUMEN SERIES 9014 90 CRI, 1400lm, 5S 25 Slate Grey Metallic **3** 1400 Lumens Max (8014, 9010, 8023 80 CRI, 2300lm, 7S 6 26 Espresso Metallic 9510) 9018 90 CRI, 1800 lm, 7S 6 27 Terra Metallic 5 1800 Lumens Max (8018, 9014) 28 Glimmer Gold CC Custom Color **7** 2300 Lumens Max (8023, 9018) [10] DIMMING RM Remodel Driver 7 [17] DIMMING [6] REFLECTOR FINISH [11] MOUNTING LH Lutron Hi-lume EcoSystem 21 Nano White ☐ **3C** Cord, Small Canopy <sup>8</sup> Soft-on Fade-to-Black (1%) 12 23 Anthracite Metallic ■ P 0-10V Dimming (10%) [12] OPTIONAL MEDIA (1 MAX.) 9 S Phase Dimming (10%) 13 24 Ink Black Metallic [Blank] No Media 25 Slate Grey Metallic FR Frosted **[18] VOLTAGE** 26 Espresso Metallic **120** 120V HC Honeycomb **27** Terra Metallic PF Perimeter Frosted **277** 277V 28 Glimmer Gold CC Custom Color **SL** Softening SPDL Spread

LED Pipe 3in Pendant Standard LED Specs p. 4/13

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## LED PIPE ..

C3P | Standard LED | Uplight + Downlight | Order Form | Integral Driver

#### Tag Type

ORDER CODE FORMAT: [1]-[2]-[3]-[4]-[5]-[6]-[7]-[8]-[9]-[10]-[11]-[12]-[13]-[14]-[15]-[16]-[17]-[18]
ORDER CODE EXAMPLE: C3P-R-9UD-21-21-B10-B60-27-8014-8014-P-120-S-CL-FR-S1-21
ORDER NOTES:

- 1. Field interchangeable beam spread options require consultation with Lightheaded personnel.
- 2. Two dimming drivers are supplied for separate switching and dimming control.
- 3. S dimming are only available in 120V.
- 4. 48" stem length standard. For additional stem length consult factory
- **5.** CM mounts over 4" octagonal junction box (by others). Comes with 2 conduit feed covers & 3 blank covers. Consult factory for additional conduit accessories.
- 6. Media lens mounted to regressed trim aperture (downlight).
- 7. Media lens mounted to regressed trim aperture (uplight).
- 8. Accessories are only available with downlight.
- 9. Finish required for S1& S2 snoots.
- 10. Accessories are not available with wet location option
- 3000K-1800K Warm Dimming.
- Title 24 JA8 qualified, consult factory for complete listing.

#### SELECT A CYLINDER [7] MODULE & BEAM SPREAD [13] MOUNTING [↓] UPLIGHT S Stem surface mount to recessed [1] CYLINDER ■ B20 20° Beam junction box.4 C3P 3" Fixed Pendant 🌑 **B30** 30° Beam **[14] OPTIONS** [2] CYLINDER SHAPE **B40** 40° Beam CM Conduit mount to surface R Round **B60** 60° Beam mount 4" octagonal junction box.5 ☐ **B70** 70° Beam [3] LAYOUT [15] MEDIA (1 MAX.) 6 900 9" Uplight + Downlight [8] COLOR TEMPERATURE [4] DOWNLIGHT [↓] UPLIGHT + DOWNLIGHT **[4] FINISH** \_\_ **CL** Clear **27** 2700K FR Frosted 21 Nano White **30** 3000K 23 Anthracite Metallic SL Softening **35** 3500K 24 Ink Black Metallic SPDL Spread **40** 4000K 25 Slate Grey Metallic 3018 3000-1800K [16] MEDIA (1 MAX.)7 26 Espresso Metallic [↓] UPLIGHT **27** Terra Metallic [9] LUMENS SERIES FR Frosted 28 Glimmer Gold [J] DOWNLIGHT SL Softening CC Custom Color 8014 80 CRI, 1400lm, 3S SPDL Spread 9010 90 CRI, 1000lm, 3S [5] REFLECTOR FINISH 9510 95 CRI, 1000lm, 3S [17] OPTIONAL ACCESSORIES 8, 10 21 Nano White 8018 80 CRI, 1800lm, 5S S1 Snoot Symmetric (1.25")9 23 Anthracite Metallic 9014 90 CRI, 1400lm, 5S S2 Snoot Asymmetric (1.5")9 24 Ink Black Metallic 8023 80 CRI, 2300lm, 7S A1 Frosted Acrylic Trim (0.5") 25 Slate Grey Metallic 9018 90 CRI, 1800lm, 7S A2 Frosted Acrylic Trim (2.0") 26 Espresso Metallic 27 Terra Metallic [18] ACCESSORIES FINISH<sup>9</sup> **[10] LUMENS SERIES** 28 Glimmer Gold [↓] UPLIGHT 21 Nano White CC Custom Color **8014** 80 CRI, 1400lm, 3S 23 Anthracite Metallic 24 Ink Black Metallic 9010 90 CRI, 1000lm, 3S [6] MODULE & BEAM SPREAD 9510 95 CRI, 1000lm, 3S 25 Slate Grev Metallic [\J] DOWNLIGHT1 **8018** 80 CRI, 1800lm, 5S ☐ **26** Espresso Metallic **B10** 10° Beam 9014 90 CRI, 1400lm, 5S 27 Terra Metallic B20 20° Beam 28 Glimmer Gold **B30** 30° Beam [11] DIMMING<sup>2</sup> CC Custom Color **B40** 40° Beam **P** 0-10V Dimming (1%) **B60** 60° Beam S Phase Dimming (1%) 3 ■ **B70** 70° Beam [12] VOLTAGE **120** 120V 277 277V

LED Pipe 3in Pendant Standard LED Specs  $\,$  p. 5/13

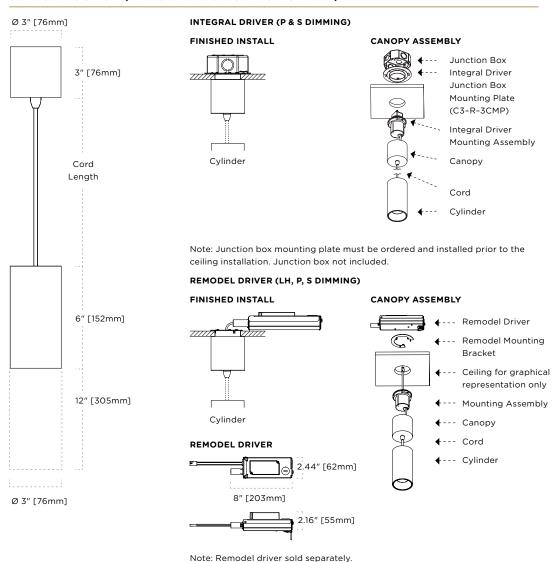
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Tacoma	<b>Type:</b> L15
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#### SMALL CEILING CANOPY (FIXED & WALL WASH DOWNLIGHT CYLINDER)



LED Pipe 3in Pendant Standard LED Specs p. 6/13
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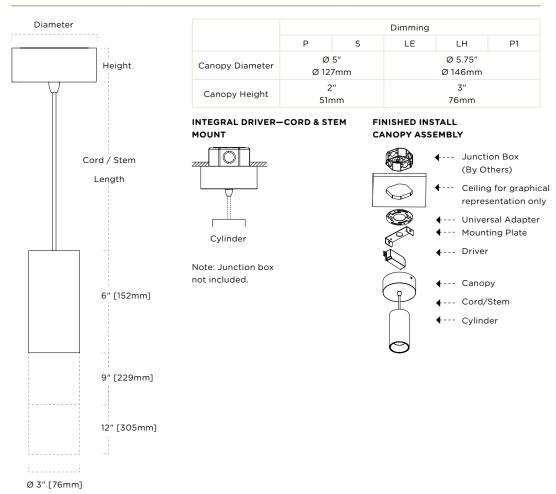
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#### LARGE CEILING CANOPY (FIXED & WALL WASH DOWNLIGHT CYLINDER)



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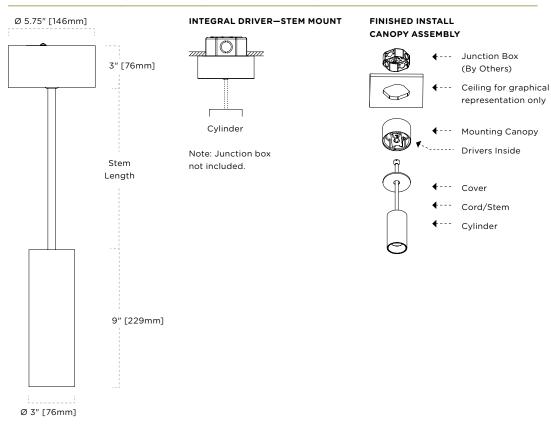
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Tacoma	Type: L15
BuildingWork	Bid Set
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#### LARGE CEILING CANOPY (FIXED UPLIGHT / DOWNLIGHT CYLINDER)



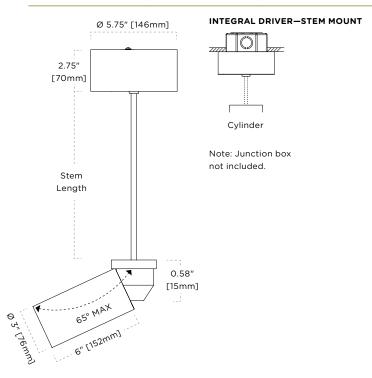
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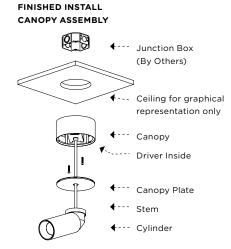




Tacoma Public Library	
Tacoma	Type: L15
BuildingWork	Bid Set
	8/4/23

#### LARGE CEILING CANOPY (ADJUSTABLE CYLINDER)





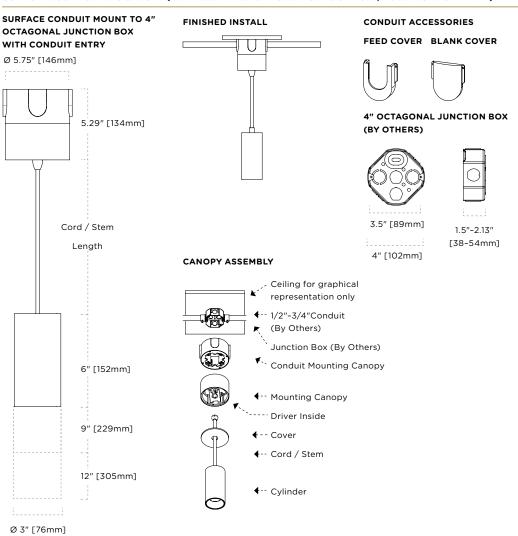
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Tacoma Public Library		
Tacoma	Type: L15	
BuildingWork		Bid Set
		8/4/23

#### CONDUIT MOUNT CEILING CANOPY (FIXED & WALL WASH DOWNLIGHT & UPLIGHT/DOWNLIGHT CYLINDER)



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Tacoma Public Library	<b>Type:</b> L15	
Tacoma	Type. L 10	
BuildingWork		Bid Set
		8/4/23

## CONDUIT MOUNT CEILING CANOPY (ADJUSTABLE CYLINDER) SURFACE CONDUIT MOUNT TO 4" FINISHED INSTALL **CONDUIT ACCESSORIES** OCTAGONAL JUNCTION BOX FEED COVER BLANK COVER WITH CONDUIT ENTRY Ø 5.75" [146mm] 5.29" 4" OCTAGONAL JUNCTION BOX [134mm] (BY OTHERS) Stem 3.5" [89mm] 1.5"-2.13" Length [38-54mm] 4" [102mm] **CANOPY ASSEMBLY** 1/2"-3/4"Conduit (By Others) 0.58" Junction Box (By Others) [15mm] Ceiling for graphical 65° MAX representation only 6" [152mm] Conduit Mounting Canopy Canopy Drive Inside Canopy Plate Stem ←-- Cylinder

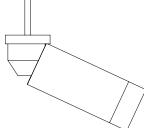
**LED Pipe 3in Pendant Standard LED Specs** p. 11/13
Product specifications and dimensions are subject to change without notice **All rights reserved.** © **2023 Lightheaded Lighting Ltd. Rev 2023.05.04**info@lightheadedlighting.com **P.** 604.464.5644 **T.** 1.800.464.9544

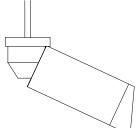




Tacoma Public Library  Tacoma	<b>Type</b> : L15	
BuildingWork		Bid Set
		8/4/23

## SNOOT ACCESSORIES (PENDANT CYLINDER) SYMMETRICAL SNOOT (S1) ASYMMETRICAL SNOOT (S2) 20° 1.5" [39mm] 1.25" [32mm] Ø 3" [76mm] Ø 3" [76mm] PENDANT WITH SYMMETRICAL PENDANT WITH ASYMMETRICAL SNOOT INSTALLED SNOOT INSTALLED ADJUSTABLE PENDANT WITH SYMMETRICAL ADJUSTABLE PENDANT WITH ASYMMETRICAL **SNOOT INSTALLED** SNOOT INSTALLED





LED Pipe 3in Pendant Standard LED Specs p. 12/13 Product specifications and dimensions are subject to change without notice All rights reserved. © 2023 Lightheaded Lighting Ltd. Rev 2023.05.04  $info@lightheadedlighting.com \begin{tabular}{ll} \textbf{P.} & 604.464.5644 & \textbf{T.} & 1.800.464.9544 \\ \end{tabular}$ 





Tacoma Public Library	
Tacoma	<b>Type:</b> L15
BuildingWork	Bid Set
	8/4/23

## DECORATIVE TRIMS ACCESSORIES (PENDANT CYLINDER) FROSTED ACRYLIC TRIM (A1) FROSTED ACRYLIC TRIM (A2) 0.5" [13mm] 2" [51mm] Ø 3" [76mm] Ø 3" [76mm] PENDANT WITH FROSTED **ACRYLIC TRIM INSTALLED** PENDANT WITH FROSTED ACRYLIC TRIM INSTALLED ADJUSTABLE PENDANT WITH FROSTED ACRYLIC TRIM INSTALLED ADJUSTABLE PENDANT WITH FROSTED ACRYLIC TRIM INSTALLED

#### CERTIFICATIONS







LED Pipe 3in Pendant Standard LED Specs p. 13/13
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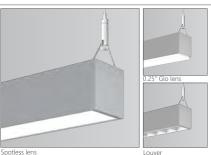




Tacoma Public Library	
Tacoma	Type: L16
BuildingWork	Bid Set
	8/4/23

## BEAM 2

#### **PENDANT MOUNT - DIRECT**





Project \_\_\_\_\_\_
Type \_\_\_\_\_
Notes \_\_\_\_

## PERFORMANCE PER LINEAR FOOT AT 3500K

NOMINAL LUMEN OUTPUT	INPUT WATTS*	EFFICACY	SHIELDING
1000 lm/ft	8.4 W/ft	118 lm/W	SO
1000 lm/ft	9.9 W/ft	104 lm/W	L
1000 lm/ft	10 W/ft	100 lm/W	BW
750 lm/ft	7.6 W/ft	106 lm/W	GZ
750 lm/ft	7.6 W/ft	107 lm/W	ww
750 lm/ft	7.6 W/ft	107 lm/W	ASO
1000 lm/ft	7.9 W/ft	126 lm/W	1M
1000 lm/ft	8.4 W/ft	119 lm/W	0.25G
1000 lm/ft	9.5 W/ft	106 lm/W	UB
750 lm/ft	7.5 W/ft	107 lm/W	NW

Please consult factory for custom lumen output and wattage.













**Ordering Guide** 

oraerin	g Guide							Tu	nable White		32143013
B25	QDLED										
PRO	DUCT ID		NOM. LUMENS/FT		CRI		COL	OR TEMP. (	choose one)		SHIELDING
B2SQDLED	Pendant Direct		300 lm/ft - min	80			2700 K	,	2700-5000 K - Tunable White	so	spotless lens
		750	750 lm/ft - max for	90	90 CRI*	30	3000 K	TW2765	2700-6500 K - Tunable White	L	louver*
			GZ, NW, WW, ASO*			35	3500 K	BTW3527	3500-2700 K - Tunable BIOS	0.25G	0.25" Glo lens
		1000	1000 lm/ft - max			40	4000 K	BTW4027	4000-2700 K - Tunable BIOS	UB	ultra blend lens
						B30	3000 K - BIOS*			1M	StepLens , lum. end cap
						B35	3500 K - BIOS*			ASO	asymmetric, flush only
						B40	4000 K - BIOS*			BW	batwing, flush only
										NW	narrow, flush only
										GZ	graze, flush only
										ww	wallwash, flush only
		* 750 lm/f Consult fa	etween listed min and max are availabl t max. only for GZ, NW, WW and ASO. ctory for outputs outside of the listed ra ctory for max output with BIOS.		ot available with BIO		ult Axitune technical si sult BIOS guide for mo		ormation of color technology. In BIOS technology		ilable in 3' and 4' increment. ilable with Black finish.
LENCTI		MD (O	DTIONIAL	FIR	ucu		OLTACE		DDIVED		CIDCUITS

	LENGIH	MIK (OPTIONAL)		MR (OPTIONAL) FINISH		FINISH	VOLIAGE		DRIVER		CIRCUITS	
2	2'	DMLED(#)	downlight module	AP	aluminum paint	120	120 V	DP	dimming (0-10V) 1%	1	1 circuit	
3	3'		LED	W	white	277	277 V	LT(#)	Lutron*	2	2 circuits	
4	4'			BLK	black	347	347 V	BI	bi-level dimming	+E(#)	emergency circuit*	
5	5'			c	custom	UNV	universal	O(#)	other**	+NL(#)	night light circuit*	
6	6'					DC	low voltage*	DPB(STC)	dimming (0-10V) 1% with BIOS*	+GTD(#)	generator transfer device*	
8	8'							DPB(DYN)	Bio-dimming™ 100%-81% with BIOS*	+M	MR	
12	12'							TW(#)	tunable white drivers*			
S(L)	system run							POE(#)	POE drivers*			
		Separate circuits Requires 120V o Available in lumi				* Only av drivers.	vailable with POE		o specify system alt factory; see page 2	*Specify qual	ntity	

MOUNTING/SUSPENSION		BATTERY (OPTIONAL)		IC CONTROLS (OPT.)			CUSTOM (OPT.)	
CT9(#) CT15(#) CTS(#) SA(#) CASL(#)	drywall+cable length (36" std.) TB/TG 9/16+cable length (36" std.) TB/TG 5/16+cable length (36" std.) screw slot+cable length (36" std.) drywall+stem length >48" (18" std.) drywall cable sloped ceiling	B(#)	battery pack (integral)	DS(#) OS(#) DOS(#) EN(#) ENR(#) WC(#)	occupancy sensor daylight & occupancy sensor Enlighted integral*	C	custom	
	drywall stem sloped ceiling							
See Mounting kit guide for full specification code. White canopy standard		Minimu	m 4ft; please consult factory	Specify quantity Consult factory	factory controls guide for more details. Requires 8" blank for Tunable White. th DPB (DYN) driver for BIOS with Dynamic	Please	specify	

Product design and development is an ongoing process at Axis Lighting. We reserve the right to change specifications. Contact Axis for the latest product information.

I / I0 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	<b>Type:</b> L16	
Tacoma	1990.210	
BuildingWork		Bid Set
		8/4/23



#### **PENDANT MOUNT - DIRECT**

#### SPECIFICATIONS

#### CONSTRUCTION

Housing Extruded aluminum (0.075" nominal)

Up to 70% recycled content

**End Cap** Cast aluminum Die formed sheet steel (20 gauge)

**Interior Brackets** Reflectors Louvers

White powder coated sheet steel (22 gauge) Die formed semi-specular aluminum (22 gauge)

Extruded acrylic (0.070" nominal)

Hanger adjustable slide mount

Suspension Y shape aircraft cable or Ø 1/2" stem

Cable Grips Quick connecting / release

#### • ELECTRICAL

Lenses

Lutron driver LDE1 - Hi-lume 1% EcoSystem with Soft-on, Fade-to-

Other drivers\*\* DALI - Digital Addressable Lighting Interface

DMX - Digital Multiplex

Xitanium SR - For wireless sensor

STC - BIOS control 0-10V with static spectrum and BIOS BIOS DPB drivers\*

SkyBlue enabled from 100% to 1%.

DYN - BIOS control 0-10V with dynamic spectrum and BIOS SkyBlue® with Bio-Dimming™, which changes spectral qualities by removing the SkyBlue component when dimming from 100% to 81%, while light output remains relatively constant; bio-dimming reduces CCT to 2700K. Dimming from 80% to 1% will then reduce light

output.

**Tunable White** DALIDT6 - DALI Type 6 (Two DALI Addresses) DALIDT8 - DALI Type 8 ( One DALI Address)
LTTW - Lutron T-Series Tunable White TW drivers\*

Power over Ethernet MOLEX POE drivers\* **IGOR** UL2108 certified for

SMARTENGINE integral or remote driver O - Other (Consult factory) **Emergency** 

Integral emergency battery pack or emergency circuit optional.

Input Voltage 120V. 277V. 347V. UNV. DC.

Flex Whip Shipped in a separate box for contractors to install

\*Choose driver from available options

f Incorporating these components may have limitations or affect the length of the luminaire. Please contact factory for more details.

#### OPTICS







SO Spotless lens UB Ultra Blend lens

**ULTRA BLEND LENS** 

Frosted acrylic snap-in micro lens suitable for Tunable White and BIOS applications.

#### **SPOTLESS LENS**

Frosted acrylic snap-in micro lens

#### PARABOLIC LOUVERS

Die formed semi-specular aluminum (22 gauge)

#### GLO LENS

0.25" frosted acrylic drop lens. Patented design.

#### LED SYSTEM

**CCT Single** 

Color

CRI Minimum 80 or 90 color rendering index.

**CRI BIOS** Minimum 80 color rendering index with R9>75

Choice of 2700K, 3000K, 3500K and 4000K color temperature with a great color consistency (within 3-step MacAdam ellipse). Both within

fixture and fixture to fixture.

CCT BIOS BIOS Static (STC) Choice of 3000K, 3500K and

4000K.

BIOS SkyBlue® Dynamic (DYN) Choice of 3000K, 3500K, and 4000K with Bio-Dimming™

BIOS Tunable White (BTW) Choice of 4000-2700K and 3500-2700K; does not use a bio-dimmer, it uses TW drivers, which allow independent control of CCT and intensity; e.g., BTW4027 provides combined SkyBlue + white light at 4000K, SkyBlue is removed at 2700K. Light output can be adjusted for each CCT.

Consult BIOS guide for more information on BIOS technology.

**CCT Axitune** Systems

Consult Axitune technical sheet for more information on color technology.

LED life

Thermal

Minimum 50,000h with 85% of lumen maintenance in 25°C ambient temperature, in compliance with IES LM-80 testing

measurements.

Aluminum housing acting as the heat sink to Management

maximize life.

Environment Dry and damp rated in operating ambient temperatures of 0-40°C (32-104F).

2/10 May 19, 2023

FILE NAME: B2SOD.LED.SPEC

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Tacoma Public Library	
Tacoma	<b>Type</b> : L16
BuildingWork	Bid Set
	8/4/23

## BEAM 2

#### **PENDANT MOUNT - DIRECT**

#### • SYSTEM (S#)

BEAM2 SQUARE linear systems, with the use of a strong profile, allow for a nearly hair thin connection system of continuous runs. Lengths of 4', 8', 12' as well as custom lengths are available. Runs of BEAM2 SQUARE that are greater than 12' in length are designated as systems (S#). This means that the run is comprised of a combination of 4', 8' and/or 12' sections to be assembled on site using our joining system. For more information on systems and joining, please refer to the BEAM installation sheets available for download at www.axislighting.com.

#### ● WARRANTY

Axis Lighting will warrant defective LEDs, boards, and drivers for 5 years from date of purchase. Warranty is valid if luminaire is installed and used according to specifications. If defective, Axis will send replacement boards or drivers at no cost along with detailed replacement instructions and instructions on how to return defective components to Axis.

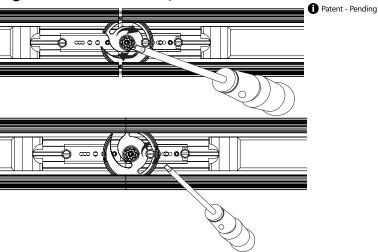
#### InstaJoiner

BEAM2 SQUARE SurroundLite luminaires feature InstaJoiner, a unique, patent-pending joining system developed by Axis offering fast, single-screw tightening.

NOTE: Mount each system segment individually.

#### Do not assemble system prior to mounting

1 Allow a minimum of 6" between end of long runs and wall.







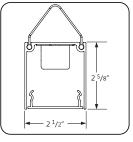
page 98 of 123

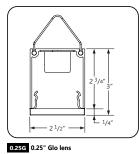
Tacoma Public Library	
Tacoma	<b>Type</b> : L16
BuildingWork	Bid Set
	8/4/23

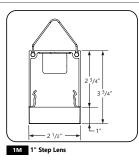


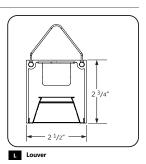
#### **PENDANT MOUNT - DIRECT**

#### SECTION VIEWS





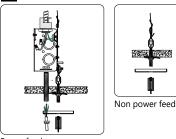




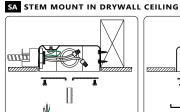
Spotless lens Narrow lens Graze lens Wallwash lene Batwing lens

### • MOUNTING OPTIONS

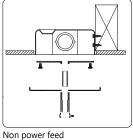
#### CT TILE CEILING - ON GRID





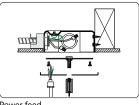


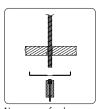
Power feed



Power feed

#### CA DRYWALL CEILING





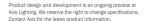
Power feed

Non power feed

#### • OTHER MOUNTING OPTIONS

BEAM 2 SQUARE is also available with surface, wall and recessed wall mounted options.

• Specification sheets and installation sheets for all mountings for BEAM 2 SQUARE LED luminaires are available for download at www.axislighting.com



4/10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L16
BuildingWork	Bid Set
	8/4/23



#### **PENDANT MOUNT - DIRECT**

#### DMLED MODULE

Blank **LED Module** Quantity

Spacing

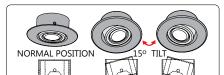
Extruded aluminum (0.075" nominal) 2" diameter

For every 4' section, there may be up to a maximum of 4 x DMLED modules. Each module is placed centered on a blank section 6" in length.

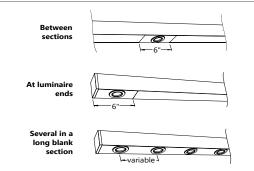
For a series of modules within a given section length, they will be spaced evenly on a longer blank section.

Custom spacing may be available on special request.

Tilt



15° each side.



**Beam Angle** 30 nominal degrees Input Watts 3W **Nominal Lumens** 126 lumens Efficacy 42 lumens per watt 80 Color Rendering Index (CRI) 25,000 hours at L<sub>70</sub> Life 3000K

Correlated color temperature (CCT)

More options are available upon request. Please consult factory.



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5 / 10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC



Tacoma Public Library	
Tacoma	Type: L16
BuildingWork	Bid Set
	8/4/23

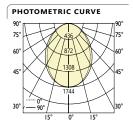


#### **PENDANT MOUNT - DIRECT**

#### PHOTOMETRIC DATA







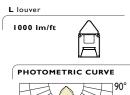
Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 34 W Efficacy: 118 lm/W IES FILE: B2SQDLED-1000-80-35-SO-4.IES

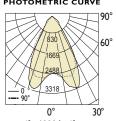
TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION							
		Horizontal Angles						
Vertical Angle	0	22.5	45	67.5	90			
0	1742	1742	1742	1742	1742			
5	1731	1723	1720	1717	1713			
15	1637	1620	1598	1581	1577			
25	1462	1433	1397	1361	1347			
35	1224	1190	1141	1096	1079			
45	956	926	876	828	810			
55	690	666	623	581	569			
65	442	424	395	367	358			
75	227	216	203	187	183			
85	63	57	51	44	44			
90	3	3	3	3	3			

	Lumens
Zone	
0	
0-10	164
10-20	456
20-30	656
30-40	734
40-50	699
50-60	580
60-70	412
70-80	230
80-90	69
90	

LUMINANCE DATA (cd/m²)						
	Horizontal Angles					
Vertical Angle	0	45	90			
45	18485	16928	15660			
55	16438	14844	13550			
65	14298	12780	11567			
75	11985	10694	9680			
85	9901	8012	6837			





Lumen/ft: 1000 lm/ft Total Lumens: 4083 lm (for 4ft) Input Watts: 39.4 W Efficacy: 104 lm/W IES FILE: 825QDLED-1000-80-35-L-4.IES

TESTED ACCORDING TO IES LM-79-2008

CAI	NDEL	A DIS	TRIBU	TION	l				
		Horizontal Angles							
Vertical Angle	0	0 22.5 45 67.5 90							
0	2341	2341	2341	2341	2341				
5	2475	2467	2440	2410	2380				
15	2605	2674	2911	3062	2978				
25	2280	2566	3119	3162	2970				
35	1584	2021	2389	1676	1444				
45	356	554	809	577	504				
55	41	62	87	170	261				
65	3	4	7	10	9				
75	- 1	- 1	- 1	2	2				
85	0	0	0	0	0				
90	0	0	0	0	0				

ZONAL LUMENS	
	Lumens
Zone	
0	
0-10	240
10-20	818
20-30	1296
30-40	1135
40-50	463
50-60	Ш
60-70	12
70-80	4
80-90	3
90	

LUMINANCE DATA (cd/m²)				
	Horizontal Angles			
Vertical Angle	0	45	90	
45	8451	19211	11969	
55	1210	2542	7644	
65	127	290	374	
75	45	65	136	
85	39	58	77	

1 All IES files for other lamping are available for download at: www.axislighting.com

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6 / I0 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L16
BuildingWork	Bid Set
	8/4/23



#### **PENDANT MOUNT - DIRECT**

CANDELA DISTRIBUTION

#### PHOTOMETRIC DATA



PHOTOMETRIC CURVE

75° 60° 45°

30°



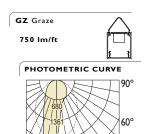
	Horizontal Angles					
Vertical Angle	0	22.5	45	67.5	90	
0	1166	1166	1166	1166	1166	
5	1158	1163	1174	1185	1190	
15	1097	1131	1209	1291	1325	
25	981	1052	1233	1404	1460	
35	831	928	1179	1399	1467	
45	669	773	1045	1207	1245	
55	505	591	792	918	942	
65	342	398	522	599	611	
75	180	205	266	299	303	
85	38	46	59	62	63	
90	3	3	3	3	3	

ZONAL LUMENS		
Lumens		
112		
343		
565		
721		
760		
671		
491		
268		
68		

LUMI	LUMINANCE DATA (cd/m²)				
	Horizontal Angles				
Vertical Angle	0	45	90		
45	12934	20196	24063		
55	12031	18869	22435		
65	11071	16882	19744		
75	9513	14052	16015		
85	5950	9261	9810		

Lumen/ft 1000 lm/ft Luminaire Lumens: 4000 lm Input Watts: 40.1 W Efficacy: 100 lm/W IES FILE: B2SQDLED-1000-80-35-BW-4.IES

TESTED ACCORDING TO IES LM-79-2008



Lumen/ft 750 lm/ft Total Lumens: 3212 lm (for 4ft) Input Watts: 30.3 W Efficacy: 106 lm/W IES FILE: B2SQDLED-750-80-35-GZ-4.IES TESTED ACCORDING TO IES LM-79-2008

2722

## CANDELA DISTRIBUTION

		Hori	zontal A	ngles	
Vertical Angle	0	22.5	45	67.5	90
0	2031	2031	2031	2031	2031
5	1991	1684	1471	1348	1323
15	1861	1159	893	809	795
25	1634	850	705	694	700
35	1349	668	620	632	639
45	1038	535	520	524	532
55	715	406	395	411	429
65	410	267	267	294	314
75	176	135	140	161	173
85	31	27	29	32	31
90	2	2	2	i i	- I

ZONAL LUMEN		
	Lumens	
Zone		
0		
0-10	188	
10-20	450	
20-30	550	
30-40	562	
40-50	519	
50-60	432	
60-70	308	
70-80	164	
80-90	39	
90		

LUMINANCE DATA (cd/m²)					
Vertical Angle	Horizontal Angles				
	0	45	90		
45	20205	10119	10356		
55	17175	9493	10294		
65	13348	8695	10246		
75	9356	7446	9220		
85	4845	4659	4847		

1 All IES files for other lamping are available for download at: www.axislighting.com

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7 / 10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	
Tacoma	<b>Type</b> : L16
BuildingWork	Bid S
	8/4/2



#### **PENDANT MOUNT - DIRECT**

#### PHOTOMETRIC DATA



## PHOTOMETRIC CURVE

# 60° 2090

Lumen/ft: 750 lm/ft Total Lumens: 3247 lm (for 4ft) Input Watts: 30.3 W

Efficacy: 107 lm/W
IES FILE: B2SQDLED-750-80-35-WW-4.IES TESTED ACCORDING TO IES LM-79-2008

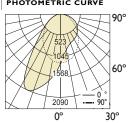
CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1243	1243	1243	1243	1243
5	1219	1137	1078	1043	1033
15	1135	937	852	822	815
25	977	771	732	734	738
35	780	635	642	670	684
45	585	510	534	572	596
55	410	382	402	467	508
65	259	249	269	347	386
75	131	127	142	194	214
85	27	27	33	40	38
90	2	3	3	2	2

ZONAL LUMENS		
	Lumens	
Zone		
0		
0-10	119	
10-20	356	
20-30	572	
30-40	65 I	
40-50	578	
50-60	455	
60-70	313	
70-80	164	
80-90	39	
90		

LUMI	LUMINANCE DATA (cd/m²)			
	Ho	rizontal An	gles	
Vertical Angle	0	45	90	
45	11389	10400	11612	
55	9845	9647	12205	
65	8439	8765	12564	
75	6987	7563	11380	
85	4291	5165	5927	

## ASO Asymmetric 750 lm/ft PHOTOMETRIC CURVE



Lumen/ft down: 750 lm/ft Total Lumens: 3247 lm (for 4ft) Input Watts: 30.3 W Efficacy: 107 lm/W IES FILE: B2SQDLED-750-80-35-ASO-4.IES

TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1243	1243	1243	1243	1243
5	1219	1137	1078	1043	1033
15	1135	937	852	822	815
25	977	771	732	734	738
35	780	635	642	670	684
45	585	510	534	572	596
55	410	382	402	467	508
65	259	249	269	347	386
75	131	127	142	194	214
85	27	27	33	40	38
90	2	3	3	2	2

ZONAL LUMENS			
	Lumens		
Zone			
0			
0-10	119		
10-20	356		
20-30	572		
30-40	651		
40-50	578		
50-60	455		
60-70	313		
70-80	164		
80-90	39		
90	90		

LUMINANCE DATA (cd/m²)			
	Ho	rizontal An	gles
Vertical Angle	0	45	90
45	11389	10400	11612
55	9845	9647	12205
65	8439	8765	12564
75	6987	7563	11380
85	4291	5165	5927

1 All IES files for other lamping are available for download at: www.axislighting.com



8/10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	
Tacoma	<b>Type</b> : L16
BuildingWork	Bid S
	8/4/2

## BEAM

#### **PENDANT MOUNT - DIRECT**

#### PHOTOMETRIC DATA





рното	METRI	C CUR	/E
			90°
1			
	$\mathcal{M}$	11/1	1
	// 347\\	XX	ZI .
$\mathbb{Z}^{\mathbb{Z}^{\times}}$	X 696 X	$\times$	60°
XV	'III	IX	00
	1042	TX >	<i>.</i> /
XX	/   \	XX	1
1	1330	0	0
	1330	91	J
	0°	3	0°

Lumen/f: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 31.7 W Efficacy: 126 lm/W IES FILE: B2SQDLED-1000-80-35-1M-4.IES

TESTED ACCORDING TO IES LM-79-2008

#### CANDELA DISTRIBUTION

	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1388	1388	1388	1388	1388
5	1377	1374	1374	1371	1373
15	1297	1292	1281	1268	1265
25	1147	1140	1121	1099	1093
35	947	947	931	917	914
45	725	739	744	747	750
55	513	542	573	592	598
65	325	370	418	446	453
75	171	224	283	315	321
85	57	115	177	206	212
90	16	77	139	169	173
95	15	70	127	155	159
105	12	57	100	132	137
115	Ш	42	80	102	112
125	8	31	65	85	95

ZONAL LUMENS			
Lumens			
131			
365			
525			
595			
585			
518			
413			
292			
181			
120			
96			
71			
52			

160-170

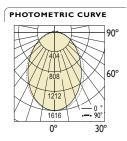
170-180

180

58

LUMINANCE DATA (cd/m <sup>2</sup>			
	Horizontal Angles		
Vertical Angle	0	45	90
45	12846	6088	5113
55	10826	4636	3936
65	8796	3450	2971
75	6739	2461	2161
85	4405	1671	1509

## 0.25G 0.25" Glo lens 1000 lm/ft



Lumen/f: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 33.7 W
Efficacy: 119 Im/W
IES FILE: B2SQDLED-1000-80-35-0.25G-4.IES

TESTED ACCORDING TO IES LM-79-2008

CAN	CANDELA DISTRIBUTION				
		Hori	zontal A	ngles	
Vertical Angle	0	22.5	45	67.5	90
0	1614	1614	1614	1614	1614
5	1606	1603	1600	1597	1594
15	1517	1506	1494	1479	1475
25	1352	1333	1307	1279	1271
35	1126	1109	1075	1039	1026
45	877	864	832	799	788
55	631	624	606	582	574
65	405	408	405	396	394
75	210	223	237	243	245
85	63	83	107	122	128
90	8	30	56	74	80
95	8	26	47	63	68
105	7	19	37	55	60
115	7	14	29	41	48
125	8	13	25	34	40

ZONAL LUMENS		
	Lumens	
Zone		
0		
0-10	152	
10-20	422	
20-30	607	
30-40	680	
40-50	651	
50-60	548	
60-70	405	
70-80	251	
80-90	115	
90		
90-100	50	
100-110	41	
110-120	30	
120-130	23	
130-140		
140-150		
150-160		
160-170		
170-180	26	
180		

LUMINANCE DATA (cd/m²)			
	Horizontal Angles		
Vertical Angle	0	45	90
45	16952	16086	15230
55	15036	14439	13678
65	13081	13087	12734
75	11075	12505	12937
85	9910	16784	20013

1 All IES files for other lamping are available for download at: www.axislighting.com

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9/10 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





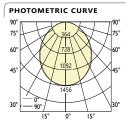
Tacoma Public Library	
Tacoma	Type: L16
BuildingWork	Bid Set
	8/4/23



#### **PENDANT MOUNT - DIRECT**

#### • PHOTOMETRIC DATA





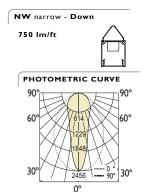
Lumen/ft: 1000 lm/ft Total Lumens: 4000 lm (for 4ft) Input Watts: 37.8 W Efficacy: 106 lm/W IES FILE: B2SQDLED-1000-80-35-UB-4.IES

TESTED ACCORDING TO IES LM-79-2008

CANDELA DISTRIBUTION					
	Horizontal Angles				
Vertical Angle	0	22.5	45	67.5	90
0	1456	1456	1456	1456	1456
5	1449	1448	1448	1447	1447
15	1390	1386	1382	1384	1387
25	1274	1269	1279	1290	1290
35	1114	1113	1129	1128	1128
45	921	932	937	926	922
55	708	720	713	701	697
65	480	491	480	471	470
75	262	267	263	260	260
85	80	78	75	71	71
90	5	3	3	3	3

ZONAL LUMENS		
	Lumens	
Zone		
0		
0-10	137	
10-20	391	
20-30	587	
30-40	698	
40-50	712	
50-60	632	
60-70	475	
70-80	280	
80-90	86	
90		

LUMINANCE DATA (cd/m²)				
	Horizontal Angles			
Vertical Angle	0	45	90	
45	16697	16972	16713	
55	15808	15937	15574	
65	14563	14560	14240	
75	12982	13027	12878	
85	11800	10987	10492	



Lumen/ft: 750 lm/ft Total Lumens: 3225 lm (for 4ft) Input Watts: 30.1 W Efficacy: 107 lm/W IES FILE: B2SQDLED-750-80-35-NW-4.IES

TESTED ACCORDING TO IES LM-79-2008

ZONAL LUMENS		
	Lumens	
Zone		
0		
0-10	207	
10-20	453	
20-30	538	
30-40	556	
40-50	519	
50-60	433	
60-70	310	
70-80	167	
80-90	41	
90		

LUMINANCE DATA (cd/m²)				
,	Horizontal Angles			
Vertical Angle	0	45	90	
45	20605	11314	10803	
55	16414	10308	10324	
65	12851	9298	9742	
75	9563	7852	8515	
85	5141	5207	4984	

1 All IES files for other lamping are available for download at: www.axislighting.com

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I0 / I0 May 19, 2023

FILE NAME: B2SQD.LED.SPEC





Tacoma Public Library	
Tacoma	Type: L17
BuildingWork	Bid Set
	8/4/23



#### **OPTIONAL ACCESSORIES**









SYMMETRICAL SNOOT

ASYMMETRICAL SNOOT

SYMMETRICAL FROSTED ACRYLIC

SYMMETRICAL FROSTED ACRYLIC

## LED PIPE TM

#### C3W | Standard LED

Our LED Pipe™ family of cylinders provide architects and lighting designers with almost limitless design possibilities. Whether you need to light a space with inaccessible ceilings, disappear among the pipes and ducts of an openceiling design, focus attention on a specific architectural detail or make a dramatic statement, you can solve almost any lighting problem with a LED Pipe™.

#### LISTINGS











Warm Damp Dimming Location

Wet Location

California Title 24 JA8







Uplight + Downlight

LED Pipe 3in Wall Standard LED Specs p. 1/6

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Tacoma Public Library	
Tacoma	Type: L17
BuildingWork	Bid Set
	8/4/23

## LED PIPE THE

C3W | Standard LED

#### **FEATURES**

- Ø 2 5/8" [67mm] aperture
- · Single media ready
- Clear media lens (damp location)
- Clear flush mounted lens (wet location)
- Field interchangeable beam spreads (damp location)
- Extruded aluminum cylinder body
- Machined aluminum components
- · Powder coated finishes
- · ADA compliant optional

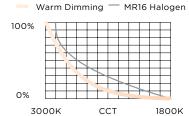
#### PERFORMANCE SUMMARY

Color Accuracy (SDCM)	olor Accuracy (SDCM) <3	
L70 Estimate (h)	50,000	
Color Rendering (CRI)	80 90	
Lumen Series (3)	8014	9010
Source Lumens	1400	1000
LED Wattage	11	11
Lumen Series (5)	8018	9014
Source Lumens	1800	1400
LED Wattage	16	16

#### PERFORMANCE SUMMARY—WARM DIMMING

Color Rendering (CRI)	95
Lumen Series (3)	9510
Source Lumens	1000
LED Wattage	12

#### WARM DIMMING METRICS



#### FINISHES

Anthracite Metallic
Espresso Metallic
Glimmer Gold
Ink Black Metallic



#### **COLOR TEMPERATURES**

3000K-1800K (Warm Dim) 2700K



#### **BEAM SPREADS**







LED Pipe 3in Wall Standard LED Specs p. 2/6

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Tacoma Public Library		
Tacoma	Type: L17	
BuildingWork		Bid Set
		8/4/23

LED PIPE ™			
C3W   Standard LED   Integ	gral Driver   Or	rder Form   Tag	д Туре
ORDER CODE FORMAT: [1]-[2]-[3]-[4] ORDER CODE EXAMPLE: C3W-R-6D-2 PRODUCT NOTES:	]-[5]-[6]-[7]-[8]-[9	]-[10]-[11]-[12]-[13]	
[Blank] clear media lens mounted to regressed trim     W clear glass lens is flush mounted to the trim aper listed when selected.     July layout is only available in 9010 & 9014 CRI, Ludimming or (P) 0-10V dimming.     Field interchangeable beam spread options require Lightheaded personnel.     Accessories are not available with wet location options.	rture and is wet location mens and (S) Phase e consultation with	uplight + downlight acces 7. Finish required for S18. S 8. Consult factory for acce 9. For ADA compliant lum Wet Location. 3000K-1800K Warm I	S2 snoots. essory availability on 9UD uplight / downlight. iinaire consult Lightheaded sales personnel.
SELECT A CYLINDER  [1] CYLINDER  C3W 3" Fixed Wall   [2] CYLINDER SHAPE  R Round  [3] GLASS  [Blank] Clear Lens¹  W Clear Lens ²²  [4] LAYOUT  6D 6" Downlight  6U 6" Uplight  9UD 9" Uplight + Downlight ³  [5] FINISH  21 Nano White  23 Anthracite Metallic  24 Ink Black Metallic  25 Slate Grey Metallic	[8] COLOR TEMPE 27 2700K 30 3000K 35 3500K 40 4000K 3018 3000-180  [9] LUMENS SERIE 8014 80 CRI, 14 9010 90 CRI, 10 9510 95 CRI, 10 8018 80 CRI, 18 9014 90 CRI, 14 [10] DIMMING LH Lutron Hi-lutsoft-on Fade-to-Blate P 0-10V Dimmi S Phase Dimmi	DOK SES 400Im 000Im SES 00	[14] ACCESSORIES FINISH?  21 Nano White 23 Anthracite Metallic 24 Ink Black Metallic 25 Slate Grey Metallic 26 Espresso Metallic 27 Terra Metallic 28 Glimmer Gold CC Custom Color
26 Espresso Metallic 27 Terra Metallic 28 Glimmer Gold CC Custom Color  [6] REFLECTOR FINISH 21 Nano White 23 Anthracite Metallic 24 Ink Black Metallic 25 Slate Grey Metallic 26 Espresso Metallic 27 Terra Metallic 28 Glimmer Gold CC Custom Color  [7] MODULE & BEAM SPREAD 4 B20 20° Beam B28 28° Beam B40 40° Beam B55 55° Beam	120 120V 277 277V  [12] OPTIONAL ME     [Blank] No Me     FR Frosted     HC Honeycomb     PF Perimeter F     SL Softening     SPDL Spread  [13] OPTIONAL AC     S1 Snoot Symm     S2 Snoot Asym     A1 Frosted Acr     A2 Frosted Acr	ccessories 5,6 metric (1.25") 7 nmetric (1.5") 7 cylic Trim (0.5")	

LED Pipe 3in Wall Standard LED Specs p. 3/6

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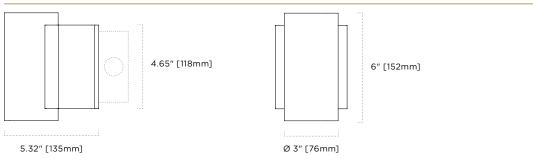
 $info@lightheadedlighting.com \begin{tabular}{ll} \textbf{P.} & 604.464.5644 & \textbf{T.} & 1.800.464.9544 \\ \end{tabular}$ 





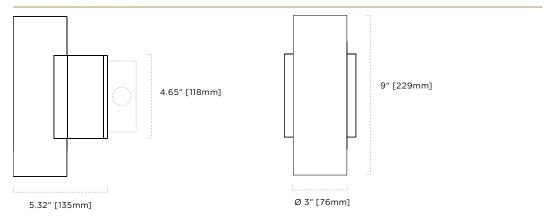
Tacoma Public Library		
Tacoma	Type: L17	
BuildingWork		Bid Set
		8/4/23

#### DIMENSIONS-6" LAYOUT



Note: Mounts to octagonal junction box. Octagonal junction box not included.

#### DIMENSIONS-9" LAYOUT



Note: Mounts to octagonal junction box. Octagonal junction box not included.

**LED Pipe 3in Wall Standard LED Specs** p. 4/6
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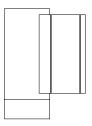
Tacoma Public Library		
Tacoma	Type: L17	
BuildingWork		Bid Set
		8/4/23

#### SNOOT ACCESSORIES (WALL MOUNT CYLINDER)

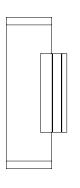
# SYMMETRICAL SNOOT (S1) 1.25" [32mm]

Ø 3" [76mm]

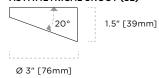
WALL MOUNT WITH SYMMETRICAL SNOOT INSTALLED



WALL MOUNT UP/DOWN WITH SYMMETRICAL SNOOT INSTALLED

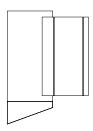


#### ASYMMETRICAL SNOOT (S2)

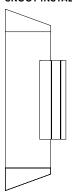




## WALL MOUNT WITH ASYMMETRICAL SNOOT INSTALLED



## WALL MOUNT WITH UP/DOWN ASYMMETRICAL SNOOT INSTALLED



LED Pipe 3in Wall Standard LED Specs p. 5/6
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Tacoma Public Library	
Tacoma	Type: L17
BuildingWork	Bid Set
	8/4/23

## DECORATIVE TRIMS ACCESSORIES (WALL MOUNT CYLINDER) FROSTED ACRYLIC TRIM (A1) FROSTED ACRYLIC TRIM (A2) 0.5" [13mm] 2" [51mm] Ø 3" [76mm] Ø 3" [76mm] WALL MOUNT WITH FROSTED ACRYLIC TRIM INSTALLED WALL MOUNT WITH FROSTED ACRYLIC TRIM INSTALLED WALL MOUNT UP/DOWN WITH FROSTED ACRYLIC TRIM INSTALLED WALL MOUNT UP/DOWN WITH FROSTED ACRYLIC TRIM INSTALLED

#### CERTIFICATIONS







LED Pipe 3in Wall Standard LED Specs p. 6/6

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Tacoma Public Library	
Tacoma	<b>Type:</b> L18
BuildingWork	Bid Set
	8/4/23





#### **OPTIONAL ACCESSORIES**









SYMMETRICAL SNOOT

ASYMMETRICAL SNOOT

SYMMETRICAL FROSTED ACRYLIC

SYMMETRICAL FROSTED ACRYLIC

## LED PIPE TM

#### C3S | Premium LED

Our LED Pipe™ family of cylinders provide architects and lighting designers with almost limitless design possibilities. Whether you need to light a space with inaccessible ceilings, disappear among the pipes and ducts of an openceiling design, focus attention on a specific architectural detail or make a dramatic statement, you can solve almost any lighting problem with a LED Pipe™.

#### LISTINGS





Warm Dimming

Damp Location



LED Pipe 3in Surface Premium LED Specs p. 1/10

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Tacoma Public Library	
Tacoma	Type: L18
BuildingWork	Bid Set
	8/4/23

## LED PIPE THE

#### C3S | Premium LED

#### **FEATURES**

- Ø 2 5/8" [67mm] aperture
- 65° tilt from nadir (adjustable surface)
- 350° rotation (adjustable surface)
- Wall Wash optic with 360° rotation adjustment
- · Single media ready
- Clear media lens (damp location)
- Clear flush mounted lens (wet location)
- Field interchangeable beam spreads (damp location)
- · Extruded aluminum cylinder body
- Machined aluminum components
- · Powder coated finishes

#### PERFORMANCE SUMMARY

Color Accuracy (SDCM)	≤ 1	x 2
L70 Estimate (h)	50,000	
Color Rendering (CRI)	83	98
Lumen Series	3	3
Source Lumens	1000	700
LED Wattage	10	9
Lumen Series		5
Source Lumens	1500	1000
LED Wattage	14	12

#### FINISHES

Anthracite Metallic
Espresso Metallic
Glimmer Gold
Ink Black Metallic
Nano White
Slate Grey Metallic
Terra Metallic

#### COLOR TEMPERATURES

2700K 2700K Beauty 3000K 3000K Vibrant 3500K 4000K

#### BEAM SPREADS



LED Pipe 3in Surface Premium LED Specs p. 2/10
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Tacoma Public Library		
Tacoma	Type: L18	
BuildingWork		Bid Set
		8/4/23

## LED PIPE ...

C3S	Premium LED	Integral Driver	Order Form	Tag Type

ORDER CODE FORMAT: [1]-[2]-[3]-[4]-[5]-[6]-[7]-[8]-[9]-[10]-[11]-[12]-[13]-[14]-[15] ORDER CODE EXAMPLE: C3S-R-W-6-21-21-X28-27-8310-LE-120-3C-FR-S1-21 ORDER NOTES:

- 1. Not available with wet location.
- 2. [Blank] clear media lens mounted to regressed trim aperture.
- **3.** Clear Glass lens is flush mounted to the trim aperture and is wet location listed when selected. Not available with XWW Beam Spread.
- Field interchangeable beam spread options require consultation with
- Lightheaded personnel.
- XWW wall wash optic is aimable after installation.
   BM27 beauty color temperature is only available in 9807, 9810 CRI, Lumens.
- 7. LE & S dimming are only available in 120V.
- **8.** LE, LH & P1 dimming require the ceiling canopy to be 5.75" in diameter & 3" deep. Refer to dimensional data.
- **9.** 3C ceiling canopy includes C3-R-3CMP junction box mounting plate. (can be shipped in advance upon request). Must be installed with octagonal junction box prior to ceiling installation. Octagonal junction box not included.
- **10.** Optional media replaces clear media when selected. Not available with XWW wall wash.
- 11. Accessories are not available with wet location option.
- 12. Finish required for S1& S2 snoots.
- ▲ Wet Location

SELECT A CYLINDER	[7] MODULE & BEAM SPREAD 4	[13] OPTIONAL MEDIA (1 MAX.) 10
[1] CYLINDER	<b>X28</b> 28° Beam	[Blank] No Media
C3S 3" Fixed Surface	<b>X40</b> 40° Beam	FR Frosted
	<b>X60</b> 60° Beam	☐ HC Honeycomb
C3SA 3" Adjustable Surface C3S 3" Wall Wash Surface	<b>XWW</b> Wall Wash⁵	PF Perimeter Frosted
C35 3" Wall Wash Surrace	FOR COLOR TEMPERATURE	SL Softening
[2] CYLINDER SHAPE	[8] COLOR TEMPERATURE	SPDL Spread
R Round	☐ <b>27</b> 2700K	
	<b>30</b> 3000K	[14] OPTIONAL ACCESSORIES 11
[3] GLASS	<b>■ 35</b> 3500K	S1 Snoot Symmetric (1.25") 12
[Blank] Clear Lens <sup>2</sup>	<b>40</b> 4000K	S2 Snoot Asymmetric (1.5") 12
W Clear lens	<b>■ BM27</b> Beauty 2700K <sup>6</sup>	A1 Frosted Acrylic Trim (0.5")
[4] LAYOUT	■ VB30 Vibrant 3000K	A2 Frosted Acrylic Trim (2.0")
6 6" Cylinder Length	[9] LUMENS SERIES	[15] ACCESSORIES FINISH 12
	8310 83 CRI, 1000lm	21 Nano White
[5] FINISH	9807 98 CRI, 700lm	23 Anthracite Metallic
21 Nano White	8315 83 CRI, 1500lm	24 Ink Black Metallic
23 Anthracite Metallic	9810 98 CRI, 1000lm	25 Slate Grey Metallic
24 Ink Black Metallic		26 Espresso Metallic
25 Slate Grey Metallic	[10] DIMMING	<b>27</b> Terra Metallic
26 Espresso Metallic	LE Lutron Hi-lume Forward Phase	28 Glimmer Gold
27 Terra Metallic	2-wire Dimming (1%) 7,8	CC Custom Color
28 Glimmer Gold	LH Lutron Hi-lume EcoSystem	
CC Custom Color	Soft-on Fade-to-Black (1%) <sup>8</sup>	
[6] REFLECTOR FINISH	P 0-10V Dimming (10%)	
21 Nano White	P1 0-10V Dimming (1%) 8	
23 Anthracite Metallic	S ELV Dimming (10%) <sup>7</sup>	
24 Ink Black Metallic	[11] VOLTAGE	
25 Slate Grey Metallic	☐ <b>120</b> 120V	
26 Espresso Metallic	☐ <b>277</b> 277∨	
<b>27</b> Terra Metallic		
28 Glimmer Gold	[12] MOUNTING	
CC Custom Color	<b>3C</b> 3" Ceiling Canopy 9	
	(Includes C3-R-3CMP Mounting Plate)	
	5C 5" Ceiling Canopy	

LED Pipe 3in Surface Premium LED Specs p. 3/10

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Tacoma Public Library		
Tacoma	Type: L18	
BuildingWork		Bid Set
		8/4/23

## LED PIPE ...

|--|

ORDER CODE FORMAT: [1]-[2]-[3]-[4]-[5]-[6]-[7]-[8]-[9]-[10]-[11]-[12]-[13]-[14]-[15]-[16]-[17]-[18]
ORDER CODE EXAMPLE: C3S-R-W-6-21-21-B20-27-8014-RM-3C-FR-S1-21-DRB-3C-3-LH-120
PRODUCT NOTES:

- 1. Not available with wet location.
- 2. [Blank] clear media lens mounted to regressed trim aperture.
- ${\bf 3.} \ W \ clear \ glass \ lens \ is \ flush \ mounted \ to \ the \ trim \ aperture \ and \ is \ wet \ location \ listed \ when \ selected. \ Not \ available \ with \ XWW \ Beam \ Spread.$
- **4.** Field interchangeable beam spread options require consultation with Lightheaded personnel.
- 5. XWW wall wash optic is aimable after installation.

- 7. RM remodel driver sold separately
- 8. Optional media replaces clear media when selected. Not available with
- 9. Accessories are not available with wet location option.
- 10. Finish required for S1& S2 snoots.
- 11. LH is not available with 7 Series.
- 12. S dimming is only available in 120 voltage.

#### 6. BM27 beauty color temperature is only available in 9807, 9810 CRI, Lumens. Wet Location listed. **SELECT A CYLINDER** [8] COLOR TEMPERATURE [15] DRIVER TYPE **27** 2700K DRB-C3 Remodel Driver **[1] CYLINDER □ 30** 3000K C3S 3" Fixed Surface [16] LUMENS SERIES **35** 3500K C3S 3" Wall Wash Surface1 3 1400 Lumens Max **40** 4000K 5 1800 Lumens Max BM27 Beauty 2700K 6 **[2] CYLINDER SHAPE** R Round VB30 Vibrant 3000K [17] DIMMING LH Lutron Hi-lume EcoSystem [9] LUMENS SERIES **[3] GLASS** Soft-on Fade-to-Black (1%)11 [Blank] Clear Lens 2 8310 83 CRI, 1000lm P 0-10V Dimming (10%) ■ W Clear lens ◆ ³ 9807 98 CRI. 700lm S Phase Dimming (10%) 12 8315 83 CRI, 1500lm [4] LAYOUT 9810 98 CRI, 1000lm [18] VOLTAGE **6** 6" Cylinder Length 120 120V [10] DIMMING [5] FINISH ■ 277 277∨ RM Remodel Driver 7 21 Nano White 23 Anthracite Metallic [11] MOUNTING 24 Ink Black Metallic 3C 3" Ceiling Canopy 25 Slate Grey Metallic [12] OPTIONAL MEDIA (1 MAX.)8 26 Espresso Metallic 27 Terra Metallic FR Frosted HC Honeycomb 28 Glimmer Gold PF Perimeter Frosted CC Custom Color SL Softening [6] REFLECTOR FINISH SPDL Spread 21 Nano White [13] OPTIONAL ACCESSORIES 9 23 Anthracite Metallic S1 Snoot Symmetric (1.25") 10 24 Ink Black Metallic S2 Snoot Asymmetric (1.5") 10 25 Slate Grey Metallic A1 Frosted Acrylic Trim (0.5") 26 Espresso Metallic A2 Frosted Acrylic Trim (2.0") **27** Terra Metallic 28 Glimmer Gold [14] ACCESSORIES FINISH 10 CC Custom Color ☐ 21 Nano White 23 Anthracite Metallic [7] MODULE & BEAM SPREAD 4 24 Ink Black Metallic **X28** 28° Beam 25 Slate Grey Metallic **X40** 40° Beam **X60** 60° Beam 26 Espresso Metallic 27 Terra Metallic XWW Wall Wash<sup>5</sup> 28 Glimmer Gold CC Custom Color

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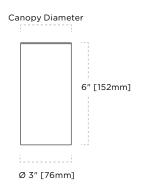
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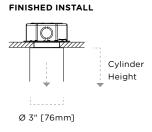


Tacoma Public Library	
Tacoma	<b>Type</b> : L18
BuildingWork	Bid Set
	8/4/23

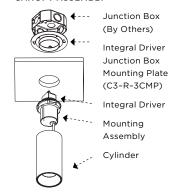
#### SMALL CEILING CANOPY (FIXED & WALL WASH CYLINDER)



#### INTEGRAL DRIVER (P, S DIMMING)



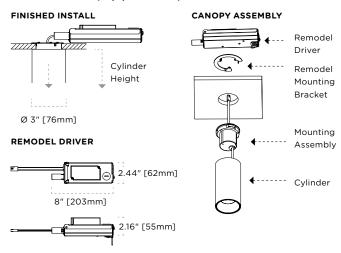
#### **CANOPY ASSEMBLY**



Note: Junction box mounting plate must be installed prior to the ceiling installation. Can be shipped in advance upon request.

Note: Junction box not included.

#### REMODEL DRIVER (LH, P, S DIMMING)



Note: Remodel driver sold separately.

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LED Pipe 3in Surface Premium LED Specs p. 5/10

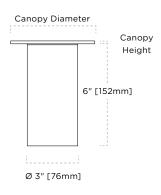
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Tacoma Public Library	
Tacoma	<b>Type</b> : L18
BuildingWork	Bid Set
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#### LARGE CEILING CANOPY (FIXED & WALL WASH CYLINDER)



	Dimming				
	Р	S	LE	LH	P1
Canany Width	Ø 5.6" Ø 142mm (Fixed)		Ø 5.75" Ø 146mm (Fixed)		
Canopy Width	Ø 4.75" Ø 121mm (Wall Wash)		Ø 6" Ø 152mm (Wall Wash)		
Canopy Height	0.25" 7mm		3" 76mm		

#### INTEGRAL DRIVER

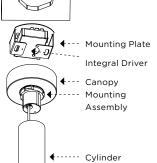
#### FINISHED INSTALL



Note: Junction box not included.

#### CANOPY ASSEMBLY (LE, LH, P1 DIMMING)

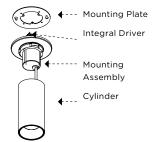




## CANOPY ASSEMBLY (P, S DIMMING)









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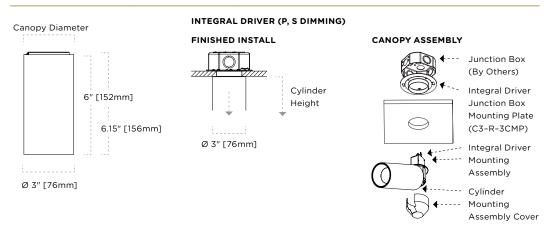
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Tacoma Public Library	
Tacoma	<b>Type</b> : L18
BuildingWork	Bid Set
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#### SMALL CEILING CANOPY (ADJUSTABLE CYLINDER)

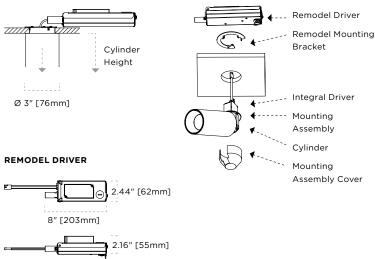


Note: Junction box mounting plate must be ordered and installed prior to the ceiling installation.

Note: Junction box not included.

#### REMODEL DRIVER (LH, P, S DIMMING)

#### FINISHED INSTALL



Note: Remodel driver sold separately.

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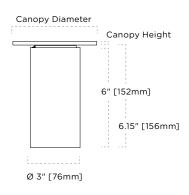
LED Pipe 3in Surface Premium LED Specs p. 7/10





Tacoma Public Library	
Tacoma	<b>Type</b> : L18
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#### LARGE CEILING CANOPY (ADJUSTABLE CYLINDER)



	Dimming				
	P S		LE	LH	P1
Canopy Width	Ø 4.75" Ø 121mm		Ø 6" Ø 152mm		
Canopy Height	0.25″ 7mm		3" 76mm		

#### INTEGRAL DRIVER-CORD & STEM MOUNT

# FINISHED INSTALL (LE, LH, P1)

FINISHED INSTALL (P, S)



Note: Junction box not included.

Note: Junction box not included. \*Consult factory for 1 1/2" deep Junction Box option.

#### **CANOPY ASSEMBLY** (LE, LH, P1 DIMMING)



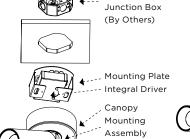


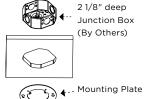
11/2" deep

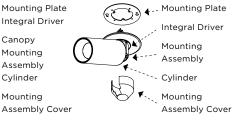
Cylinder

Mounting









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Tacoma Public Library	
Tacoma	<b>Type:</b> L18
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## SNOOT ACCESSORIES (PENDANT CYLINDER) SYMMETRICAL SNOOT (S1) ASYMMETRICAL SNOOT (S2) 20° 1.5" [39mm] 1.25" [32mm] Ø 3" [76mm] Ø 3" [76mm] PENDANT WITH SYMMETRICAL PENDANT WITH ASYMMETRICAL SNOOT INSTALLED SNOOT INSTALLED ADJUSTABLE PENDANT WITH SYMMETRICAL ADJUSTABLE PENDANT WITH ASYMMETRICAL **SNOOT INSTALLED** SNOOT INSTALLED

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### LIGHTING FIXTURE CUTS

Tacoma Public Library	
Tacoma	<b>Type:</b> L18
BuildingWork	Bid Set
	8/4/23

# DECORATIVE TRIMS ACCESSORIES (PENDANT CYLINDER) FROSTED ACRYLIC TRIM (A1) FROSTED ACRYLIC TRIM (A2) 0.5" [13mm] 2" [51mm] Ø 3" [76mm] Ø 3" [76mm] PENDANT WITH FROSTED ACRYLIC TRIM INSTALLED PENDANT WITH FROSTED ACRYLIC TRIM INSTALLED ADJUSTABLE PENDANT WITH FROSTED ACRYLIC TRIM INSTALLED ADJUSTABLE PENDANT WITH FROSTED ACRYLIC TRIM INSTALLED

#### CERTIFICATIONS







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### LIGHTING FIXTURE CUTS

Tacoma Public Library	
Tacoma	Type: L19
BuildingWork	Bid Set
	8/4/23



### **LEDBAR-CCT**

LED Fluorobar, 290-1850 Lumens, 5-22W, Colour Selectable

Cove, Under Cabinet & Millwork

	Job Information	
Project Name		Туре
Location		
Quantity		Date
Contact/Phone		
Notes		

#### **Features**

#### Housing

Durable extruded aluminum frame with frosted smooth lens. Suitable for dry location applications only. On-body ON/OFF switch and a 5-position 2700-5000K CCT select switch are provided for individual control.

**LED Driver**Fixture is provided with built-in silent non-flicker electronic LED driver, 120V, 50 / 60Hz.

#### **Light Output**

Providing up to 1850 lumens, and up to 96lm/W, this undercabinet fixture also features a 5-position 2700-5000K CCT select switch.

**Dimming**Fixture is 100~10% dimmable with industry standard TRIAC, ELV dimmers.

#### **LED Characteristics**

Powered by an LED integrated strip that maintains uniform intensity with 70% lumens at 60,000 hours with a rated life

of 36,000 hours average life; at 90 CRI.

#### Beam Spread

The fixture lens provides a 125° beam spread.

#### Linking

Complete with a joiner, these no shadow linking fixtures can be linked up to 2500 mA / 300 W.

#### Mounting Kit

Hardware provided for mounting fixture to standard horizontal surfaces or vertical wall surface.

#### Operating Temperature

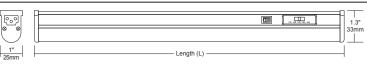
Rating Suitable for use in closets. Compliant with NFPA 70, NEC section 410.16 (A)(1). Maintain a minimum of 6" clearance to combustible materials at all times.

SPECIF	CATION
Approved Location	Dry
Beam Angle	125°
CCT Switch	2700 K / 3000 K / 3500 K / 4000 K / 5000 K
Certification	cULus
Connection Type	3-Wire
CRI	90+
Dimming	Yes
Dimming Technology	TRIAC / ELV
Lumens	Up to 1850
Lumens per watt	Up to 96
Min. Start Temp.	-18°C
Lumen Maintenance	70% @ 60,000 hrs
Power Factor	>0.95
Rated Life	36,000 hrs
THD	<15
Voltage	120V
Warranty	3 Years
Wattage	Up to 22



#### Description

This LED Fluorobar light is a linear light with an integrated LED strip. Available in various lengths featuring ON/OFF and CCT Select switch to meet any installation application.



		LEDBAR14-CCT	LEDBAR23-CCT	LEDBAR34-CCT	LEDBAR46-CCT	LEDBAR58-CCT
Length (L)		131/2"	22%"	347/16"	46¾16"	58"
		343mm	574mm	874mm	1174mm	1474mm
Watta	ige (W)	5	9	14	18	22
	2700 K	294	567	923	1163	1329
Lumens	3000 K	315	633	1004	1247	1422
	3500 K	347	705	1121	1416	1618
	4000 K	366	760	1225	1544	1757
	5000 K	396	802	1310	1647	1858









#### **Ordering Guide**

LEDBAR



Accessories are sold separately. For additional options consult your Liteline representative.

Due to our continued efforts to improve our products, product specifications are subject to change without notice.

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### LIGHTING FIXTURE CUTS

Tacoma Public Library	
Tacoma	<b>Type</b> : L19
BuildingWork	Bid Set
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#### **Accessories (Power feed required)**

#### **Power Cord**



#### ALFT6000-WH-3

6' Flexible 3-wire power cord for FluoroBar series.



#### ALFT6000S-WH-3

6' Flexible 3-wire power cord with on/off switch, for FluoroBar series.



#### ALFT6016-WH-3

16" Flexible 3-wire power cord for FluoroBar series.

#### Power Cord with 90° Connector



#### ALFT60901-WH-3

ALFT60904-WH-3

 $6^{\circ}$  Flexible 3-wire power cord with  $90^{\circ}$  connector (top connection).

6' Flexible 3-wire power cord with 90° connector (right connection).



#### ALFT60902-WH-3

6' Flexible 3-wire power cord with 90° connector (left connection).



#### ALFT60903-WH-3

6' Flexible 3-wire power cord with 90° connector (bottom connection).

### Hardwire Box



#### ALFT6300-WH

Hardwire box for FluoroBar series, with on/off switch.



#### ALFT6300-OS-WH

LEDBAR hardwire with motion sensor.

#### Flexible Cord with 90° Connectors



#### ALFT90-WH-3

**ALFT903-WH-3** 6" Flexible 3-wire cord with 90° connectors (right connection).

6" Flexible 3-wire cord with 90° connectors (top connection).



### \_\_\_ A

#### ALFT902-WH-3

6" Flexible 3-wire cord with 90° connectors (bottom connection).

#### Flexible Connectors



#### FBT6106-WH-3

FBT6136-WH-3 36" Flexible 3-wire connector

6" Flexible 3-wire connector.



#### FBT6100-WH-3

12" Flexible 3-wire connector.

#### FBT6124-WH-3

24" Flexible 3-wire connector.



#### LEDBAR-MAGCLIP-3

Magnetic mounting clips for LEDBAR,



#### **PART 1 - GENERAL**

#### 1.1 DESCRIPTION

#### A. Definition

1. "Telecommunications Cabling" as used in this Section refer to a unified cable plant primarily designed for carrying signals associated with telephone, telecommunications common carrier, data, and communications within the building. At places, interfaces occur between the telecommunications cabling system and other signal cable systems, and telecommunications systems may share tray and rack spaces with other systems. However, for construction purposes the "Telecommunications Cabling" system is separate and may have different specification provisions from other systems.

#### B. Station Cable

- 1. Provide a complete cable system tested for continuity and performance to each outlet, including:
  - a. Category 6 station cables for voice/data interconnections
  - b. Multi-purpose outlet plates
  - c. RJ-45 jacks and terminations
  - d. Rack mounted RJ-45 patch panels
  - e. Wall mounted, 25 unit data rack mounted on level 2 of Main Library.
- C. Identification and Labeling: Labeling is to be functional and permanent, in strict compliance with Owner/Engineer direction.

#### D. Detailed Documentation:

 Provide detailed documentation of as-built conditions as is required for this section to complete shop drawings for telephone and data cabling system administration. Labeled cables connected at each outlet location must be those shown in "as-built" documentation.

#### E. Work Furnished By Others:

- 1. Telephone switching equipment, telephone instruments, computing equipment, and data switches will be furnished by others.
- 2. ANY connections to active equipment in a telecommunications room will be performed by Owner IT staff only.

#### 1.2 SYSTEM DESIGN OBJECTIVES

All recommended revision, Value Engineering suggestions, or installer options during the construction phase should consider the following design objectives:

- A. System Description: The cabling system is designed to support a universal cabling system for both voice and data. Most information outlets will consist of outlet boxes with uniform Category 6 jacks for voice and data. The size of outlet boxes and conduit at each location are indicated on electrical drawings.
- B. Telecommunication Room Support Fixtures:
  - 1. The second floor telecommunications room shall be provided with new wall mounted

data rack. Contractor shall provide (5) 48 port patch panels and terminate all Cat. 6 cables.

#### 1.3 REGULATORY REQUIREMENTS

All work shall be performed in accordance with the latest revisions of the Washington Department of labor and Industries and the following industry standards and codes:

FCC Part 68 Connection of terminal Equipment to Telephone

Network.

Uniform Building

International Conference of

Code

Building Officials (ICBO: Regional Office: 12605 Bellevue-Redmond Road, Bellevue, WA 98005

WAC-296-46 Laws, Rules, and Regulations for installing Electric

Wires & Equipment

NFPA 70 (NEC) 1999 National Electrical Code

NFPA 75 Protection of Electronic Computer and Data

Processing Equipment

NFPA 78 Lightning Protection Code

**NFPA 101** Life Safety Code

OSHA 29 CFR Part 1910 Occupational Safety and Health Standards

FCC Part 76.611 CFR Title 47 Radiation Leakage Standards

Other References: B.

> ANSI/TIA/EIA-526-14A Optical Power Loss Measurements of Installed

> > Multimode Fiber Cable Plant

ANSI/TIA/EIA-569-A Commercial Building Standard for

Telecommunication Pathways and Spaces

ANSI/TIA/EIA-568-B Commercial Building Telecommunications Cabling

Standard (Includes B.1, B.2 & B.3 including addenda)

NSI/TIA/EIA-606-A The Administration Standard for the

Telecommunication Infrastructure of Commercial

**Buildings** 

ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding

Requirements for Telecommunications

ANSI/TIA/EIA-758-A Customer-Owned Outside Plant

Telecommunications Standard

Governing codes and Conflicts: If the requirements of this section of the project drawings exceed those of the governing codes and regulations, then the requirements of this section and the Drawings shall govern. However, nothing in this section or the drawings shall be construed to permit work not conforming to all governing codes and regulations.

#### 1.4 COORDINATION

Coordinate work with other contractors and trades. The layout and installation of the systems shown on the drawings and specified herein shall be coordinated such that all special requirements for the telecommunications systems shall be provided and incorporated into the project. The systems to be coordinated shall include (but are not

limited to) electrical raceway, grounding, fire rated assembly, lighting, power distribution, control and labeling of cables, termination, outlets, jacks, etc. Report all conflicts of to the Contracting Agency.

#### 1.5 INSTALLER QUALIFICATIONS AND QUALITY ASSURANCE

- A. The Low Voltage cable system installer shall at a minimum be firm normally employed in the low voltage cabling industry with reference list of at least (5) five projects with contact names to confirm the successful completion of Category 6 UTP projects within the last (12) twelve months prior to the bid opening date of this project. In addition, the Contractor must submit proof of category 6 UTP cable test equipment training and certification for the technicians that will be testing the installation. The Contractor shall discuss Category 6 testing procedures with the Owner and Engineer prior to beginning testing.
- B. The Owner reserves the right to exercise it's discretion to require the Contractor to remove from the project any such employee of the Contractor deemed by the Owner to incompetent, careless, or insubordinate.
- C. Personnel whom the Contractor intends to use as supervisors or testers, and at least (50%) half of the installation technicians at large, must have been employed by the Contractor for at least (6) six months as of the date of the bid opening. Technicians shall have been trained on the Contractor's company policies with respect to personnel safety, telecommunications industry cabling quality and neatness standards, and use of CSI-standard specifications and drawings.
- D. The selected Low voltage installer must be licensed, bonded, and insured in the State of Washington.

#### 1.6 UNIT PRICES

A. Unit prices must be submitted for addition or deletion of telecommunications wiring devices during the period of this contract. The pricing shall include all costs associated for addition and the credit for deletion of outlets ad locations. In addition, unit pricing shall be submitted for addition or deletion of patch panels, wire managers, cable, etc.

#### 1.7 SUBMITTALS

- A. Per section 01330, the Contractor shall finish the following in a single consolidated submittal with an approval copy to the Owner:
  - 1. Contractors license number and proof of qualifications required in paragraph 1.5 above
  - 2. The name of the person who will act as the Contractor's official contact with the Contractor/Owner/Engineer.
  - 3. The name of every certified Category 6 cable installation technician who may be used in the conduct of the project, and evidence of certification of each.
  - 4. To qualify, under the preceding paragraph, courses attended must include hands-on access to cable and terminating tools and materials, and test equipment required to perform the installation functions required in the work of this contract.
  - 5. Complete manufacturer's product literature for all products to be used in the installation except for the Owner furnished materials. In addition, whenever Owner/Engineer preapproved prior to bid substitutions are recommended products are made, samples (when requested by the Owner/Engineer) and the manufacturer's supporting documentation demonstrating compatibility with related products shall be included. Product submittals must be keyed to the specification or drawing references.

#### 6. Shop Drawings.

- Proposed cable routing shall be submitted and approved prior to installation of any cables.
- b. The contractor shall submit scaled drawings of all proposed changes in communications room installation detail (see paragraph 1.3.B.2).
- Proposed Contractor category 6 UTP cable test result forms. Contractor shall provide test documentation and forms.
- 8. Examples of the cable labeling materials and proposed arrangement. Submittal must include actual samples of each type of proposed connecting fixture, with realistic labels attached.

#### B. Project Completion

As a condition for project acceptance, the contractor shall submit to the Owner/Engineer the following for review and approval:

- 1. Complete manufacturer's product literature and samples (if requested) for all approved substitutions to the recommended products made during the course of the project.
- An Exceptions List of deviations (in materials, construction, and workmanship) from the specified in this section and shown on the Project Drawings. The Owner will review this list and declare each item as either an approved exception, or as one the Contractor must correct.
- 3. Field Drawings. Through out the course of the project, details concerning the exact physical layout or arrangement of the backboards as shown on the Construction Drawings and details shall be marked on the field set with dimensions) reserved for this purpose. The field drawings shall be available throughout the project for inspection and shall be submitted to the Consultant/Engineer at Project Completion with changes "asbuilts" in CADD format and submitted on CD. The Field Drawings shall be clear and accurate so that the original Construction drawings can be brought up to date by the Contractor.
- 4. Inspection and test Reports: During the course of the Project the Contractor shall maintain the adequate inspection system and shall perform such inspections to ensure that the materials supplied, and the work performed conform to Contract requirements. The Contractor shall provide written documentation, which indicates that all cable termination testing was completed and that all irregularities were corrected prior to job completion.

#### 1.8 PROJECT OBSERVATION AND FINAL ACCEPTANCE

- A. The Contractor shall request interim observations by the Owner/Engineer throughout the course of the project to avoiding costly corrections at the end of the project.
- B. The Contractor shall incorporate in the construction schedule a minimum 2-week period for the final review and project observation process. During this period, the Owner/Engineer will review the project completion submittals and conduct on-site observation.
- B. The Field Drawings will be checked for completion and accuracy to be compared to engineer provided construction documented and details from the start of the project.
- C. The Owner/Engineer will generate a list of materials and workmanship that are not acceptable (in a project observation report/punchlist). Any part of the system, materials, or workmanship, not meeting the requirements of this section, and not otherwise accepted by the Owner/Engineers, shell be corrected by the Contractor at no additional cost to the

Owner prior to final acceptance.

- E. A follow-up observation shall be made after the Contractor has made all corrections necessitated by earlier project observation reports. This review and observation process will be repeated as required until final acceptance is granted.
- F. If completed test results for copper are questionable in regard to failures, an independent spot test on cables with problems may be done by a different independent contractor, with the cost of such spot-checks to be retained from Contractor's payments.

#### 1.9 CABLE LABELING AND PLACEMENT

- A. Cable terminations shall be labeled according to Owner/Engineer instructions onsite.
- B. Cables will be assigned specific termination locations. Such assignment may be made or changed by the Owner/Engineer at any time prior to the installation phase at no additional cost to the owner or contract.

#### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. All material required for a complete installation shall be furnished by the Contractor.
- B. All materials must be new, free from defects and not less than the quality herein specified. They shall be designed to ensure satisfactory operation and operation life in the environmental conditions which will prevail where they are being installed.
- C. Each type of materials bid and furnished shall be of the same make and shall be of the standard products or manufacturers regularly engaged in the production of such materials and shall be the manufacturer's latest standard design.
- D. Materials shall be as listed or shall be equivalent products of other manufacturers meeting the intent and quality level of the specifications. Any approved equivalent products will be published by addendum prior to bid.
- E. Security: Contractor shall furnish and maintain suitable lockable storage locations for on-site secure storage of materials. Any lost, stolen, damaged, or cut materials shall be replaced by the Contractor.
- F. No custom items shall be used except as specified on the Construction Drawings or as reviewed and approved by both the Owner and Engineer as required to meet unusual physical requirements of the installation site.

#### 2.2 WIRE PLANT MATERIALS

- A. Materials shall be as listed or shall be equivalent products *of* other manufacturers meeting the intent and quality level of specifications. All approved equivalent products will be published by addendum prior to bid.
- B. All products shall be new and brought to the job site in original manufacturer's packaging. Electrical components shall bear the Underwriter's Laboratories label and/or the CSA equivalent. All communications cable shall bear flammability testing ratings as follows:

**CM Communications Cable** 

CMP Plenum Rated Communications Cable

CMR Riser-rated Communications Cable

All voice and data station cables specified herein shall be CMP plenum as required by code.

C. Initial Cable inspection: The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable or any other components failing to meet specifications shall not be used in the installation.

#### 2.3 SUBSTITUTION OF MATERIALS

- A. Listing of materials is not intended to prevent listing *of* other material provided the substitute product is submitted for listing, 7 working days prior to bid, and has been reviewed and listed in accordance with the following Substitution of Materials requirements.
  - 1. No requests for variance will be approved unless it is stated that a pre-approved product may be submitted for review and listing.
  - After Award of Contract, only as follows:
     The reason for the unavailability is beyond the Contractor's control, i.e., due to strikes, bankruptcy, discontinuance of manufacture, etc. Requests for substitutions shall be made in writing and shall be accompanied by complete description of the substitute material or equipment.
- B. In all cases, should a substituted material result in requiring system or building modifications, or additional labor on the part *of* the installation contractor(s), the Contractor shall be liable for all costs to provide these modifications including all costs to the Engineer for redesign time required to accommodate the required modifications. Liquidated damages provisions of the Contract may also apply.

#### 2.4 STATION CABLING

A. Voice/Data Station Cable: Provide Category 6 cable (as identified by TIA/EIA-568-B) for all voice/data station cables: Each cable reel shall be tested for Category 6 performance at the factory. All cable shall be plenum rated.

Acceptable Products: AMP# 219667-X (White for Campus Network) 219567-X (Violet for CIT)

Mohawk# M56905 (White for Campus Network) M57201 (Violet for CIT)

#### 2.5 STATION HARDWARE

A. Jacks: Flush mount voice and data jacks shall be high quality tested Category 6 8-pin (RJ45) modular jacks with IDC style terminations. All jacks shall use the T568B pin configuration. Jacks shall exceed the TIA/EIA-568-B recommendations for Category 6 connecting hardware. Confirm campus network wall and floor box outlet colors with Owner/engineer.

Acceptable Products: (See Below) Wall and Floor Box Locations: AMP # I375055-X AMP# 1-1375055-0 (Violet for CIT)

B. Icons and Labels: Icons shall have voice or data symbols as appropriate Acceptable Products: AMP icons

C. Faceplates: Faceplate color shall be determined by the Owner/Engineer.

Acceptable Products:

AMP Faceplate# 1139l18-X

AMP Module# Ill6409-X AMP Blank# 1116410-X

#### E. Cable labels.

- 1. All cables shall be labeled at the TR termination and at the user terminal connection with the same identifying code.
- 2. TR-end labels shall be mechanically printed on strips designed for use with the prescribed terminating hardware.
- 3. Jack-end labels must be mechanically created, have letters that are at least 3/16 inches high, and have a high contrast with the label background.
- Label adhesive must be shown to be permanent and not removable without use of heat or solvents, when applied to each of the types of outlet cover plates to be used in the project.

#### 2.6 VOICE/DATA TERMINATION HARDWARE

A. Horizontal Voice/Data Cabling Patch Panels. 48 port Category 6 patch panel.

Acceptable products: AMP Part# 1375015-1

#### **PART 3 - EXECUTION**

#### 3.1 FIRE STOPPING

A. Any penetration through fire rated walls, and both ends of all vertical conduit chases (including those in sleeves) will be resealed with specified fire stopping sealant. Contractor shall also seal all floor, ceiling, and wall penetrations in fire or smoke barriers and in the telecommunications rooms.

#### 3.2 CABLE HANDLING

A. All cable, especially Category 6, is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around blunt corners or against material that might cause chafing. For the purpose of this paragraph, any edge with a radius of less than 5 inches is considered "blunt". Any non-rotational surface that has sufficient friction to cause shavings or particles to be pulled off of cable jackets is unacceptable.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES ON THE JOB MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD OBSERVED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING IMPROPER TECHNIQUES.

B. Allowable Cable Bend Radius and Pull Tension: In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. The following tables provide typical minimum pulling bend radii and maximum pull tensions for twisted pair in conduit.

Refer to manufacturer's recommendations for the limitations on the installed cables.

# MINIMUM PULLING BEND RADIUS and MAXIMUM PULL TENSION FOR TWISTED-PAIR CABLE in CONDUIT

PAIRS	MINIMUM PULLING BEND RADIUS	MAXIMUM PULL TENSION	
4	5 inches	25 lbs.	
100	17 inches	500 lbs.	
200	22 inches	1000 lbs.	
900	44 inches	5000 lbs.	

Cable Lubricants: Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue.

#### Recommended Products:

Twisted-pair Cable: Dyna-Blue, American Polywater Optical Fiber Cable: Optic-Lube, Ideal

 Pull Cords: Provide pull cords in all sections of conduit. Tapes shall be marked in feet and secured at each end of the conduit.

Recommended Product: Greenlee

E. Replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, over tightened bindings, loosely twisted and over twisted pairs at terminals, and re-terminate cables with sheath removed over 2 inches

#### 3.3 LABELS

- A. The Contractor will label all outlets and cables using permanent, legible typed or machine engraved labels pre-approved by the Owner. Submit proposed labels to Engineer/Consultant for approval.
- B. Terminals in the telecommunications rooms shall be labeled by the Contractor using designation strips designed for the patch panels or terminal hardware.

#### 3.4 STATION CABLING INSTALLATION

- A. Certified Installers: The Contractor shall supervise the installation of all communications cable. All Category 6 cable shall be installed by individuals trained and certified in low voltage data cable system installation. All Category 6 cable must be handled with care during installation so as not to change performance specifications. The Contractor shall not over tighten wraps or over bend cables.
- B. Station cables shall be typically installed in under floor spaces. Any cable placed in ceiling areas shall be supported with Erico ]-hooks attached appropriately to walls or support wires and spaced a maximum of four feet apart. Cables shall not come in contact with HVAC or mechanical system components or run within (8) eight inches of any electrical component. Provide straight routes, parallel with floors and corridor walls, between the outlet box locations and the telecommunications room.
- C. Coordination: All cabling and associated hardware shall be placed so as to make efficient use of available space in coordination with other uses. All cable and associated hardware shall be placed so as to not impair the use or capacity of other building systems, equipment or hardware placed by others (or existing). All cable, associated support structures and

hardware shall be placed so as to not impair the Owner's efficient use of their full capacity.

D. Installation: Pull all cables carefully, adhering to standards of care and manufacturer's recommendations for installation of cabling. Where cables emerge from raceways or drop out of cable racks, maintain a supported bundle with at least a (5) five-inch bend radius. Use special care not to pull cables around corners unless a large-radius pulley or careful manual handling is employed. Assure that when cables are left on the floor, signs or other procedures are used to assure that no one steps on the cables. (In the event an observing Owner's representative, Consultant/Engineer, or Architect observes installation practices in which cables are subject to crushing or tight-bend abuse, the Contractor may be required to remove and discard from the site all cables which may have been subjected to the observed abusive action. No additional charges will be allowed in the event of such replacement action.)

NOTE: Cabling installation shall not precede floor installation

#### 3.5 STATION HARDWARE

A. UTP cables shall be terminated in high-quality Category 6 RJ-45 jacks meeting EIA/TIA-568-B specifications, using wiring format T568B (TIA), which is both 100baseT and ISDN compatible.

#### 3.6 BACKBOARD CABLING/EQUIPMENT RACK CONFIGURATION

- A. Cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, network equipment, mounting access hatches to air filters, switches or electrical outlets, electrical panels, and lighting fixtures. Avoid crossing areas horizontally just above or below any conduit opening. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings.
- B. Cable shall be routed as close as possible and parallel to the ceiling, floor, or corners to ensure that adequate wall or backboard space is available for current and future equipment and for cable terminations. Cables shall not come in contact with electrical conduit or other equipment.
- C. Cable bundles passing from a wall to a rack or other free-standing object shall not bridge a gap of greater than (4) four inches without the use of a uni-strut or other bridging structural piece. All cables to a rack shall be cabled out to the top. On backboards, lay cables via the shortest route directly to the nearest edge of the backboard from the mounted equipment or block.
- D. Lace or bundle all similarly routed cables together and attach by means of D-rings screwed to the outside edge(s) of the backboard vertically and/or horizontally, then route via "square" comers over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables.
- E. Do not allow binding on cable. Do not use tie-wraps. Velcro-style straps are recommended for cable bundling, where required. Observe Category 6 cable bend radius standards for all cables.

#### 3.7 COPPER CABLE INSTALLATION TESTING

A. The Owner/Engineer shall be notified one week prior to any testing so that the initial testing may be witnessed. Contractor shall not replace or correct any cable deficiencies found through testing prior to the notified date. (The initial test results are an effective indication of

the overall quality of an installation. "Rehearsal" tests by the Contractor deprive the test observer of the opportunity to detect general quality conditions that may detected at the time of the first test performed.)

- B. Before requesting a final inspection, the Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable for all copper plant wing.
- C. Acceptance of the simple test procedures discussed below is predicated on the Contractor's use of the recommended products (including but not limited to twisted-pair cable, cross-connect blocks, and outlet devices specified in the Products paragraph), and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors.
- D. At a minimum, the Contractor shall test:
  - 1. All station drop cable pairs from telecommunications rooms to outlet device RJ45 jacks.
- E. Each Category 6 wire/pair shall be tested per TWEIA-568-B, including addenda, at a minimum for the following:
  - 1. Wire map
  - 2. Length
  - 3. Insertion loss
  - 4. Near-end crosstalk (NEXT) loss
  - 5. Power sum near-end crosstalk (PSNEXT) loss
  - 6. Equal-level far-end crosstalk (ELFEXT)
  - 7. Power sum equal-level far-end crosstalk (pSELFEXT)
  - 8. Return loss
  - 9. Propagation delay 10. Delay skew
- F. These test procedures shall be based on EIA/TIA-568-B utilizing a commercial Level III UTP cable tester that will test at or above the Category 6 parameters. Acceptable test equipment includes Fluke DSP-4XXX, Aglient Scope 350 or other approved tester. Testers shall have the latest software update. Testers shall be set for Category 6 cable tests. Each tester shall be certified as calibrated within (3) three months of testing.
- G. UTP Category 6 cables shall be tested from the telecommunications room to RJ45 outlets in small groups. After a small group of station cables are installed, they must be tested. Test groups shall consist of no more than (40) forty cables.
- H. The Category 6 testing will show numerous problems which go undetected with lower frequency testing including the following:
  - 1. Stretched cables.
  - 2. Kinked cables.
  - 3. Short bend radius.
  - 4. Tight bindings.
  - 5. Loose twists and tight twists at terminals.
  - 6. Cable sheath removed too far.

- I. When errors are found, the source of each error shall be determined, corrected, and the cable re-tested. All defective components shall be replaced and retested. Defective components not corrected shall be reported to the Owner/Engineer with explanations of the corrective actions attempted.
- J. Test records shall be maintained using the test equipment manufacturer's electronic form. The form shall record cable identification number, outcome of test, indication of errors found, cable length, re-test results after problem resolution, and signature of the technician completing the tests. Test results shall be submitted in electronic spreadsheet format (Excel or Word compatible) on disk with a printed copy. Test results for each test group shall be submitted within two days of tests for immediate review.

#### 3.8 GROUNDING

- A. Grounding shall conform to ANSI/TIA/EIA-607, National Electrical Code and manufacturer's grounding requirements at a minimum.
- B. Ground equipment racks, housing, and raceways individually.

**END OF SECTION** 

#### **PART 1 - GENERAL**

#### 1.1 SCOPE

- A. This specification document provides the requirements for the installation, programming and configuration of a complete digital protocol analog addressable fire alarm system. This system shall include, but not be limited to, system cabinet, power supply, built in Signaling Line Circuit (SLC), 80 character LCD annunciator, six programmable Flexputs, built in dual line Digital Communicator associated peripheral devices, batteries, wiring, conduit and other relevant components and accessories required to furnish a complete and operational Life Safety System.
- B. The existing Gamewell E3 addressable fire alarm panel and two slave panels remain. Contractors shall provide one (1) new slave panel for new devices provided under this scope. Contractor's fire alarm sub shall be responsible for updated circuited drawing and battery calculations for review and approval by Fire Marshall.

#### 1.2 WORK INCLUDED

#### A. General Requirements

1. The contractor shall furnish and install a complete 24 VDC, electrically supervised, analog addressable fire alarm system as specified herein and indicated on the drawings. The system shall include but not be limited to all control panels, audio amplifiers, power supplies, initiating devices, audible and visual notification appliances, alarm devices, and all accessories required to provide a complete operating fire alarm system.

#### B. Listinas

1. All fire alarm system equipment shall be listed for it's intended purpose and be compatibility listed to assure the integrity of the complete system.

#### 1.3 STANDARDS

- A. The fire alarm equipment and installation shall comply with the current provisions of the following standards and shall be listed for it's intended purpose and be compatibility listed to insure integrity of the complete system.
  - 1. National Electric Code, Article 760
  - 2. National Fire Protection Association Standards:

NFPA 70 National Electrical Code NFPA 72 National Fire Alarm Code

NFPA 101 Life Safety Code

3. Local and State Building Codes

BOCA, National Building Code, Mechanical Code, Fire Prevention Code

- 4. Local Authorities Having Jurisdiction
- 5. Underwriters Laboratories Inc.
- 6. All equipment shall be approved by Underwriters Laboratories, Inc. for it's intended purpose, listed as power limited by Underwriters Laboratories, Inc., for the following standards as applicable:

UL 864 UOJZ Control units for Fire Protective Signaling Systems Local Signaling Unit

Central Station Signaling Protected Premises Unit Remote Signaling Protected Premises Unit.

Water Deluge Releasing Unit

Trate. Dolage	rtologonig o'nt
UL 268	Smoke Detectors for Fire Protective Signaling systems.
UL 268A	Smoke Detectors for duct applications
UL 217	Smoke Detectors for Single Stations
UL 521	Heat Detectors for Fire Protective Signaling systems.
UL 228	Door Holders for Fire Protective Signaling systems.
UL 464	Audible Signaling appliances
UL 1638	Visual Signaling appliances
UL 38	Manually Activated Signaling Boxes
UL 346	Waterflow indicators for Fire Protective Signaling systems.
UL 1481	Power Supplies for Fire Protective Signaling systems.
UL1711	Amplifiers for Fire Protection Signaling Systems

- 7. Americans with Disabilities Act (ADA).
- 8. All visual Notification appliances and manual pull stations shall comply with the requirements of the Americans with Disabilities Act.

#### 1.4 GENERAL REQUIREMENTS

#### A. Manufacturers/Distributors Services:

- 1. The following supervision shall be provided by a factory trained service technician from the distributor of the fire alarm equipment. The technician shall be trained and shall have a minimum of two (2) years of service experience in the fire alarm industry. The technicians name shall appear on equipment submittals and a copy of his manufactures trained shall be sent to the project engineer. The technician shall be responsible for the following items:
  - a. Approved Venders:
    - 1. Evergreen Fire Alarm
    - 2. Smith Fire System
  - b. A pre installation visit to the job site to review equipment submittals and to verify the method by which the system is to be wired.
  - c. During the installation the certified technician shall be on site or make periodic visits to verify installation and wiring of the system. He shall also supervise the completion of conduit rough, wires pulled into conduit and wiring rough, and ready for trim.
  - d. Upon completion of wiring, final checkout and certification of the system shall be made under the supervision of this technician.
  - e. At the time of the formal checkout, technician shall give operational instructions to the owner and or his representative on the system.

#### B. Submittals

- 1. The contractor shall submit a single electronic PDF copy of documentation within thirty (30) calendar days after award of the purchase order. Indicated in the document will be the type, size, rating, style, catalog number, manufacturers names, photos, and /or catalog data sheets for all items proposed to meet these specifications. The proposed equipment shall be subject to the approval of the Architect/Engineer and no equipment shall be ordered or installed on the premises without that approval.
- 2. NOTE: DOCUMENTATION Submittal of shop drawings shall contain at least

- three (3) copies of original manufacturer specification and installation instruction sheets. Subsequent information may be copies. All equipment and devices on the shop drawings to be furnished under this contract shall be clearly marked in the specification sheets.
- Supplier qualifications shall be submitted indicating years in business, service
  policies, warranty definitions, NICET certification, and completion of factory training
  program and a list of similar installations.
- Contractor qualifications shall be supplied indicating years in business and prior experience with installations that include the type of equipment that is to be supplied.
- 5. The contractor shall provide hourly Service Rates, performed by a factory trained technician for this installed Life Safety System with the submittal. Proof of training and authorization shall be included with the submittal. These hourly service rates shall be guaranteed for a 1-year period.

#### C. Contract close-out Submittals

- 1. Deliver an electronic PDF of the following to the owner's representative within Thirty (30) days of system acceptance. The closeout submittals shall include:
  - a. Installation and Programming manuals for the installed Life Safety System.
  - b. Point to point diagrams of the entire Life Safety System as installed. This shall include all connected Smoke Detectors and addressable field modules.
  - c. All drawings must reflect device address as verified in the presence of the engineer and/or end user.

#### D. Warranty

 Warranty all materials, installation and workmanship for a one (1) year period, unless otherwise specified. A copy of the manufacturer warranty shall be provided with the close out documentation.

#### E. Products

- This Life Safety System Specification must be conformed to in its entirety to ensure that the installed and programmed Life Safety System will accommodate all of the requirements and operations required by the building owner. Any specified item or operational feature not specifically addressed prior to the bid date will be required to be met without exception.
- 2. Submission of product purported to be equal to those specified herein will be considered as possible substitutes only when all of the following requirements have been met:
  - a. Any deviation from the equipment, operations, methods, design or other criteria specified herein must be submitted in detail to the specifying Architect or Engineer a minimum of ten (10) working days prior to the scheduled submission of bids. Each deviation from the operation detailed in these specifications must be documented in detail, including page number and section number, which lists the system function for which the substitution is being proposed.
  - b. A complete list of such substituted products with electronic PDF copies of working drawings thereof shall be submitted to the approved Architect and/or Consulting Engineer not less than ten (10) working days prior to the scheduled submission of bids.

- c. The contractor or substitute bidder shall functionally demonstrate that the proposed substitute products are in fact equal in quality and performance to those specified herein.
- 3. General Equipment and Materials Requirements
  - a. All equipment furnished for this project shall be new and unused. All components shall be designed for uninterrupted duty. All equipment, materials, accessories, devices and other facilities covered by this specification or noted on the contract drawings and installation specification shall be best suited for the intended use and shall be provided by a single manufacturer. If any of the equipment provided under this specification is provided by different manufacturers, then that equipment shall be "Listed" as to its compatibility by Underwriters Laboratories (UL), if such compatibility is required by UL standards.
- G. Satisfying the Entire Intent of these Specifications
  - 1. It is the contractor's responsibility to meet the entire intent of these specifications.
  - 2. Deviations from the specified items shall be at the risk of the contractor until the date of final acceptance by the architect, engineer, and owner's representative.
  - All costs for removal, relocation, or replacement of a substituted item shall be at the risk of the electrical contractor.

#### H. Extra Materials:

- General: Furnish extra materials, matching products installed (as described below), packaging with protective covering for storage, and identifying with labels clearly describing contents.
- 2. Furnish the following quantity of each unit:

Smoke Detector and Base - 5
1350F Heat Detector and Base - 5
Speaker/Strobe 15/75 cd - 5

3. Provide 50 feet of spare conduit, wire, and boxes per device, and installation labor incorporating fire alarm devices into the system if changes are required by the code authority. Unused devices shall be turned over to the Owner as extra materials.

#### **PART 2 - SPECIFICATIONS**

#### 2.1 GENERAL

#### A. Control Panel

- The fire alarm control panel (FACP) shall be the analog addressable control panel.
   The FACP must have a 6 amp power supply and be capable of expansion to a maximum of 54 total amps via bus connected expander modules that supervise low battery, loss off AC and loss of communication.
- 2. The FACP must have Day/Night sensitivity capabilities on detectors and be capable of supporting up to 792 analog addressable points. This shall be accomplished via eight signaling line circuits (SLC) capable of supporting a minimum of 99 detectors and 99 module devices each. The main panel will contain one SLC circuit with the option of utilizing up to 7 5815XL expander modules. The communication protocol on the SLC loop must be digital.
- 3. The FACP must support a minimum of six programmable "Flexputs". The panel Project # 22006 28 31 00 4

- must have a built in 80 character LCD annunciator with the capability of having an additional eight supervised remote annunciators connected in the field.
- 4. The FACP must have a built in UL approved digital communicator. The communicator must allow local and remote up/downloading of system operating options, event history, and detector sensitivity data.
- The FACP must automatically test the smoke detectors in compliance with NFPA standards to ensure that they are within listed sensitivity parameters and be listed with Underwriters Laboratories for this purpose.
- 6. The FACP must compensate for the accumulation of contaminants that affect detector sensitivity. The FACP must have day/night sensitivity adjustments, maintenance alert feature (differentiated from trouble condition), detector sensitivity selection, auto-programming mode (Jumpstart) and the ability to upgrade the core operating software on site or over the telephone.
- 7. The FACP shall have a Jumpstart feature that can automatically enroll all properly connected accessories into a functional system within 60 seconds of powering up the panel. Panels that do not have these capabilities will not be accepted.
- 8. The main communication bus (SBUS RS485) shall be capable of class A or class B configuration with a total Bus length of 6,000 feet.

#### B. System Wiring

1. The Signaling Line Circuit (SLC) and Data Communication Bus (S-BUS) shall be wired with standard NEC 760 compliant wiring, no twisted, shielded or mid capacitance wiring is required for standard installations. All FACP screw terminals shall be capable of accepting 14-18 AWG wire. All system wiring shall be in accordance with the requirements of NFPA 70, the National Electrical Code (NEC) and also comply with article 760 of the NEC.

#### C. Signaling Line Circuits

1. Each SLC shall be capable of a wiring distance of 10,000 feet from the SLC driver module (5815XL) and be capable of supporting 792 devices. The communication protocol to SLC devices must be digital. Any SLC loop device, which goes into alarm, must interrupt the polling cycle for priority response from the FACP. The FACP must respond consistently to a device that goes into alarm on an SLC in under 3 seconds. The auxiliary 5815XL SLC loop module must be capable of being located up to 6000 feet from the FACP on an RS-485 bus, which is separate from the SLC bus. The SLC shall be capable of functioning in a class A or class B configuration.

### D. SLC loop devices

 Devices supported must include analog photoelectric, ionization smoke detectors, analog heat detectors, addressable input modules, relay output modules or addressable notification modules. There is to be no limit to the number of any particular device type up to the maximum of 792, that can be connected to the SLC.

#### E. Analog detector functions

- The products of combustion detectors must communicate analog values using a digital protocol to the control panel for the following functions:
  - a. Automatic compliance with NFPA 72 standards for detector sensitivity testing

- b. Drift compensation to assure detector is operating correctly
- c. Maintenance alert when a detector nears the trouble condition
- Trouble alert when a detector is out of tolerance.

#### F. Sensitivity function

1. The FACP shall have the ability to set three different sensitivity levels. A zone can be programmed to a day and a night sensitivity value. The day/night schedule shall allow for 16 holiday dates that are user programmable to allow the FACP to respond at the night level on those days.

#### G. Programmable FlexPuts

 The FACP shall support six programmable Flexput circuits that are capable of being programmed as supervised reverse polarity notification circuits or supervised auxiliary power circuits that can be programmed as continuous, reset able or door holder power. The circuits shall also be programmable as input circuits in class A or B configurations to support dry contact or compatible two wire smoke detectors.

#### H. Addressable Notification Module

1. The contractor shall furnish and install where indicated on the plans, addressable notification modules. The notification module must provide one class A (Style Z) or class B (Style Y) notification output with one auxiliary power input. The notification module must be suitable for mounting in a standard 4 square electrical box and must include a plastic cover plate. The notification module must provide an LED that is visible from the outside of the cover plate. The notification module must be fully programmable for such applications as required by the installation. The IDP-control shall reside on the SLC loop and can be placed up to 10,000ft. from the control or 5815 SLC loop module.

#### I. Annunciators

The main control must have a built in annunciator with an 80-character LCD display and feature LED's for General alarm, Supervisory, System trouble, System Silence and Power. When in the normal condition the LCD shall display time and date based on a 200 year clock which is capable of automatic daylight savings time adjustments. All controls and programming keys are silicone mechanical type with tactile and audible feedback. Keys have a travel of .040 in.. No membrane style buttons will be permissible. The annunciator must be able to silence and reset alarms through the use of a keypad entered code, or by using a firefighters key. The annunciators must have twenty levels of user codes that will allow the limitation of operating system programming to authorized individuals.

#### J. Remote Annunciators

- 1. The fire system shall be capable of supporting up to one remote annunciators. LCD Remote annunciator Model RA-1000 shall have the same control and display layout so that they match identically the built in annunciator. Remote annunciators shall be available in two colors, red and light gray. Remote annunciators shall have the same functionality and operation as the built in annunciator. All annunciators must have 80-character LCD displays and must feature five LED's for general alarm, supervisory, system trouble, system silence, and system power. All controls and programming keys are silicone mechanical type with tactical and audible feedback. Keys shall have a travel of .040 inches. No membrane style buttons will be permitted.
- 2. The annunciator must be able to silence and reset alarms through the use of a Project # 22006 28 31 00 6

code entered on the annunciator keypad or by using a firefighter key. The annunciator must have twenty levels of user codes that will limit the operating system programming to authorized individuals. The control panel must allow all annunciators to accommodate multiple users input simultaneously. Remote annunciators shall be capable of operating at a distance of 6000 feet from the main control panel on unshielded non-twisted cable.

K. The fire system shall be able to support up to eight I/O modules that shall be used to drive remote LED graphic style displays and accommodate up to eight dry contact type switch inputs. The I/O modules shall each drive up to 40 LEDs without requiring external power connections. The I/O module inputs shall be supervised and be suitable for alarm and trouble circuits as well as reset and silence switches. The system shall also support up to 40 LED drivers that reside on the two-wire SLC loop. These driver boards shall contain 80 LED outputs that are powered by an external power source.

#### L. Serial/Parallel interface

The fire system shall be capable of supporting up to two serial / parallel interfaces
that are capable of driving standard computer style printers. The interface shall be
programmable as to what information is sent to it and shall include the ability to
print out Detector Status by point, Event History by point and System
Programming.

#### M. Distributed Power Module

- 1. The contractor shall supply a power module compatible with the existing Gamewell E3 fire alarm control panel. The power module must have 5 amps of output power, six flexput circuits rated at 3amps each, and two form C relay circuits rated at 2.5 amps at 24 volts DC. The fire system shall be capable of supporting up to eight (8) RPS-1000 power modules. The six flexput circuits shall have the same functionality as the flexput circuits on the main panel. The Distributed Power Supply shall be capable of being connected via an RS-485 system bus (SBUS) at a maximum distance of 6000ft. from the main control panel. The power module shall contain an additional RS-485 bus that is completely compatible with all add on modules. The power module will also act as a bus repeater so that additional RS-485 (modules) devices can be connected at a maximum distance of 6000ft. from the power module.
- 2. The power module's RS-485 bus shall be electrically isolated providing ground loop isolation and transient protection.

#### N. Digital Communicator

1. The digital communicator is existing and shall remain in place.

#### O. Dry Contacts

1. The FACP will have three form "C" dry contacts, one will be dedicated to trouble conditions, the other two will be programmable for alarm, trouble, sprinkler supervisory, notification, pre-alarm, waterflow, manual pull, aux. 1 or aux. 2. The trouble contact shall be normal in an electrically energized state so that any total power loss (AC and Backup) will cause a trouble condition. In the event that the Microprocessor on the FACP fails the trouble contacts shall also indicate a trouble condition.

#### P. Ground Fault Detection

1. A ground fault detection circuit shall be used to detect positive and negative grounds on all field wiring. The ground fault detector shall operate the general

trouble devices as specified but shall not cause an alarm to be sounded. Ground faults will not interfere with normal operation, such as alarm, or other trouble conditions.

#### Q. Over Current Protection

 All low voltage circuits will be protected by microprocessor controlled power limiting or have a self restoring polyswitches for the following: smoke detector power, main power supply, indicating appliance circuits, battery standby power and auxiliary output.

#### R. Test Functions

- A "Lamp Test" mode shall be a standard feature of the fire alarm control panel and shall test all LED's and the LCD display on the main panel and remote annunciators.
- 2. A "Walk Test" mode shall be a standard feature of the fire alarm control panel. The walk test feature shall function so that each alarm input tested will operate the associated notification appliance for two seconds. The FACP will then automatically perform a reset and confirm normal device operation. The event memory shall contain the information on the point tested. the zone tripped, the zone restore and the individual points return to normal.
- 3. A "Fire Drill" mode shall allow the manual testing of the fire alarm system notification circuits. The "Fire Drill" shall be capable of being controlled at the main annunciator, remote annunciators and via a remote contact input.
- 4. A "Bypass Mode" shall allow for any point or nac circuit to be bypassed without effecting the operation of the total fire system.

#### S. Remote Input Capabilities

The control panel shall have provisions for supervised switch inputs for the purpose
of Alarm reset and Alarm and trouble restore.

#### T. Notification Appliance Mapping Structure

All notification circuits and modules shall be programmable via a mapping structure that allows for a maximum of 250 output groups. Each of these groups shall have the ability to be triggered by any of the panels 125 Zones. A zone may trigger from groups individually, or may contain a global trigger for manual pull stations, fire drills and two different system alarms. Additionally each Zone will individually control the cadence pattern of each of the Groups that it is "Mapped" to so that sounders can indicate a variety of conditions. The Zone shall be capable of issuing a different cadence pattern for each of the Groups under it's control. The mapping structure must also allow a group to be designated to "ignore cadence" for use with strobes and other continuous input devices. Zones shall have eight different output categories; Detector alarm, Trouble, Supervisory, Pre-alarm, Waterflow, Manual pull, Zone auxiliary one and Zone Auxiliary two. Each of the categories shall have the ability to control from 1 to 8 output groups with a cadence pattern. The patterns are; March code, ANSI 3.41, Single Stroke Bell Temporal, California code, Zone 1 coded, Zone 2 coded, Zone 3 coded, Zone 4 coded, Zone 5 coded, Zone 6 coded, Zone 7 coded, Zone 8 coded, Custom output pattern 1, Custom output pattern 2, Custom output pattern 3, Custom output pattern 4, and Constant. This mapping/cadence pattern shall be supported by all system power supplies and Notification Expander Modules.

#### U. On board programmer

 The FACP shall have an on board programmer which will allow for all system functions and options to be programmed via the on board annunciator keypad. Any panel that does not have this capability will not be accepted.

#### V. Downloading Software

1. The fire alarm control panel must support up/downloading of system programming from a PC under Windows 7 or newer. The FACP must also be able to download the detector sensitivity test results and a 1000 event system event buffer to the PC. Communication shall take place over a direct connection to the PC and/or via the same telephone lines as the built in digital communicator and shall not require an external modem to be connected to the panel. The downloading software shall contain a code that will block unauthorized persons from accessing the panel via direct connection or over the phone lines.

#### W. Facility Management Software

1. The FACP must support a facility management software capable of providing off site access to FACP data that is necessary to manage fire system operation. A software package capable of uploading the detector sensitivity test results and the 1000 event system event buffer to the PC shall be required as part of the bid package. Communication shall take place over a direct connection to the PC and/or via the same telephone lines as the built in digital communicator. The facility management package must be separate from the downloader package and must not be capable of affecting programmed system options.

#### X. Service reminder

 The FACP shall be capable of automatically generating textual service reminder and the main and remote annunciator LCD's to inform the user of required testing or service. The service reminder shall not interfere with the normal operation of the FACP.

#### Y. English language descriptions

1. The FACP shall provide the ability to have an text description of each system device, input zone and output group on the system. The use of individual lights to provide descriptions will not be acceptable.

#### 2.2 SYSTEM OPERATION

#### A. Alarm

- When a device indicates any alarm condition the control panel must respond within 3 seconds. All programmed audio and visual devices will activate this time. The General Alarm or Supervisory Alarm LED on the annunciator(s) should light and the LCD should prompt the user as to the number of current events. The alarm information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators.
- 2. When the alarmed device is restored to normal, the control panel shall be required to be manually reset to clear the alarm condition, except that the alarms may be silenced as programmed.
- 3. An alarm shall be silenced by a code or Firefighter key at the main or remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur (subsequent alarm feature). When alarms are silenced the silenced LED on the control panel, and on any remote annunciators shall remain lit, until the alarmed device is returned to normal

#### B. Troubles

- 1. When a device indicates a trouble condition, the control panel System Trouble LED should light and the LCD should prompt the user as to the number of current events. The trouble information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators.
- 2. When the device in trouble is restored to normal, the control panel shall be automatically reset, The trouble restore information must be stored in event memory for later review. Event memory must be available at the main and all remote annunciators. A trouble shall be silenced by a code or Firefighter key at the main or remote annunciators. When silenced, this shall not prevent the resounding of subsequent events if another event should occur.

#### C. Supervision methods

- 1. Each SLC loop shall be electrically supervised for opens and ground faults in the circuit wiring, and shall be so arranged that a fault condition on any loop will not cause an alarm to sound. Additionally, every addressable device connected to the SLC will be supervised and individually identified if in a fault condition. The occurrence of any fault will light a trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition.
- 2. Each indicating appliance circuit shall be electrically supervised for opens, grounds and short circuit faults, on the circuit wiring, and shall be so arranged that a fault condition on any indicating appliance circuit or group of circuits will not cause an alarm to sound. The occurrence of any fault will light the trouble LED and sound the system trouble sounder, but will not interfere with the proper operation of any circuit which does not have a fault condition.

#### PART 3 - SYSTEM COMPONENTS

#### 3.1 CONTROL UNIT

#### A. System Cabinet

#### 1. Mounting

- a. The system cabinets shall be red and can be either surface or flush mounted. The cabinet door shall be easily removable to facilitate installation and service.
- b. Audible System Trouble Sounder
- c. An audible system trouble sounder shall be an integral part of the control unit. Provisions shall also be provided for an optional supervised remote trouble signal.

#### B. Power Supply and Charger:

- 1. The entire system shall operate on 24 VDC, filtered switch mode power supply with the rated current available of 5 Amps. The FACP must have a battery charging circuit capable of complying with the following requirements:
- 2. Sixty (60) hours of battery standby with five (5) minutes of alarm signaling at the end of this sixty (60) hour period (as required per NFPA 72 remote station signaling requirements) using rechargeable batteries with automatic charger to maintain standby gel-cell batteries in a fully charged condition.
- 3. Twenty-four (24) hours of battery standby with five (5) minutes of alarm signaling at

the end of this twenty-four (24) hour period (as required per NFPA 72 central station signaling requirements) using rechargeable batteries with automatic charger to maintain gel-cell batteries in a fully charged condition.

- 4. The power supply shall comply with U.L. Standard 864 for power limiting.
- 5. The FACP will indicate a trouble condition if there is a loss of AC power or if the batteries are missing or of insufficient capacity to support proper system operation in the event of AC failure. A "Battery Test" will be performed automatically every minute to check the integrity of the batteries. The test must disconnect the batteries from the charging circuit and place a load on the battery to verify the battery condition.
- 6. In the event that it is necessary to provide additional power one or more of the model Distributed Power Modules shall be used to accomplish this purpose.

#### C. Connections and Circuits

- Connections to the light and power service shall be on a dedicated branch circuit in accordance with the National Fire Alarm Code NFPA 72, National Electrical Code (NEC) NFPA 70, and the local authority having jurisdiction (AHJ).
- 2. The circuit and connections shall be mechanically protected. A circuit disconnecting means shall be accessible only to authorized personnel and shall be clearly marked "FIRE ALARM CIRCUIT CONTROL".

#### **PART 4 - ACCESSORY COMPONENTS**

## 4.1 FURNISH AND INSTALL, WHERE SHOWN ON THE DRAWINGS, THE FOLLOWING DEVICES

#### A. Manual Fire Alarm Stations

- Manual Fire Alarm Stations shall be non-coded, break glass, Single or double
  action type, with a key operated test-reset lock in order that they may be tested,
  and so designed that after actual Emergency Operation, they cannot be restored to
  normal except by use of a key. The reset key shall be so designed that it will reset
  Manual station and open FACP without use of another key.
- 2. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of fifty feet, front or side. Manual Stations shall be constructed of die cast metal with clearly visible operating instructions on the front of the stations in raised letters.
- Stations shall be suitable for surface mounting on matching backbox, or semi-flush
  mounting on a standard single-gang box, and shall be installed within the limits
  defined by the Americans with Disabilities Act (ADA) dependent on Manual Station
  accessibility or per local requirements.

#### B. Remote Power Supplies

- The Power Supply shall hang on the main S-Bus and be programmed through the control. It will support 5amps of 24 volt DC power, with 6 Flexput circuits, rated at 3amps each. Two additional SLC loop expanders shall be capable of be install in the cabinet, to allow an additional 254 points. The power supply will also regenerate the S-Bus for an additional 6000'.
- 2. The remote power supply model 5499 or 5495 may also be used on the system. These power supplies are activated by the ANM module and support 6amps of 24VDC power, with 4 notification circuits, rated at 3amps each. These power boosters may also be activated from another notification circuit from either the fire

alarm control, a distributed power supply. An AIM device shall be needed to monitor the power booster for trouble.

#### 4.2 NOTIFICATION DEVICES

- A. The visible and audible/visible signal shall be listed by Underwriters Laboritories Inc. per UL 1971 and/or 1638 for the ST and also UL464 for the HS.
- B. The notification appliance (combination audible/visible units only) shall produce a peak sound output of 90dba or greater as measured in an anechoic chamber. The signaling appliance shall also have the capability to silence the audible signal while leaving the visible signal energized with the use of a single par of wires Additionally, the user shall be able to select either continuous or temporal tone output with the temporal signal having the ability to be synchronized.
- C. The visible signaling appliance shall maintain a minimum flash rate of 1Hz or greater regardless or power input voltage. The appliance shall also be capable of meeting the candela requirements of the blueprints presented by the Engineer and ADA. The appliance shall have an operation current of 57ma or less at 24VDC for the 15/75Cd
- D. The appliance shall be polarized to allow for electrical supervision of the system wiring. The unit shall be provided with terminals with barriers for input/output wiring and be able to mount to a single gang or double gang box or double workbox with the use of an adapter plate. The unit shall have an input voltage range of 20-30 volts with either direct current or full wave rectified power.

#### 4.3 SMOKE DETECTORS

- A. Smoke detectors shall be ceiling mounted, Analog/Addressable photoelectric smoke detectors. The combination detector head and twist lock base shall be U.L. listed compatible with the fire alarm control panel.
- B. The base shall permit direct interchange ionization smoke detector or the IDP-Heat detector. The base shall be the appropriate twist lock base.
- C. The smoke detector shall have a flashing status LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady at full brilliance. The detector may be reset by actuating the control panel's reset switch. The sensitivity of the detector shall be capable of being selected and measured by the control panel without the need for external test equipment.
- D. The vandal security-locking feature shall be used in those areas as indicated on the drawing. The locking feature shall be field selectable when required. It shall be possible to perform a sensitivity test of the detector without the need of generating smoke. The test method shall simulate the effects of products of combustion in the chamber to ensure testing of the detector circuits.
- E. Detectors shall have completely closed back to restrict entry of dust and air turbulence and have a 30 mesh insect screen. Electronics of the unit shall be shielded to protect against false alarms from E.M.I. and R.F.I.

#### 4.4 HEAT DETECTORS

A. Furnish and install analog/addressable heat detectors. The combination heat detector and twist lock base shall be U.L. listed compatible with the fire alarm control panel.

- B. The base shall permit direct interchange with the Ionization smoke detector and the IDP-Photo photoelectric smoke detector. The base shall be appropriate twist lock base.
- C. The heat detector shall have a flashing status LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady at full brilliance. The detector may be reset by actuating the control panel's reset switch. The vandal security-locking feature shall be used in those areas as indicated on the drawings. Electronics of the unit shall be shielded to protect against false alarms from E.M.I. and R.F.I.

#### **PART 5 - WIRING**

#### 5.1 INSTALLER'S RESPONSIBILITIES

- A. The installer shall coordinate the installation of the fire alarm equipment. All conductors and wiring shall be installed according to the manufacturer's recommendations.
- B. It shall be the installer's responsibility to coordinate with the supplier, regarding the correct wiring procedures before installing any conduits or conductors.

#### 5.2 INSTALLATION OF SYSTEM COMPONENTS

- A. System components shall be installed in accordance with the latest revisions of the appropriate NFPA pamphlets, the requirements contained herein, National Electrical Code, local and state regulations, the requirements of the fire department and other applicable authorities having jurisdiction (AHJ).
- B. All wire used on the fire alarm system shall be U.L. Listed as fire alarm protection signaling circuit cable per National Electrical Code, Articles 760.

#### **PART 6 - WARRANTY AND FINAL TEST**

#### 6.1 GENERAL

A. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for one year (365 days) from the date of final acceptance.

#### 6.2 FINAL TEST

- A. Before the installation shall be considered completed and acceptable by the awarding authority, a test of the system shall be performed as follows:
- B. The contractor's job foreman, a representative of the owner, and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.
- C. At least one half of all tests shall be performed on battery standby power.
- D. Where application of heat would destroy any detector, it may be manually activated.
- E. The communication loops and the indicating appliance circuits shall be opened in at least two (2) locations per circuit to check for the presence of correct supervision circuitry.
- F. When the testing has been completed to the satisfaction of both the contractor's job foreman and owner, a notarized letter cosigned by each attesting to the satisfactory

completion of said testing shall be forwarded to the owner and the fire department.

- G. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the awarding authority.
- H. Prior to final test the fire department must be notified in accordance with local requirements.

#### 6.3 AS BUILT DRAWINGS, TESTING, AND MAINTENANCE INSTRUCTIONS

#### A. As Built Drawings

 A complete set of reproducible "as-built" drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system.

#### B. Operating and Instruction Manuals

 Operating and instruction manuals shall be submitted prior to testing of the system. Electronic PDF copy of operating and instruction manuals shall be delivered to the owner upon completion. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with U.L. Standard 864.

**END OF SECTION**