



City of Tacoma, WA

**TACOMA POWER
CONSERVATION RESOURCES MANAGEMENT**

REQUEST FOR QUALIFICATIONS

**CONTRACTOR ROSTER FOR RESIDENTIAL CONSERVATION
INSTALLER PROGRAMS**

SPECIFICATION NO. PE11-0509F



City of Tacoma

REQUEST FOR QUALIFICATIONS

**Specification No. PE11-0509F
Department of Public Utilities - Tacoma Power
Conservation Resources Management
Contractor Roster for Residential Conservation Installer Programs**

The City of Tacoma is accepting **SEALED PROPOSALS** for the above solicitation. Submittals will be received and time stamped only at the Purchasing Division, located in the Tacoma Public Utilities Administration Building, Main Floor, 3628 South 35th Street, Tacoma, WA 98409.

Proposals will be received until **11:00 a.m., Pacific Time, November 15, 2011**, at which time they will be recorded and forwarded to a Selection Advisory Committee for evaluation. Proposals are not typically opened and read aloud.

This specification is for the establishment of an ongoing roster and not for a specific project or job; therefore submittals will be accepted on an ongoing basis. An electronic copy of the complete solicitation documents may be viewed and obtained by accessing the City of Tacoma Purchasing website at www.TacomaPurchasing.org. A list of vendors who registered for this solicitation is also available at the website.

Project Scope: The intent of this request for qualifications is to establish a roster of qualified contractors eligible to participate in Tacoma Power's residential conservation programs. The roster will be made available for publication on Tacoma Power's website, in printed program materials distributed to interested customers and in program marketing.

Estimate: N/A

Additional information regarding this specification may be obtained by contacting Christy Valdes at 253-502-8170, or Jayne McCartney, Sr. Buyer, 253-502-8249, for general purchasing information.

CITY OF TACOMA

Kathy Katterhagen
Payables and Procurement Manager

Jayne McCartney
Sr. Buyer

City of Tacoma [protest policy](http://www.tacomapurchasing.org), located at www.tacomapurchasing.org, specifies procedures for protests submitted prior to and after submittal deadline.



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.

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Submittal Checklist

This checklist is being provided for convenience only and identifies the documents to submit with each submittal. Any submittals received without this information may be considered non-responsive and not be considered for award.

Note: Any proposal submitted which does not adequately address all aspects required in the specifications may be rejected at the discretion of the City of Tacoma for noncompliance.

Please submit one original and one (1) copy of your response. The following information is to be included in your submittal.

RFQ Signature Sheet-Appendix A	
History/Training Summary Sheet-Appendix C Residential Conservation Measures Form-Appendix B	
All other items listed in Submittal Requirements section, including references	
Documents to be submitted/executed after review/ award	
Contractor Agreement	
Insurance	

Request for Qualifications PE11-0509F
Contractor Roster for Residential Conservation Installer Programs

Intent

The intent of this Request for Qualifications (RFQ) is to create a Qualified Contractor Roster (list) for the residential conservation installer programs for publication on Tacoma Power's website, in printed program materials distributed to interested customers, and in program marketing. Qualified contractors will enter into an agreement with Tacoma Power Conservation Resources Management to participate in rebate and incentive programs. Lists will be created for specific programs (see Appendix F for program descriptions listed in the Contractor Agreement) and it is anticipated that new programs and measures will be added. New and updated submittals from qualified contractors will be accepted year around, however a firm will not be placed into the Qualified Contractor Roster until all qualifications have been verified and submittal requirements met.

Listing on the Contractor Roster does not imply any exclusive commitment to the Contractor by Tacoma Power and Tacoma Power may sign agreements similar to this one with other Contractors. Being listed on the roster does not constitute a commitment by Tacoma Power that any customer will request a bid from the Contractor or will enter into a contract with the Contractor. Listing and de-listing requirements are defined in the Tacoma Power Conservation Contractor Agreement Terms and Conditions, section H – see Appendix F.

Process

Tacoma Public Utilities/Tacoma Power conducts rebate and/or loan programs to motivate residential customers, in Tacoma Power's service area to reduce electric use.

Customers call Tacoma Power to inquire about conservation programs and determine if they qualify for participation. Tacoma Power provides program information at the customer's request including but not limited to Tacoma Power's Qualified Contractor Roster.

All measures installed by a listed contractor must be in compliance with Tacoma Power's Program Specifications and the Contractor Agreement. Upon completion and successful inspection by Tacoma Power staff, the utility pays the program incentive as defined in the Tacoma Power Conservation Contractor Agreement – see Attachment A in Appendix F.

Qualifications

To participate in Tacoma Power's conservation programs, qualified contractors must:

- Identify measures for which they will submit bids
- New contractors must provide three customer references for conservation related work from the previous six months or referrals from other Agencies/Utilities for whom they have completed work
- Existing contractors, currently listed as a Tacoma Power participating contractor, must have successfully completed three Tacoma Power projects in the last six months to be included on the list
- New contractors will need to complete three projects that qualify for the program with successful Tacoma Power inspections in order to be listed
- Show evidence of being in the conservation trade for which they are applying or a related trade for a minimum of one year
- Possess a current Washington State general contractor license or the appropriate Washington State specialty contractor license and provide a copy to Tacoma Power
- Possess proper EPA certifications where required by law (i.e. Lead Paint, Liquid Refrigerant)
- Carry Commercial General Liability Insurance in the amount of \$1,000,000 single limit combined for personal injury and property damage; \$2,000,000 aggregate and provide certificates of insurance to Tacoma Power
- Agree to perform the work in compliance with Tacoma Power's program specifications (See Appendix E for Program Specifications)
- Enter into an agreement with Tacoma Power to participate in residential programs (See Appendix F for sample of the Tacoma Power Conservation Contractor Agreement)
- Contractors can perform work on the program after they have been notified by Tacoma Power that their RFQ has met the program requirements, all required documents have been received by Tacoma Power and the Contractor Agreement has been approved by Tacoma Power
- New contractors must also attend a contractor orientation provided by Tacoma Power before starting work on any approved Tacoma Power conservation projects

Submittal Requirements

1. Submit one original and one copy of all required forms and documents.
2. The City of Tacoma does not expect or require a large amount of preliminary work to be performed by firms responding to this RFQ. Submittal's should be limited to no more than 12 pages and include the following information:

A. Summary of Conservation History and Training (Appendix C), to include, but not be limited to:

- 1) Number of years in business
- 2) Staff training & certifications
- 3) Years of experience of field staff
- 4) History of working with other conservation programs, agencies, and/or utilities
- 5) Any areas of specialty or expertise (i.e., sustainability, pest control, duct testing/sealing, etc.)

B. New contractors must submit three references from customers or conservation agencies and/or utilities (Appendix D). Contractors currently listed on the Tacoma Power programs are exempt from submitting references.

C. List of sub-contractors (if sub-contractors are to be used)

D. Required Forms

- 1) RFQ Signature Sheet-Appendix A
- 2) Residential Conservation Measures Form-Appendix B
- 3) Summary of Conservation Trade history/training Summary-Appendix C

The Sample copies from Appendix E–Program Specifications and Appendix F-Sample Contractor Agreement are for reference purposes only, do not send these copies back with the required submittal documents.

Project Coordinator

The Residential Conservation Contractor Roster will be maintained by Tacoma Power's Conservation Resources Management. All submittals will be received by Purchasing, and then forwarded to the Department for review and subsequent posting to the Roster when qualifications are met. For questions regarding the approval process, contact: Christy Valdes 253 502-8170 or Mark Percy 253 502-8414.

Appendices

Appendix A: Request for Qualifications Signature Sheet

Appendix B: Residential Conservation Measures

Appendix C: Summary of Conservation Trade History/Training

Appendix D: Reference/Completed Project Form

Appendix E: Program Specifications

Appendix F: Sample Contractor Agreement

Appendix A: Request for Qualifications Signature Sheet

NO. PE11-0509F

Vendors shall submit one original and one copy of RFQ package.

The undersigned states that he or she is authorized to submit a response on behalf of the corporation, partnership, or sole proprietorship listed below:

Firm _____

Mailing address _____ City/State/Zip _____

Telephone number _____ Fax number _____

Website address _____ E-mail address _____

Federal Tax ID no. _____ WA St. Contractor's License no. _____

Tacoma business license no. _____

Printed signature _____ Title _____

Signature _____ Date _____

Acknowledgment of Addenda, if applicable:

No. 1 _____ (initial) No. 2 _____ (initial) No. 3 _____ (initial)

Name of firm _____

Appendix B: Residential Conservation Measures Form

Name of firm _____

See Tacoma Power Conservation Contractor Agreement (Appendix F, Attachment A) for Program Descriptions

Weatherization program measures to include:

Please indicate which services your firm is qualified to provide	Indicate with X
<ul style="list-style-type: none"> • Insulation for single family homes: ceilings, walls and floors 	
<ul style="list-style-type: none"> • Window replacements for single family homes: single glazed and double pane metal-frames 	
<ul style="list-style-type: none"> • Insulation for multifamily buildings: ceilings, walls and floors 	
<ul style="list-style-type: none"> • Window replacement for multifamily buildings: single glazed 	
<ul style="list-style-type: none"> • Duct testing and sealing (PTCS certification required) 	

High Efficiency Heating program measures to include:

Please indicate which services your firm is qualified to provide	Indicate with X
<ul style="list-style-type: none"> • Heat pump installation 	
<ul style="list-style-type: none"> • Heat pump commissioning (PTCS certification required) 	
<ul style="list-style-type: none"> • Duct testing and sealing (PTCS certification required) 	

Appendix C: Summary of Conservation Trade History/Training

Include the following information:

Name of firm _____

1. Years in the conservation business _____

2. Attach a list of field employees showing years of experience and any certifications, using the format below:

- Employee
- Name
- Years of Experience
- Training
- Course name
- Date of training
- Certification Information
 - Type of certification
 - name of certifying agency
 - date of certification
 - certification number

3. Describe your firm's history of working with other conservation programs, agencies and or utilities.

4. Describe other areas of specialty or expertise.

Appendix D: Reference/Completed Project Form

Name of firm _____

In accordance with the Submittal Requirements of this RFQ, new, prospective contractors must provide a list of three references. (Existing contractors, currently listed as a Tacoma Power participating contractor do not need to submit references.)

References must be from individuals or utilities that you have completed work for in the last six months. Please provide the following information for your references:

- Customer Name
- Address
- Phone numbers
- Type of work and date

Appendix E: Program Specifications

Tacoma Power

Weatherization Program Specifications

September 2011

KnowYourPower.com



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PART 1: SINGLE FAMILY WEATHERIZATION

1. GENERAL PROCEDURES

All provisions of the general procedures shall apply to all sections of these specifications. Each contractor shall be responsible for informing each of their installers of the procedures in these specifications and ensuring the procedures are followed. A contractor performing below standard work on a continuous basis and consistently causing several re-inspections to be made by the inspector shall be suspended from further participation in this program at the discretion of the Tacoma Power program coordinator. **Tacoma Power** will be referred to as “the utility” throughout this document.

a. Introduction

- i. The purpose of these specifications is to assist contractors and/or utility customers in planning, implementing, and installing weatherization products and measures. These products and measures will reduce energy use, provide adequate residential comfort levels, and maintain the structural integrity in residences. Contractors and homeowners need to be aware that improper weatherization methods or poor installation techniques can lead to building component failure years after the work has been completed. It is the intent of this document to prevent these problems.

b. Utility Participation

- i. Adoption or use of this specification does not commit Tacoma Power to offer incentives or programs for each measure type. Check with the program coordinator for more information on what measures are included.
- ii. Tacoma Power may modify performance requirements of materials or allowed materials/installation techniques to better serve the Utility’s customers. These modifications or changes should be published in a “cover letter” or similar document that can be easily distributed to contractors.

c. Codes

- i. Compliance with federal, locally adopted building codes or regulations affecting work under these specifications shall be required. Where federal, local codes or regulations permit lower standards than required by these specifications, the standards contained herein shall govern. The Utility does not assume responsibility for enforcing or determining compliance with federal codes, local codes, regulations, or interpretations. However, the Utility will reject any work that is found to be in non-compliance with current codes, to include current state energy codes.

d. Combustion Appliance Requirements

- i. Whenever there is a Combustion Appliance present in the house, garage, or other attached space, a UL listed, C-UL listed, or equivalent carbon monoxide alarm shall be installed in accordance with the carbon monoxide alarm manufacturer's instructions.

e. Asbestos

- i. In cases where asbestos materials are found, by the contractor or anyone in the contractor's employ, the contractor shall comply with all federal, state, and local codes and regulations regarding the handling and disposal of the asbestos material.
- ii. In no case shall the contractor allow anyone in his employ to disturb, in any way, asbestos materials that are found on the customer's property. Asbestos handling and removal shall be performed only by certified asbestos workers, per WAC 296-65.

f. Pre-Installation Inspection

- i. Before any work is started, the contractor shall make a thorough inspection of the residence and inform the customer of any existing conditions which would adversely affect the performance of the measures to be installed.
- ii. Structural members and Building components shall be free of decay and structurally sound before weatherization Measures are installed.
- iii. Personal effects stored by the customer in locations which hinder the efficient application of any weatherization measure must be moved and restoring provisions made by the customer before weatherization of that area can commence.
- iv. Structural changes required to install weatherization measures are beyond the scope of this program. Any work beyond the scope of the program must be separately arranged and financed by the customer on an individual basis.
- v. Where aesthetic or special features inherent in weatherization products are requested by the customer, these costs shall be identified separately and paid for by the customer. Some examples of special features which are the responsibility of the customer are tinted glass, mirrored glass, decorative trim, window grids, iron scrollwork, etc. Some examples which are not special features are fire retardancy of insulation materials or use of vapor permeable building wrap (house wrap) to cover insulation in occupied unconditioned space.

g. Customer Contact

- i. All critical measurements, installations, and repairs must be made by a prearranged appointment with the customer.

h. Materials

- i. Unless otherwise stipulated, the contractor shall furnish all materials, labor, tools, services, and equipment necessary for the execution and completion of all work under these specifications.
- ii. All materials shall be new, and both workmanship and materials shall be of good quality. Materials damaged in shipment or in assembly shall not be used.
- iii. The Utility reserves the right to identify and disapprove for use in this program, any weatherization product at any time when it deems the product unsatisfactory for the requirements of this program.

i. Workmanship and Warranties

- i. All work shall be done in a workmanlike manner, using craftsmen skilled in their trades. The contractor shall be prompt, on schedule, and complete work in the time frame agreed upon with the customer.
- ii. Weatherization materials and labor, for both insulation and windows, shall be warranted by the installer against failure due to manufacturing and installation defects for a period of at least two years. However, all sealed insulating glass units shall be warranted against failure of the seal for a period of at least five (5) years. Manufacturer's written warranties may be used by installers to satisfy a part of this requirement where appropriate.
- iii. All warranties issued under this Program shall be fully transferable for the periods stated above.

j. Use of Premises

- i. The contractor shall confine his apparatus, the storage of materials, and the operations of his workmen to limits indicated by law, permits, ordinances, and/or directions of the customer and shall not unreasonably encumber the premises with his materials.

k. Cutting and Patching

- i. The contractor shall do all cutting, patching, or fitting on the existing structure that may be required to complete the work in a workmanlike manner acceptable to the customer and Utility. However, the contractor shall not

endanger the existing structure by cutting or otherwise altering the structure and shall not cut or alter the structure without the written consent of the customer.

I. Protection of Work and Property

- i. The contractor shall continuously maintain adequate protection of all his work from damage and shall protect the customer's property from injury and loss arising in connection with his work. He shall make good any such damage, injury, or loss, except such as may be caused by the customer or due to causes beyond the contractor's control and not to his fault or negligence.

m. Post-Installation Procedures

- i. The contractor shall keep the premises from accumulation of waste materials or rubbish caused by his employees or work. At the completion of the work, he shall remove all his rubbish from and about the residence and all his tools, scaffolding, and surplus materials. He shall leave his work area "broom clean" or its equivalent, unless more exactly specified in writing.

2. INSULATION

This section covers the requirements for the selection of materials, ventilation, and installation of thermal insulation into existing residences.

Insulation shall be installed in areas of the residence envelope that separate the conditioned living space from unconditioned or outside space in the following locations (where no insulation exists or the R-value is less than that prescribed in this specification):

- i. Ceilings under attic spaces in permanent housing.
- ii. Exterior surfaces of roofs in permanent housing where no attic space exists, and where ventilation does not exist nor is intended to exist.
- iii. Interior surface of roofs in permanent housing where no attic space exists.
- iv. Underfloors over unheated spaces in permanent housing.
- v. Unfinished exterior walls in permanent housing bordering living spaces (exterior garage walls are excluded; garage/house common walls are included).
- vi. Finished exterior walls in permanent housing.
- vii. Heating ventilating and air conditioning (HVAC) ducts located in unconditioned spaces in permanent housing.

b. Material Requirements

- i. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals (current edition) is the accepted standard for R-value/U-factor of materials used by installers. Products that vary from ASHRAE may be acceptable if they comply with

current Federal Trade Commission (FTC) certifications, testing and labeling rules, and have independent laboratory testing which indicates the product's thermal value.

- ii. Materials used for thermal insulation shall meet the requirements contained in the applicable Federal Specification listed below. Certain requirements in these specifications refer to voluntary standards such as ASTM for specific test methods or physical properties. For purposes of compliance with this weatherization specification, the referenced voluntary standard shall be considered mandatory.

Mineral Fiber Blankets/Batts	ASTM C-665
Mineral Fiber Loose Fill	ASTM C-764
Cellulose Loose Fill	ASTM C-739-86
	CPSC 16 CFR 1209
	CPSC 16 CFR 1404
	UL Label on each Bag
Polystyrene	ASTM C-578-B1
Polyurethane	ASTM C-591
Polyisocyanurate	ASTM C-591

- iii. Loose-fill cellulose manufacturers shall subscribe to an ongoing laboratory quality control inspection program substantially equivalent to the "UL classification" program. This program verifies periodically manufacturer's adherence to the requirements of CPSC cellulose regulation 16 CFR 1209 (i.e., critical radiant flux, smoldering combustion, settled density, and corrosiveness). Also, the UL label shall appear on every bag of material. The label shall include the file number (R-number) of the manufacturer and the issue number for labels purchased.
- iv. Insulation materials (except foam plastics), including facings, must meet the flame spread and smoke developed requirements of IBC 2103 and/or 719.
- v. Foam plastic insulation must meet the flame spread and ignition protection requirements of IBC 2603.4
- vi. Facings on pipe and duct insulation must meet the flame spread and smoke developed code requirements
- vii. All insulation materials installed shall meet the requirements of the Federal Trade Commission labeling Rule (16 CFR 460).
 - i. When unusual conditions exist which indicate the use of foam plastics, or their combinations with other materials, such applications shall comply with the

International Building Code and be approved by the Customer and the Utility in writing.

- ii. The use of insulation materials containing Urea-Formaldehyde is expressly forbidden in this program.

c. Installation Requirements for Ceilings under Attic

- i. Insulation shall be installed according to the provisions of the International Building Code and shall include the requirements listed below.
- ii. All major air leaks must be sealed before attic insulation is installed, including the following:
 - 1. Plumbing and electrical penetrations
 - 2. Gaps around chimneys
 - 3. Balloon framed interior and exterior wall cavities
 - 4. Top plates of interior wall partitions
 - 5. Housings of exhaust fans and recessed lights
- iii. Ceilings shall be insulated to a minimum of R-49 when less than R-20 is present. In the event R-49 can't be achieved, prior utility approval will be required.
- iv. Attic spaces with floors shall be insulated to the highest practical R-value approaching R-49.
- v. Knee walls adjoining attic spaces shall be insulated to a minimum of R-13, with R-19 preferable. If installed, a vapor barrier shall be installed facing the conditioned, living space. Insulation must be supported in place with twine.
- vi. The installer is responsible for determining that the ceiling system is structurally adequate to support the combined weight of all materials imposed on the ceiling structure. Structural damage can be caused by excessive pressures imposed during installation or by installing insulation in structures too weak to support the added load. The installer shall be responsible for ceiling damage incurred during the installation of ceiling insulation and associated work.
- vii. Insulation shall not be installed within 2 inches of the sides nor, when installed directly over a recessed lighting fixture, within 24 inches of the top of the recess lighting fixture unless the fixture is labeled for direct cover by insulation. A metal, open topped enclosure shall be placed around recessed lighting fixtures to provide required clearance to the side, and to prevent loose fill material from blowing into or sloughing onto the fixture. Such enclosures shall be attached to the ceiling structure to prevent their displacement during or after application of

insulation. Tops of such enclosures or dams shall extend a minimum of 4 inches vertically above the loose fill insulation.

- viii. When insulation is to be installed over a heat producing fixture, a solid, flame resistant, closed-top box shall be used which provides the 3-inch side clearance and a vertical clearance overhead of at least 24 inches above the highest point of the fixture. Such enclosures shall be attached to the ceiling structure to prevent their displacement during or after application of insulation.
- ix. Metal recessed lighting fixtures with enclosed tops may be insulated around and over without additional protection when certified by an independent laboratory as being capable of dissipating fixture heat, (e.g., UL listed fixtures will be marked "Recessed Fixture Type IC")
- x. Proper protection is required for all miscellaneous electrical devices (e.g., door bell transformers, ventilating fans, and other motors) in accordance with Spec. viii. and with state and local codes.
- xi. Insulation shall not be introduced into recessed soffits which contain lighting, electrical devices (e.g. door bell transformers, ventilating fans, and other motors) or flues.
- xii. Recessed lighting fixtures and fan/light combinations that are Type-IC rated by UL may be covered with insulation. Fan/heater, fan/light/heater, and light/heater combinations may be covered with insulation ONLY IF they are rated "Heater" or "Air Heater".
- xiii. A ventilation only fan may be covered with insulation if all holes and penetrations are sealed with a nonflammable sealant.
- xiv. Only fluorescent fixtures with appropriate thermal protection shall be covered with insulation.
- xv. All combustible insulation materials shall be kept a minimum of 2 inches from all metal flues. This can be done by installing a solid, non combustible retaining wall extending a minimum of 4 inches above the level of loose fill insulation.
- xvi. All combustible insulation materials shall be kept a minimum of 2 inches from masonry chimneys. This can be done by installing a solid, non-combustible retaining wall extending a minimum of 4 inches above the level of loose fill insulation. Non-combustible insulation may be installed in contact with masonry chimneys.
- xvii. Attic duct systems shall be sealed before any ceiling insulation is applied. Refer to section 3.- Duct Sealing Standards.

- xviii. Knob and tube wiring shall be treated with special care. In any case where installation of insulation is in areas where knob and tube wiring exists, the following conditions shall be met prior to installing the insulation:
1. The wiring shall be inspected by an appropriately licensed and bonded electrical contractor who shall certify that the wiring is in good condition with no evidence of improper over current protection, conductor insulation failure or deterioration, and with no improper connections or splices.
 2. The contractor is responsible for informing the customer of the requirement to have the knob and tube inspection performed. This notification must be made to the customer at the time of bid.
 3. An inspection report signed by an electrician must be provided to the utility prior to installing the insulation.
 4. All knob and tube circuits shall have over current protection in compliance with the 60° C column of table 310-16 of the National Electrical Code. Over current protection shall be either circuit breakers or type S fuses with ampacities no greater than 15 amperes (or as certified as a safe ampacity, on the inspection report signed by the inspecting electrician).
 5. In the event that the insulation is installed prior to the electrical inspection, the contractor shall be liable for the cost of the electrical inspection as well as any consequential repairs needed to pass the inspection, or for the costs of removing the installed insulation.
 6. The insulation shall meet Class I specifications as identified in the IBC 2603 and/or 719, with a flame spread factor of 25 or less as tested in accordance with current ASTM standard. Foam insulation shall not be used where knob and tube wiring exists.
- xix. Provided all of the above conditions are met, insulation may be installed directly around and over wiring to the desired level. If batts are used, they shall be unfaced. However, a more stringent local or state code may preclude the use of the above method. It is highly advisable that the contractor checks with the jurisdictions in his service areas to insure that the appropriate codes are adhered to.

- xx. Attic entry access openings shall be framed to prevent loose fill insulation from falling or sloughing through the opening. Alternately, a 14 inch or wider insulation batt, with an R-value equal to that specified for the attic, shall be laid flat around the perimeter of the attic access opening to contain the loose fill insulation.
- xxi. Attic access doors that open to a heated space shall be insulated to at least R-38 for horizontal openings and to at least R-13 for vertical openings.
- xxii. Access doors, in heated spaces, which incorporate retractable ladders or similar devices, are required to be insulated by installing an air tight mechanically fastened insulated cover (R-38) over the opening in the attic.
- xxiii. Attic access doors shall be weatherstripped with appropriate materials if they open to a heated, living space. Horizontal openings require foam-backed, self adhering tape. Vertical openings require door weatherstripping and shall be mechanically fastened (e.g. turn knob screws).
- xxiv. Water pipe insulation shall be part of attic insulation. It shall be pre-formed material specifically designed for water pipes or flat fiberglass batts. It shall have a flame spread rating of 25 or less when tested in accordance with ASTM-E-84-(current).
 - 1. If fiberglass batts are used, then the batts shall be at least R-7 when flat. After installation, a minimum of R-3 shall be present on any water pipes not enclosed within the attic insulation. The insulation shall be permanently attached to the pipe with wire, cable ties, or twine wrapped around the insulation. Water pipes that are protected by (enclosed within) installed attic insulation are not required to be separately wrapped.
- xxv. All water shut off valves that are covered by attic insulation shall be identified using a method that allows the valve to be readily located by the customer.
- xxvi. Exhaust fans [except kitchen range exhaust fans (see 2. c. xxvii) which vent any living space directly into the attic space, or to an unsealed vent cap, shall be extended through to the outside and shall be mechanically attached to a vent cap. Attachment to the vent cap shall be substantially airtight. Tape shall not be acceptable for use as a fastener.
 - 1. Extension material shall be made of metal, be mounted in a secure manner, and of appropriate diameter for the vent opening. Its configuration shall be such that no traps or reversing horizontal runs are present. Plastic/vinyl flex duct shall not be used. If plastic or vinyl flex duct is evident on an existing exhaust fan, it shall be replaced with metal ductwork. Dampened vent caps shall be installed on fans not

containing dampers as part of the housing. Exhaust fan assemblies shall have only 1 damper per unit.

2. Exposed duct runs shall be wrapped with insulation at least R-4 in value. Refer to Washington State Ventilation and Indoor Air Quality Code 302.2.3.
- xxvii. Kitchen hood range exhaust fans shall be connected to a duct of no less than 30 gauge galvanized steel which is substantially airtight throughout and which terminates directly to the outside in a metal vent cap with no more than a 2 foot horizontal run. Combustible insulation must be kept a minimum of 2 inches from the duct (baffled). Do not install different metals such as galvanized steel and aluminum in contact with each other.
- xxviii. If clothes dryers are found to be vented directly into the attic space, ceiling insulation shall not be installed until the vent is extended directly to the outside of the structure. The vent shall terminate in a non-screened vent cap with a damper. Extension material in excess of 6 feet must be metal with a non-ribbed interior and must be mounted in a manner that no traps or reversing horizontal runs are present. An approved flex pipe may be used for extensions of 6 feet or less. Clothes dryer vent caps shall not be screened. Ducting shall be insulated to at least an R-4 in value.
- xxix. If a vapor barrier is installed with ceiling insulation, it must be placed next to the ceiling between the insulation material and the conditioned, living space. If an existing vapor barrier is not in substantial contact with the ceiling, it must be removed or re-installed in substantial contact with ceiling. A vapor barrier shall not be installed over the top of existing insulation. Slashing of existing or added vapor barriers shall not be allowed.
- xxx. The total net free ventilating area in attic spaces shall be determined to meet the following requirements or shall be modified to meet these requirements as an integral part of any ceiling insulation installation. Vent openings shall be protected against the entrance of rain and snow. Also, the attic space shall be properly enclosed to prevent the entry of animals
1. Enclosed attics shall have cross ventilation (over the top of all insulation) for each separate space provided by ventilation openings protected against the entrance of rain and snow. The total net free ventilating area of these openings shall be 1 square foot per 150 square feet of attic area (1:150). If there is a 3 foot vertical distance from low to high vents, or if a vapor barrier is present, venting can be reduced to 1 square foot (net free area) per 300 square feet of attic area (1:300). In either case, 50-60% of the ventilation shall be installed as exhaust (high) and 40-50% shall be installed as intake (low).

2. Alternative vent placement requests must be submitted to “the Utility” in writing. If approved, approval by “the Utility” will be issued in writing and must be in hand prior to the installation of any alternate means of ventilation.
3. Net free ventilating area is the net effective area of a ventilator after adjusting for its gross ventilating area. Screens and/or louvers can reduce net free area by as much as two-thirds. To determine the net free ventilating area of a vent, divide the gross ventilating area of the ventilator by the Area Factor in the following table:

Covering	Area Factor
1/4 inch hardware cloth	1.0
1/4 inch hardware cloth w/rain louvers	2.0
#8 mesh screen	1.25
#8 mesh screen w/rain louvers	2.25
#16 mesh screen	2.0
#16 mesh screen w/rain louvers	3.0
Rain louvers only	2.0

4. Roof vents shall be installed with sufficient spacing between the vents so as to prevent localized circulation or short circuiting of ventilation.
 5. Roof Jacks shall not be used to provide intake (low) ventilation unless the situation has been evaluated and low roof jack installation has been approved by the Tacoma Power inspector.
- xxx. Eave or soffit vents by themselves, shall not be considered as providing adequate "cross ventilation." Additional means of establishing ventilation by natural convection shall be incorporated.
- xxxii. Ventilation baffling shall be provided so that at least two and one half (2 -1/2) inches measured perpendicular to the sheathing over the full joist/truss spacing is available for incoming air from the soffit or eave openings. A shorter distance may be used if the opening defined by the baffle, sheathing, and joist/trusses has a net free ventilating area equal to or greater than the net free ventilating area of the soffit or eave openings.
- xxxiii. Ventilation baffles shall be of weather-resistant cardboard or other approved materials. Mineral wool batts of sufficient thickness to adequately baffle and yet maintain the free air clearance are acceptable. All baffles must extend out over the wall top plate. Baffles shall be visible above the final insulation level. Roof slopes may dictate that the top of the insulation be sloped for several feet from the exterior wall line so that the baffle remains visible above the insulation level.

- xxxiv. All soffit or eave openings shall be left free of any blockage by insulation or other materials, and such eave systems must remain effective following weatherization.
- xxxv. Sloping ceilings shall be ventilated by maintaining a minimum space of one (1) inch between the top of any insulation material and the bottom of the roof sheathing. Cross ventilation shall be provided by openings at the top and bottom of the space.
- xxxvi. Air turbines shall not be installed on a residence to provide for required ventilation. Ventilation provided by existing air turbines may be included by calculating the net free ventilating area of the air turbine in a locked (non-rotating) position.
- xxxvii. If ventilation for the attic is supplied through an attached garage, then the net free ventilating area supplied through the garage shall be considered the smallest of either the ventilating area between the attic space and garage (attic opening) or the ventilating area between the garage and the exterior (outside). In this situation, the calculation for the total ceiling area to be ventilated shall include the garage floor area.
- xxxviii. The contractor shall post the insulation certificate and empty insulation bag with coverage chart in the attic; near the access. The contractor is also required to provide the utility with a copy of the certificate of insulation containing the following information:
 - 1. Address of residence
 - 2. Date of installation
 - 3. Name and address of installing contractor
 - 4. Bag count, R-value, & type of insulation installed
 - 5. Area (sq. ft.) of ceiling insulated

d. Installation Requirements for Roofs – Exterior Space

- i. Roof exteriors shall be insulated to a minimum of R-20 or the highest R-value approaching R-30 which is practical.
- ii. Insulation shall not be applied to roofs which contain ventilated cavities (e.g., vaulted ceilings with ventilated spaces, attics, sloped ceilings connected to attics and/or knee wall spaces, etc.). Ventilated cavities of flat or sloping roofs shall not be blocked.
- iii. Insulation shall be in rigid board form.

- iv. A vapor barrier of 1.0 perm or less shall be in place between the insulation and the roof deck. However, if insulation is already present in the roof system, then a vapor barrier shall not be installed.
- v. Roof drainage systems shall function properly after insulation is installed IRC Chapter 11.
- vi. Roof coverings shall be applied directly over the insulation per Section 1507 of the IBC.
- vii. All penetrations through the roof covering and all joints between the roof covering and vertical surfaces (e.g., walls, chimneys, etc.) shall be flashed according to the requirements of the IBC 1507
- viii. The installer shall contact the Utility and request an "in-progress" inspection by the Utility during the installation.
- ix. Other methods of installing exterior roof insulation shall be approved by the Utility, in writing, prior to beginning the work.
- x. Only the costs of insulation materials, installation of the insulation, and associated furring costs shall be covered under the program. Costs associated with providing a weatherproof roof shall not be covered under this program.
- xi. An "in-progress" inspection shall be requested by the installer after the rigid board has been installed and prior to covering the insulation with a fire rated barrier to verify the insulation board is properly installed and sealed. The "in-progress" inspection shall be documented in the customer's permanent file.
- xii. The fire rated barrier shall be taped at all joints and sealed at all edges to ensure air/moisture infiltration paths have been eliminated.
- xiii. All associated costs (e.g., painting, taping, etc.) of the fire rated barrier (e.g., sheet rock) and its installation are beyond the scope of the program and shall be covered by the homeowner.

e. Installation Requirements for Underfloors

- i. All major air leaks must be sealed before floor insulation is installed, including the following.
 - 1. Around plumbing and electrical penetrations
 - 2. Gaps around masonry fireplaces
 - 3. Duct penetrations

- ii. Floor insulation shall be a minimum of R-30 or the level needed to fill the joist cavity, whichever is less. If greater than R-10 exists, the utility will not fund additional insulation. The following conditions may allow removal and installation of new insulation: Damaged insulation due to pests and water, improper installation of insulation where it does not make contact with the floor surface.
- iii. The insulation shall be installed in substantial contact with the underfloor.
- iv. If any indication of fungal decay or insect infestation is found before or during installation of underfloor insulation, appropriate action shall be taken at the homeowner's expense before any further installation of insulation is done.
- v. If any wet areas of the subfloor or wood supporting members are found, then the source of the moisture shall be eliminated and wet areas dried out at the customer's expense before floor insulation is installed.
- vi. Crawl space ventilation shall be 1:150 net free area unless the crawl space is dry, in which case 1:1500 is acceptable. Place vents as close to corners as practical, with the balance evenly distributed along the walls. Place vents on opposing walls for cross ventilation. Where adequate ventilation cannot be obtained, the contractor shall be required to contact the utility (inspector) for approval prior to installing any insulation.
- vii. All newly installed crawl space vents shall be covered with 1/4 inch mesh. All added crawl space vents shall provide at least 50 square inches of net free area. Louvered vents designed for use in soffits (or similar vents) shall not be used in crawl with crawl space ventilation except when requested by the customer and approved in writing by the Utility.
- viii. A ground cover moisture barrier shall be in place upon job completion. The new ground cover shall be 6 mil black polyethylene and all joints shall be overlapped with sufficient material so that all ground surface area is covered. Ground cover shall be secured to prevent movement and shall not contact wood members of the structure.
- ix. If underfloor insulation is installed over an unheated basement and the basement has no exposed soil, then the provisions for a ground cover and ventilation are not required. Any basement with exposed soil shall be treated as a crawl space and the provisions for ventilation shall be required. In addition, a ground cover shall be present which covers the entire area of exposed soil.
- x. If clothes dryers (or other exhaust systems) are found vented directly into the crawl space, underfloor insulation shall not be installed until the vent is extended directly to the outside of the structure. The vent shall terminate in a non-screened vent cap with a damper. Extension material in excess of 6 feet must be metal with a non-ribbed interior and mounted in a manner that no

traps or reversing horizontal runs are present. An approved metal flex pipe may be used for extensions of 6 feet or less. All exposed metal duct shall be insulated to a minimum of R-4.

- xi. Kitchen range exhaust fans that are vented to the crawl space shall be ducted through to the exterior of the building in accordance with local codes and the manufacturer's instructions.
- xii. Support of floor insulation shall be provided in accordance with the floor matrix shown in the following chart:

Floor Support Matrix					
Floor Type	Support Material	Material Requirements	Max. Spacing	Acceptable Patterns	Minimum Fastener Type
Joist Up To 24" O.C.	Wood Lath	¼" X 1½"	20" O.C.	Across Floor Joists	Corrosion Resistant ¼" Crown 18 Awg
	Twine	150 Lb. Test Polyester, Polypropylene or Nylon	12" O.C.	Shoelace/ Zigzag (Must Be Stapled at Each Joist)	Corrosion Resistant 3/8" Crown 18 Awg
Post & Beam Over 24" O.C.	Wood Lath	3/8" X 1½"	20" O.C.	Across Floor Beams Up To 48" - Over 48" Need Center Support	Corrosion Resistant 3/8" Crown 18 Awg
	Twine	150 Lb. Test Polyester, Polypropylene or Nylon	12" O.C.	Shoelace/ Zigzag With Center Support	Corrosion Resistant 3/8" Crown 18 Awg

- xiii. Support fasteners shall have a minimum penetration depth of 5/8" into the joist or beam.
- xiv. Support systems for floor insulation shall not compress the insulation material more than 10 percent or otherwise alter the insulation value of the material, except where necessary around the perimeter. Support systems will be allowed to compress floor insulation greater than 10 percent in those cases where an insulation batt of greater R-value is used to fill a joist cavity which requires a batt of lesser R-value (i.e. Installation of an R-30 batt in place of R-25 in a 2 x 8 joist cavity).

- xv. Support for insulation batts shall be provided within 6 inches of the end of each batt.
- xvi. Vapor barriers, when installed, shall have a perm rating of 1.0 or less, and shall be located between the insulation material and the conditioned living space.
- xvii. Crawl space access opening must be provided by the customer. Any access door adjacent to a conditioned space shall be insulated to at least R-19 for horizontal openings and to at least R-11 for vertical openings. Insulation shall be permanently attached to the access door.
- xviii. Crawl space access doors which are adjacent to conditioned space shall be weather-stripped with appropriate materials.
- xix. Crawl spaces must be properly enclosed to prevent entry of animals which may damage the insulation. Exterior access doors shall be installed in such a manner so as to prevent entry by animals. If new wood material is needed, then it shall consist of pressure treated materials.
 - i. Water pipe insulation shall be part of underfloor insulation. It shall be pre-formed material specifically designed for water pipes or flat fiberglass batts. It shall have a flame spread rating of 25 or less when tested in accordance with ASTM-E-84-(current). If insulation is installed on piping exposed to the weather, it shall be resistant to degradation from moisture, ultra-violet light, and extremes in temperature, or a jacket or facing shall be installed that protects the insulation from these conditions. Manufacturer's recommendation for outdoor installations shall be followed in all cases.
- xx. If fiberglass batts are used, then the batts shall be at least R-7 when flat. After installation, a minimum of R-3 shall be present on any water pipes, including piping for refrigerator ice makers not enclosed within the floor insulation. The insulation shall be permanently attached to the pipe with wire, cable ties, twine, strapping tape, or other Utility approved methods. Waste or drain pipes are excluded from this insulation requirement. Water pipes that are protected by (enclosed within) installed floor insulation are not required to be separately wrapped.
- xxi. All water shut off valves that are covered by floor insulation shall be identified with attached tags that hang below the insulation.
- xxii. Underfloor insulation in areas which are exposed to environmental elements (wind, rain, etc.) shall be protected after installation with a breathable cover or some type of perimeter system (e.g. skirting).

- xxiii. Enclosed floor cavities, such as a finished ceiling over a garage, may be insulated by drilling holes a minimum of one (1) inch in diameter into the floor cavity between the joists from the underside of the floor and blowing the cavities full. When the cavities are full, plug and spackle the holes. Insulation shall not be blown more than 3 feet in any direction unless the insert tube method is used.
- xxiv. When insulating open floors above garages or unheated basements, follow standard support methods. An alternative temporary support system may be used provided the customer agrees, in writing, to cover the insulation with sheetrock or in accordance with local codes. Tacoma Power requires an in progress inspection.
- xxv. Underfloor areas insulated with fiberglass batts subject to routine human contact shall be covered with a breathable material that inhibits the movement of insulation particles but allows water vapor to pass through. The material must have a flame spread rating of 25 or less as tested in accordance with ASTM E-84-(current).

f. Site Built – Exterior Perimeter Insulation

- i. Exterior perimeter insulation may be installed on residences with basements, slab on grade floors or in an existing whole-house plenum system.
- ii. Insulation installed shall have a minimum thermal resistance of R-10 in exterior applications
- iii. Slab, Crawlspace, or Basement Exterior Perimeter Insulation Installation Provisions:
 - 1. Insulation shall be installed from the bottom edge of the siding to a depth equal to the local “frost-line” or 2 feet below grade, whichever is greater. In those areas that do not have freezing conditions or where the “frost-line” is higher than 12 inches, the insulation shall extend a minimum of 12 inches below grade. Insulation shall not be installed below the level of the footing, but shall extend horizontally away from the footing for the remaining required distance. Under no circumstances shall excavation take place below the level of the foundation footing.
 - 2. Insulation shall be adhered to the foundation with an adhesive suitable for the purpose installed in continuous horizontal beads to block insect infestation.
 - 3. The exterior surfaces of the insulation material shall be water proofed with a suitable barrier and shall be protected from mechanical damage,

solvents, mastics, moisture, and ultraviolet light degradation. Above grade, the insulation shall be covered with a suitable compatible with either adjacent walls or the previously exposed foundation surface in color and general surface appearance.

4. Metal "Z" flashing shall be installed at the top edge of the insulation with the vertical flange extending up behind the siding to prevent water from getting behind the perimeter insulation.
- iv. Insulation board which is used for perimeter insulation shall have a moisture absorption rate no greater than 0.3 percent when tested in accordance with ASTM C-272 and a water vapor transmission rate no greater than 2.0 perm/inch of thickness when tested in accordance with ASTM C-96. Expanded polystyrene (bead board) is not acceptable.

g. Installation Requirements for Unfinished Walls

- i. Only unfinished walls located between unheated spaces and heated living spaces shall be insulated.
- ii. Insulation shall be installed according to the provisions of the IBC and shall include the requirements listed below.
- iii. Walls shall be completely filled with insulation (minimum of R-13).
- iv. If a vapor barrier is installed it shall be installed toward the heated living area.
- v. The cost of any electrical wiring, installation, taping, and painting of sheetrock; as well as other finishing, shall be at the homeowner's expense.
- vi. A cover shall be installed with a fire rating of no less than 15 minutes, tested in accordance with ASTM E-119-76. However, if the insulation is noncombustible and the facing/vapor barrier has a flame spread of 25 or less as tested in accordance with ASTM E-84-(current), then the cover required above need not be installed.

h. Installation Requirements for Walls – Blown-in-Insulation

- i. Normal application of insulation materials in walls assumes drilling through the siding and wall material. However, if the customer specifically asks that the siding be removed before drilling, the customer must pay the cost of the work over the amount covered by the Utility or the customer can remove the siding. The contractor will advise the customer in cases where, in the contractor's opinion, the siding cannot be removed without probable damage. For homes with lead paint, Lead Safe Work Practices may be required.

- ii. When bidding blown-in wall insulation for homes with cedar shake siding, it is advisable to include the cost for removal and replacement of all damaged shakes. Drilling holes through cedar shake siding shall not be allowed unless grooved wooden wall plugs or other methods are compatible with the grooves in the existing shakes. The customer will need to approve of any drilling through the siding before the work is started.
- iii. The homeowner shall be responsible for, eliminate the source of, and repair structural damage from insect infestation, dry rot, or water leaks, prior to the installation of wall insulation.
- iv. Before drilling exterior walls, check the house structure for sections of balloon type framing (where top or bottom wall plates do not exist).
- v. A minimum of two holes per cavity in vertical spans greater than 48 inches shall be used. The lower hole shall be drilled no higher than 48 inches above the floor level and the upper hole no lower than 12 inches from the top of the wall. Use a chalk line to assure the holes will be in a straight line.
- vi. Insulation may be installed in wall cavities that are partially insulated, or are less than 3 1/2 inches thick. When 1 inch or less of insulation exists, the 1 hole method must be used. . This wall blowing method requires inserting the filler tube and turning it up and down to travel the full height of the cavity. If the existing wall insulation exceeds 1" no additional wall insulation shall be added.
- vii. The hole diameter shall be at least 2 inches for mineral wool insulation and 1 inch for cellulose insulation. After drilling, probe for fire stops or other obstructions. All wall cavities shall be pressure-filled.
- viii. Only non-combustible insulation [(per ASTM E-136-(current))] shall be installed in wall cavities adjoining fireplaces and/or chimneys.
- ix. Insulation shall not be installed in wall cavities which contain electric wall heaters unless fire stops are present which isolate the heater from all contact with the insulation material. Verification shall be accomplished by removal of the heater after insulation is installed.
- x. Exterior wall cavities that contain water pipes may be insulated at the discretion of the contractor.
- xi. If Knob and Tube wiring is evident in the wall structure, loose-fill insulation may be installed if the wiring is inspected by an appropriately licensed and bonded electrical contractor who shall certify that the wiring is in good condition with no evidence of improper over current protection, conductor insulation failure or deterioration, and with no improper connections or splices.

1. The contractor is responsible for informing the customer of the requirement to have the knob and tube inspection performed. This notification must be made to the customer at the time of bid, and proper arrangements made for payment of the inspection costs, which are the responsibility of the customer.
 2. An inspection report signed by a licensed and bonded electrician must be provided to the utility prior to installing the insulation.
 3. In the event that the insulation is installed prior to the electrical inspection, the contractor shall be liable for the cost of the electrical inspection as well as any consequential repairs needed to pass the inspection, or for the costs of removing the installed insulation.
 4. The insulation shall meet Class I specifications as identified in the IRC, with a flame spread factor of 25 or less as tested in accordance with ASTM E84-(current). Foam insulation shall not be used where knob and tube wiring exists.
 5. All knob and tube circuits shall have over current protection in compliance with the 60° C column of table 310-16 of the National Electrical Code. Over current protection shall be either circuit breakers or type S fuses not greater than 15 amperes (or as certified as a safe ampacity, on the inspection certificate signed by the inspecting electrical contractor).
- xii. All holes drilled through walls shall be plugged. Use only wooden plugs which have been recessed and finished with a spackling compound flush with the exterior surface of the siding. In no case shall silicone sealants be used when installing wall plugs. Final finish and painting are the responsibility of the homeowner.
 - xiii. After installation, wall plugs must provide a weatherproof seal and shall remain in place for the expected life of the installed insulation.
 - xiv. All electrical wall outlets and switch boxes shall be clear of any insulation material.
 - xv. The contractor shall be required to provide the homeowner and utility with a certificate of insulation containing the following information:
 1. Address of residence
 2. Date of installation
 3. Name and address of installing contractor
 4. Bag count, R-value, & type of insulation installed
 5. Area (sq. ft.) of walls insulated

- xvi. The contractor will be required to return to the job site to fill any voids in wall cavities found during the inspection, or found during the warranty period

3. DUCT SEALING STANDARDS

a. Introduction and Scope

- i. This section outlines the specifications for duct sealing in accordance to the Performance Tested Comfort Systems (PTCS) Program.
- ii. All Testing shall be done by a PTCS Certified Technician or Inspector.

b. Duct System Diagnostic Procedures

- i. One or both of the following tests shall be used to measure the duct leakage in a system, unless otherwise specified in this document.
 - 1. Total Duct Leakage Test – According to the protocol set forth in the PTCS Duct Testing Procedures
 - 2. Duct Leakage to Exterior Test– According to the protocol set forth in the PTCS Duct Testing Procedures

c. Sealing Materials and Duct Connections Definitions

- i. Non-flex duct joints and connections shall be sealed with UL-181 listed mastic.
 - 1. The application of mastic shall be done properly, according to manufacturer specifications.
 - 2. Take offs and slip joints shall be mechanically secured with screws and sealed with mastic.
 - 3. Where service access is necessary, only UL-181 listed foil tape shall be used. The furnace to plenum connection is also allowed to be sealed with UL-181 listed foil tape.
 - 4. Cloth-backed duct tape shall not be used to seal, secure, or fasten ducts.
- ii. Flexible duct connections shall have the interior and exterior liners secured and air-sealed with nylon straps (Panduit or equivalent) and tightened with a manufacturer-approved tensioning tool. Steel band clamps with worm drive tension adjusters also are acceptable.

d. Duct Connecting and Sealing Applicability

- i. All accessible portions of the duct system shall be inspected for signs of leakage and soundness of materials. For new duct systems, the entire duct system is considered to be accessible.
 1. Accessible plenum connections and take-offs shall be exposed, properly connected and sealed.
 2. Accessible wyes, elbows and other duct connections shall be exposed, properly connected and sealed when they are found to show signs of leakage or poor fit.
 - a. Exception: new duct systems shall have all connections between duct components properly connected and sealed.
 3. Flexible duct connections that have properly secured exterior liners may be considered to have interior liners that are not accessible.
 - a. Exception: The inner liner on manufactured home crossover ducts shall be considered accessible.
- ii. Where a large section of duct insulation is removed, the insulation shall be re-installed and securely attached to the duct system. Recommended methods include the use of twine. Mastic will not effectively hold insulation in place.

e. Home and Duct System Types

- i. New Construction / New Ducts (Site or Manufactured Homes) – The home must be new construction and not have been occupied for more than 1 year.
 1. The duct leakage in a **new home** shall not exceed 6% of the floor area served by the system ($0.06 \times \text{SF CFM50}$) or 75 CFM50, whichever is greater, as measured according to the testing protocols identified in 3.b.1 and/or 3.b.2.
 - a. Exception 1- If the air handler is located completely within the conditioned space, it is not required to be in place during the test.
 2. Exception 2- If the air handler is located in unconditioned space, it is not required to be in place during the test, the leakage limit shall be decreased to 4% of the floor area served by the system ($0.04 \times \text{SF CFM50}$) or 50 CFM50, whichever is greater.
- ii. Existing Home / New Ducts
 1. In order to qualify as an existing home, it must be occupied for at least one year.

2. The air leakage of the duct system shall be measured before sealing the system, using either protocol identified in 3.b.1 and 3.b.2; and the same test shall be used to measure the leakage in the system after it is sealed.
 - a. If a new section is being added to an existing duct system, no pre-test is necessary; and the final test for the entire system shall not exceed 10% of the floor area served by the system ($0.10 \times SF \text{ CFM50}$) or 75 CFM50, whichever is greater.
3. In order to certify the home under PTCS, the leakage in the duct system after sealing shall not exceed 10% of the floor area served by the system ($0.10 \times SF \text{ CFM50}$) or 75 CFM50, whichever is greater.
4. A home which meets these standards without additional sealing may be certified.

iii. Existing Home / Existing Ducts

1. In order to qualify as an existing home, it must be occupied for at least one year.
2. The air leakage of the duct system shall be measured before sealing the system, using the protocol Duct Leakage to the Exterior.
3. In order to qualify for duct sealing, the measured leakage of the system before sealing, must be at 15% or less of the floor area served by the system ($0.15 \times SF \text{ CFM50}$)
4. In order to qualify, the measured leakage of the system after sealing, using the same test method as above, shall meet either of the following criteria:
 - a. It shall not exceed 10% of the floor area served by the system ($0.10 \times SF \text{ CFM50}$)
 - OR
 - b. The measured leakage in the system after sealing measures have been done shall show a reduction of at least 50%.
5. In cases where return ducts are inaccessible, compliance with 3.e.iii.4 may be accomplished by performing the Duct Leakage to the Exterior test on the supply side only (using the more stringent of the two – whichever is less).

iv. Existing Manufactured Homes

1. The air leakage of the duct system shall be measured before sealing the system using the protocol Duct Leakage to the Exterior.
2. In order to be eligible for certification, the duct system must have a measured leakage of 50 CFM50 or less for single wide homes, plus an additional 30 CFM50 allowed for each additional section (double & triple wide).
3. If compliance is not possible with 3.e.iv.2. (above), then the duct system leakage, after the sealing measures have been performed, shall document a 50% reduction using the Duct Leakage to Exterior test.
4. If the final tested leakage rate is greater than that specified in 3.e.iv.2., the air-handler transition-to-trunk duct connection shall be sealed.
5. Regardless of qualifying path, all accessible components of the duct system shall be sealed, including the crossover takeoff-to-trunk duct connections and crossover-to-crossover takeoff connections.

f. Combustion Appliance Zone Testing

- i. Whenever there is a non-sealed Combustion Appliance present in the house, garage, or other attached space, a CAZ test must be performed and the results recorded on the PTCS Duct Sealing Certificate & Sealing Form. Necessary actions will be required if the test results in depressurization more negative than -3.0 Pascals in any zone. A UL listed, C-UL listed, or equivalent carbon monoxide alarm shall be installed in accordance with the carbon monoxide alarm manufacturer's instructions.

4. WINDOWS AND SLIDING GLASS DOORS

This section covers the requirements for the selection of window types, construction of windows, and installation of the various window types. Section G. covers sliding glass doors.

a. General Requirements

- i. Windows on exterior walls adjacent to the outdoors are eligible for replacement. Windows located between the heated space and buffered areas such as garages and unconditioned rooms, are not eligible for program incentives.
- ii. The weatherization program does not allow replacement of existing double glazed wood framed windows or vinyl framed double glazed windows. Wood stopped raw double glazed units are considered wood framed windows, therefore not eligible for replacement.

- iii. The weatherization program does not allow replacement of existing double glazed windows for Manufactured Homes.
- iv. New window selection does not allow for Garden style windows and Bay/Bow style windows for installation where none exist.

b. General Material Requirements

- i. Only window types that are National Fenestration Rating Council (NFRC) certified products shall be acceptable for installation under program.
- ii. The weighted average of all windows installed shall have a NFRC rated U-value of .30 or lower. All patio doors shall have a NFRC rated U-value of .35 or lower.
- iii. Submit Manufacturers Invoice showing U-value for each installed window.

c. Replacement Prime Windows (Framed Units)

- i. Shall have a label attached to the window which indicates the manufacturer, model name, and/or number of the window.
- ii. Existing windows which have a unique shape or construction that does not allow weatherization with the normal type of windows listed above, shall be weatherized with windows which have been approved by the Utility, in writing, on an individual basis prior to installation.
- iii. All materials shall be of sufficient strength and durability so as to resist damage or distortion from wind loads, thermal stress (including that due to solar gain), or induced installation stresses.
- iv. No windows shall have exposed burrs, sharp corners or other potential hazardous conditions that could be encountered by the customer during normal use.
- v. All operable windows shall be of sufficient combinations of glass/slider-frame rigidity to prevent bowing after installation.
- vi. All operable window vents/sashes or associated channels shall be fitted with infiltration and weather barrier devices. Weatherstripping shall be appropriate for the window type and operation.
- vii. Locks or latches (or spring tension in pressure/friction channels) on vertical operating windows shall be designed to hold the sash secure and level in ventilating positions.

- viii. Pressure/friction controlled sliders shall effectively prevent "free fall".
- ix. Security locking mechanisms are required on all prime window replacements. Secondary latches are not required except where mandated by local jurisdictions.
- x. Screens required on all operable windows unless specified in writing.

d. General Installation Requirements for Window Products

- i. Contractor shall insure a weatherproof installation.
- ii. Installations shall not increase the existing rough opening area, except to allow for emergency egress required by IRC R310.
- iii. After installation, units shall operate properly and smoothly. Hardware shall be durable, function properly, and not create interference. When closed, the entire assembly shall provide a complete weather barrier.
- iv. Glazing sealants shall be resilient, non-hardening compounds, tapes, or gaskets with an established long life expectancy.
- v. Caulking used to seal windows shall meet the window manufacturer's specifications for interior/exterior applications.
- vi. "Stucco Bar" style windows shall not be applied directly to wood siding. Exceptions shall be approved by the Utility in writing prior to installation.
- vii. Windows shall have no exposed burrs, sharp corners, or other potentially hazardous condition.
- viii. Any damage caused by contractor to window liners, sills, surrounds, walls or exterior siding shall be repaired by the contractor to pre-installation conditions or better, unless a prior agreement between the contractor and customer has been arranged.

e. Safety Glass Shall Be Used Under the Following Conditions

- i. Glazing in ingress and egress doors.
- ii. Glazing in fixed and sliding panels of sliding door assemblies and panels in swinging doors.
- iii. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs, and showers. Glazing in any portion of a building wall enclosing these

compartments where the bottom edge of the glazing is less than 60 inches (5 ft.) above a standing surface and drain inlet.

- iv. Glazing in fixed or operable panels adjacent to an interior or exterior door where the nearest exposed edge of the glazing is within a 24 inch arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 60 inches (5 ft.) above the walking surface.
- v. Glazing in an individual fixed or operable panel, other than those locations described in .3 and .4 above, that meets all of the following conditions:
 1. Exposed area of an individual pane greater than 9 square feet.
 2. Exposed bottom edge is less than 18 inches above the floor.
 3. Exposed top edge greater than 36 inches above the floor.
 4. One or more walking surfaces within 36 inches horizontally of the plane of the glazing.
- vi. Glazing in railings regardless of height above a walking surface. Included are structural baluster panels and nonstructural in-fill panels.
- vii. Glazing in walls enclosing stairway landings or within 5 feet of the bottom and top of stairways where the bottom edge of the glass is less than 60 inches above a walking surface
 1. **EXCEPTION:** The following products and applications are exempt from the safety glazing requirements listed in section e.(above):
 - a. Glazing in Item 4.e.iv. when there is an intervening wall or other permanent barrier between the door and the glazing.
 - b. Glazing in Item 4.e.v. when a protective bar is permanently installed with "one way" screws or lag bolts, on the accessible sides of the glazing 34 to 38 inches above the floor. The bar shall be capable of withstanding a horizontal load of 50 pounds per linear foot without contacting the glass and be a minimum of 1 inch in height (vertical width).
 - c. Outboard pane in insulating glass units and in other multiple glazed panels in Item 4.e.v. when the bottom exposed edge of the glass is 25 feet or more above any grade, roof, walking surface or other horizontal or sloped (within 45 degrees of horizontal) surface adjacent to the glass exterior.

- d. Openings in a door through which a 3-inch diameter sphere will not pass.
- e. Assemblies of leaded, faceted, or carved glass in section 4.e. when used for decorative purposes.
- f. Curved panels in revolving door assemblies.
- g. Glass block assemblies complying with IBC code.

All safety glass shall be permanently marked (etched or sand-blasted) with the name of the manufacturer (or tempering facility) and place of manufacture, and shall certify compliance with all applicable standards for making and testing safety glass (e.g. CPSC Class 2).

- viii. Do not install windows with clear glazing over existing windows that are tinted or have solar-control film applied to the surface.

f. Installation Requirements for Prime Window Replacements

- i. Prime window replacements shall meet the general material and installation requirements for all window types as noted elsewhere in this specification manual.
- ii. Installation of Replacement Windows with Nailing Flange Removed
 - 1. For replacement windows being installed with the nailing flange removed, a flashing shall be installed along the top edge of all windows that are not protected by a porch roof, soffit overhang, or eave overhang extending at least 12 inches beyond the header and within 25 inches above the window. Such flashing shall be chemically compatible with the framing material of the window so as to not cause future staining (i.e. aluminum or vinyl flashing material is normally acceptable). Flashing shall overhang the window frame a minimum of 1/4 inch and maximum of 1/2 inch to ensure water runoff. The flashing shall be caulked between the flashing and siding and the flashing and window frame. Alternative methods of flashing, or in lieu of, may be used only if approved by the Utility (in writing) prior to installation.
 - 2. Replacement window shall be attached with at least **#8 pan-head screws** through the jamb, perpendicular (90 degrees) to the window track. All screw holes shall be pre-drilled one size larger than the screw being installed, particularly in vinyl extrusion material. Drywall/Sheetrock or any "bugle head" type screws shall not be used in vinyl or aluminum extrusions or flanges.

3. Replacement windows being installed into existing wood frames; windows shall be installed by one of the following methods: 1) Windows shall be wood stopped in place on each rail of the window with full length stops. Or 2) Windows shall be installed with #8 pan-head screws applied through the replacement window frame directly into the existing wood frame. Sill expanders may be used as part of the installation.
4. When fastening the window to the jamb, the screws shall be snug but not to cause deflection of the profile (in particular when installing vinyl windows). Do not use nails, or install screws at a 45 degree angle in vinyl or aluminum frame/extrusion to pull the window into the rough opening.
5. Screws shall not be introduced into the exterior sill extrusion from the top down. It is however, permissible to penetrate the sill extrusion from the lower (bottom) side, provided that the screw used does not penetrate the upper surface of the sill.
6. Screws shall be installed within five (5) inches of the frame corners with screws spaced evenly along the frames vertical length according to the following table:

<u>Track Length</u>	<u>Total Screws Per Pack</u>
Up to 2'11"	2
3 ft. to 5'11"	3
6 ft. to 8'11"	4
9 ft. to 11'11"	5
12 ft. and over	6

7. All screw penetrations through extrusions shall be sealed to prevent any water leakage.
8. The exterior replacement window frame shall not overhang the exterior siding of the structure more than one inch. All screws shall penetrate the wood framing members of the structure to a minimum depth of 1/2 inch. Screws attached only through the siding or screws installed at an angle to penetrate the structure framing member shall not be allowed. Exceptions shall be approved by the Utility, **in writing, prior to installation.**
9. Caulking shall be installed around the interior blind stop prior to inserting the window into the rough opening.
10. Caulking around the perimeter of the replacement window frames shall adhere to both the frame material as well as the siding and/or trim

material. Caulking shall be paintable and have a minimum product life of 15 years, and not shrink or "pull away" from the surfaces to which it is applied.

11. Any gaps of $\frac{1}{4}$ " or more between the rough opening and the window frame shall be filled with either backer rod, or non-expanding foam before trim work or caulking is installed
 12. When installing stucco style windows (on stucco or masonry buildings only) where the existing window frames are left intact. The original window frame shall have the old caulking removed and new caulking applied prior to installing the stucco window. Before the interior trim cap is installed, the gap between the stucco window and the rough opening shall be filled with non expanding foam or backer rod.
- iii. Installation of Replacement Windows with Nailing Flange Intact
1. When installing windows using the nailing flange, install polyurethane (or equivalent) caulking between the nailing flange and the rough opening. Nail or screw the windows in place in strict accordance with the manufacturers recommended installation instructions. Sufficient nails or screws shall be used to hold the windows in place without the aid of the trim's support. Drywall/Sheetrock or any "bugle head" type screws shall not be used in vinyl or aluminum extrusions or flanges.
 2. When using "build-out" material to fill the gap between the nailing flange and the sheathing, the "build-out" material shall be of one piece construction and shall fill the cavity in its entirety. Fasteners through the nail flange shall penetrate beyond the sheathing not less than 1-1/2 inches.
 3. Windows shall be fully supported to at least one (1) inch of the exterior vertical edge of the window frame.
- iv. Glazing compounds, sealants, and gaskets shall be installed with a slope so as to ensure water run-off. Such compounds shall not contact the seal of the sealed insulating unit or the material used shall be shown to be chemically compatible with the seal of the sealed insulating unit.
- v. Caulking around the perimeter of replacement frames must adhere to both the frame material as well as the siding and/or trim material. Caulking shall be paintable, shall have a minimum product life of 15 years, and shall not shrink or "pull away" from the surfaces to which it is applied.
- vi. All waterproofing materials shall be chemically compatible with the glazing seal.

- vii. When installed, all clearances and normal "bite" (containment of the glass) shall be as specified by the manufacturer. Setting blocks shall be installed at quarter points or as specified in the manufacturer's installation instructions.
- viii. The final step of the installation process shall be the cleaning of all glass (inside and out) on the installed window.

g. Material Requirements for Sliding Glass Doors

- i. Only sliding glass doors that comply with the requirements listed below shall be acceptable for installation under this program.
 - 1. Complete sliding glass door replacements or storm doors shall be provided with a durable, effective, infiltration barrier and shall include a mechanical interlock at the meeting rail.
 - 2. Glazing shall be restricted to safety/tempered glass. The thickness, strength, and quality of glass shall meet with the requirements of Chapter 54 of the Uniform Building Code. Lites shall be of good quality glazing, and shall meet Federal Quality Control Specifications DD-G-451D and DD-G-1403B.
 - 3. Replacement sliding glass doors shall have a tested U-Value of .35 or better, when tested in accordance with NFRC 100-91 test procedure.
 - 4. All sealed insulating glass used shall be certified under a SIGMA approved program as Class A, when tested in accordance with ASTM E-774-(current). Certified units shall be marked by the manufacturer on the spacer bar located between the two panes of glass. The mark shall indicate the manufacturer's assigned I.D. number, the certifying agency, the class which the unit meets, the quarter, and year of manufacture.
 - 5. Screens shall be provided with all door replacements or conversions, unless waived in writing, by the homeowner.

h. Replacement Sliding Glass Doors

- i. Shall have written documentation indicating satisfactory compliance with one of the following standards:
 - 1. ANSI/AAMA 101-(current)
 - 2. ANSI/AAMA 101V-(current)
 - 3. NWWDA I.S. 3-83

- ii. Shall have current acceptance in writing from the Utility prior to installation. Utility may require that the manufacturer provide a working sample of the door for evaluation.
- iii. Shall have a label attached to the door or frame, which indicates the manufacturer and model name/number of the door.

i. Installation Requirements for Sliding Glass Doors

- i. Prime opening members shall be free of decay and be structurally sound to provide anchorage and support for the existing (or added) slider. Any deficiencies shall be corrected by the customer separately from this program.
- ii. All sliding glass door installations shall incorporate solid threshold support from the inside edge of the threshold to the outside edge. The threshold shall not bow, sag, or distort under normal use conditions.
- iii. Any bare wood, whether exposed or added, shall be treated with a sealer to prevent future swelling or warping. Customers shall be advised that color matched painting must be arranged separately from this program.
- iv. Gaps and cracks exposed to the elements shall be caulked on both existing and added framing members. Any gap between the SGD frame and the rough opening $\frac{1}{4}$ " or greater shall be filled with either non expanding foam or backer rod.
- v. Materials damaged in shipment or during installation shall not be used.
- vi. The final step of the installation process shall be the cleaning of all glass (inside & out) on the installed sliding glass door.

Part 2: Manufactured (Mobile) Home Weatherization

1. INTRODUCTION

Use Part 1: Single Family Weatherization specifications for Manufactured Homes except where the following specifications apply specific to Manufactured Homes.

2. GENERAL REQUIREMENTS

- a. The structure shall be properly supported, leveled and restrained (if required) at the Homeowner's expense before weatherization Measures are installed.

3. INSULATION

a. General Requirements

- i. All combustion appliances, except gas cooking appliances and gas clothes dryers, shall have outside combustion air ducted directly to the appliance. Fireplaces and wood-burning stoves shall have tight-fitting glass or metal doors that cover the entire opening of the firebox.

b. Installation Provisions for Ramada Roofs - Manufactured Homes

- i. A ramada roof is a free standing (self supporting) covering over a Manufactured Home.
- ii. The ramada roof shall be joined to the Manufactured Home to create an enclosed attic cavity at the homeowner's expense. The ramada roof shall be weatherproof and be joined to prevent the entry of birds, animals, etc.
- iii. The attic cavity shall meet the ventilation requirements of the site-built specifications.
- iv. All exhaust-fan ducts, plumbing vent stacks, etc. shall be extended outside and have a proper termination.
- v. All heat producing fixtures shall be protected according the site-built weatherization specifications.
- vi. The original roof cap of the Manufactured Home shall be opened to allow a full fill of insulation inside the cap. Insulation shall be installed above the original roof to provide an installed level of R-38. The openings in the original roof shall NOT be sealed.
- vii. All penetrations through the ceiling shall be sealed before the insulation is installed.

c. Installation Provisions for Underfloors - Manufactured Homes

- i. Insulation shall be protected by a moisture permeable covering or skirting shall be installed at the homeowner's expense before underfloor insulation is installed. Skirting shall be as close to the ground as practical.
- ii. A minimum of R-19, or the maximum R-value achievable to fill the floor cavity, shall be installed. Special care shall be taken when insulating the floors of tip-outs or expandos.
- iii. Where required by State or local codes, a moisture permeable rodent barrier shall be in place and in good repair after the insulation is installed.
- iv. All exhaust ducts, such as those for kitchen ranges and dryers, shall be extended to the outside of the crawl space and sealed to prevent exhausted air from returning to the crawl space and/or the Manufactured Home when skirting exists.
- v. All water drains, including condensate drains from air conditioning equipment, shall be extended outside the crawl space.

d. Ventilation Requirements

- i. When skirted, the entire enclosed underfloor crawl space area shall be ventilated by openings in the skirting. Such openings shall have a net area of not less than 1 square foot for each 150 square feet of underfloor area, including the crawl space area of all structures which open to Manufactured Home.
 1. Where moisture due to climate and groundwater conditions are not considered excessive, the Utility may allow operable louvers and may allow the required net area of vent opening to be reduced to 1/300 or less (minimum 1/1500), provided the underfloor ground-surface area is covered with an approved ground cover. Openings shall be located as close to corners as practical and shall provide cross ventilation. The required area of such openings shall be approximately equally distributed along the length of at least two opposite sides. They shall be covered with corrosion-resistant wire mesh with maximum mesh openings of 1/4-inch. Existing vent openings which are covered with wire mesh need not be modified.

e. Installation Provisions for HVAC Ducts - Manufactured Homes

- i. All new and all accessible existing HVAC supply and return ducts, air handlers, and plenums inside and outside the heated space shall be sealed at all joints and corners, including prefabricated joints, with duct mastic. Tape is not allowed

except for use on operable doors in the system such as on the air handler. In this case, foil tape with a 15-mil butyl sealant shall be used; alternately, the joints can be cleaned with a suitable solvent and sealed with a UL-181 listed tape.

- ii. The crossover ducts shall be installed to prevent compressions or sharp bends, minimize stress at the connections, avoid standing water, and avoid excessive duct lengths. When skirting is not present, the crossover duct shall be protected against rodents, pets, etc.
- iii. Flexible crossover ducts shall have a minimum R-8 insulation. They shall be secured with mechanical fasteners (e.g., stainless steel worm drive clamps, plastic/nylon straps applied with tightening tool, etc.) and sealed with mastic or aluminum/foil backed butyl or equivalent sealant tape.
- iv. Where clearances permit, the crossover duct shall be supported above the ground by strapping or blocking.
- v. If a non-ducted return-air system is in the floor or ceiling cavity, it shall be eliminated. Seal all return-air openings in the floor or ceiling and Seal the main return-air opening in the floor or ceiling of the furnace closet. Return air shall be provided through grills in the furnace closet to the heated space. These grills shall be adequately sized for the installed heating system. All interior doors shall be undercut to allow return air to flow back to the furnace closet.
- vi. If the belly board/rodent barrier has been removed and batt insulation has been installed in the floor, all HVAC ducts, boots and plenums, except flexible crossover ducts, shall be wrapped with R-11 insulation.

4. MECHANICAL VENTILATION

A mechanical ventilation system meeting either the requirements of 4.a., 4.b., 4.c. shall be installed in **manufactured homes**.

a. Non-Heat-Recovery Ventilation - Intermittent Operation

- i. A bathroom exhaust fan is controlled by both a manual switch, crank timer or dehumidistat in the bathroom to provide spot ventilation AND a time clock to provide whole-house ventilation when called for by the timer. Outside-air inlets in all living areas and bedrooms, and undercut doors, grilles, transoms, or other approved means provide fresh-air circulation through the house to the bath fan.
- ii. Exhaust ducts shall be smooth metal and terminate outside the house at the closest possible location. All connections shall be tight fitting and taped or sealed, and backdraft dampers shall be provided.

- iii. The minimum exhaust airflow rates shall comply with either the performance OR prescriptive paths listed below. Surface-mounted fans shall have a sone rating of 1.5 or less, or other rating as approved by the Contractor. Existing fans that meet the minimum airflow rates are exempt from the sone rating requirement.

1. Performance Path: The minimum measured airflow capacity shall be either 0.35 air-changes per hour (ACH) or those listed below:

Number of Bedrooms	Measured Exhaust Flow
1	45 cfm
2	60 cfm
3	75 cfm
4	90 cfm

- a. To calculate the ACH for a fan with a MEASURED airflow of 45cfm multiply by 60 to obtain the airflow per hour (45 X 60 = 2700 cfh) and divide by the volume of the heated space.

2. Prescriptive Path: Ventilation systems that do not meet the performance path shall provide 0.35 ACH based upon the rated fan flow minus 15 cfm or use the rated fan flows in the following table:

Number of Bedrooms	Rated Fan Flow
1	70 cfm
2	85 cfm
3	100 cfm
4	115 cfm

- b. To calculate ACH based on the RATED airflow, subtract 15 cfm, multiply by 60, and divide by the volume of the heated space.

- iv. The fan shall have both automatic and manual controls. Automatic controls shall include a time clock or cycle timers with a minimum of 2 on-periods per day, a manual control switch to let the occupant turn the fan on or off, and be set to operate a minimum of 8 hours per day.
- v. The ventilation fan shall be wired to both the manual spot-ventilation switch in the bathroom and to a time clock.
- vi. Individual outside-air inlets, located to avoid drafts, shall provide a minimum of 4 sq. inches per bedroom and combined living area.
1. If a whole house blower door test, in accordance with Appendix T and conducted after air sealing measures are installed, results in an $ACH_{50} \div 20$ greater than 0.35 and the house has no combustion appliances

capable of backdrafting (i.e. naturally vented or atmospheric chimneys) within the exterior shell of the house, outside-air inlets may be omitted.

- vii. The outside-air source shall be located at least 3 feet from exhaust vents and to minimize drawing outdoor pollutants and excessive outdoor noise inside during operation.
- viii. The outside-air source shall limit excessive airflows during normal operation and have a weather protection hood and maximum 1/4" screen-mesh, or as approved.

b. Unbalanced Non-Heat-Recovery Ventilation - Continuous Operation

- i. This system uses a continuously-operating fan to exhaust air at a minimum rate of 25 cfm for the kitchen, and 20 cfm for each bathroom, with a maximum rate of 0.5 ACH. One fan exhausting from the kitchen and each bathroom also provides spot ventilation. An integrated spot and whole-house fan is acceptable if spot ventilation is also provided for the kitchen and for the bathrooms. .
- ii. The exhaust-air pickup in the kitchen shall not be over the kitchen range.
- iii. If the exhaust flow from each kitchen and bathroom is not measured, the rated fan capacity shall exceed the required flow rate by a minimum of 15 cfm.
- iv. The continuous ventilation fan(s) shall be wired to an existing circuit or to the electrical service panel.
- v. The outside-air inlet and source requirements shall be the same as Sections 4.a.vi., vii. viii.

c. Balanced Flow Non-Heat Recovery Ventilation - Continuous Operation

- i. Balanced flow non-heat-recovery air exchange units shall:
 - 1. Have fans capable of providing the intake and exhaust airflow rates in section 4.a.iii. at 0-25 inches of water gauge as determined by HVI 916 (July 1993);
 - 2. Provide complete isolation of the intake and exhaust air;
 - 3. Have UL approval of all electrical components;
 - 4. Have outside-air inlets in all living areas and bedrooms, positioned so-as-to avoid drafts; and
 - 5. Be installed according to the manufacturer's instructions.

GLOSSARY

Argon Gas - An inert gas used to fill the air space in sealed insulating glass to increase the U-factors.

Atrium Door also known as Swinging Patio Door - A door that has the appearances of a French door, but is hinged on only one leaf. The second leaf is a fixed panel which cannot operate.

Awning Window - A window whose operable vent is hinged along the top edge and opens in an outward fashion similar to an awning.

Backer Rod - A material that is placed into a joint primarily to control the depth of applied sealants or caulking compounds.

Bay Window - A window that projects outward from the wall of a structure, typically composed of three or more windows joined at a 45 degree angle.

Bite - The distance the edge of any glazing material penetrates the frame supporting the glazing in windows or doors.

Bow Window - A window which projects outward from the rough opening, with a gentle curve; usually divided by 4 or 5 vertical lites.

Casement Window - A window whose operable vents are hinged at the side, for either right or left operation. Vents operate similar to that of a door.

Cellulose Insulation - An insulation material treated with flame retardant and made from used newsprint or virgin wood fiber.

Class .30 Windows - A prime window (or replacement window) which has been thermally tested and shown to have a U-factor below or equal to .30 as a total unit.

Coverage Chart - The chart from a bag of loose fill insulation describing the size of area, depth, weight, and R-Value that the material will provide.

Crawl Space - That space between the ground and the first floor of a structure which is enclosed by perimeter foundation walls.

Cross Ventilation - Placement of vent openings so that air flows in one vent, over the insulated space and out the other. It occurs naturally due to wind or thermal convection.

Dormer - A window set upright in a sloping roof; or, the roofed projection in which this window is set.

Double Strength Glass - Glass of higher physical strength than single strength glass, usually 1/8 inch in thickness.

Egress - A required amount of clear open area in a window vent (usually specified by Uniform Building Code) necessary for emergency egress or rescue. Egress is required for all sleeping areas.

Finish Materials - A building material such as sheet rock or wood paneling exposed to the heated living space and used to contain or conceal construction components.

Flame Spread Rating - Used to indicate the rate at which flame will spread across the surface of a given material. The higher the number, the faster the flame spread. The rating is determined by performing the test standard as listed in ASTM E-84-(current).

Flashing - Sheet metal or vinyl strips installed to prevent leakage over windows, doors, etc. Also used around chimneys and other roof penetrations or protrusions.

Frost Line - The maximum depth in the ground at which freezing will typically occur in a given geographical area.

Furring - Thin strips of board (typically 2x4 or 2x2) fastened to the wall to provide an air space for insulation and support for wall materials (such as sheet rock) to be installed over the insulation.

Gable - That part of a structure consisting of a 90° wall which is normally peaked and is located at the terminal end of a sloping roof structure.

Gable Vents - Vent openings located in the gable wall section of the attic, typically at or near the peak of the roof.

Garden Window - A projecting window with sloped glass top and plywood base. Commonly used in kitchens or baths as a plant window.

Glazing - Glass or other transparent material (such as acrylic) used in windows and doors. Also, the act of fitting a window with glass or similar material.

Grids - Metal or wood bars (muntins) placed either between panes of glass or on the surface of glass to simulate the look of divided lites of glass.

Ground Cover - A polyethylene sheet or similar material having a low water vapor permeance overlaying the ground within a crawl space.

HVAC - An abbreviation for Heating Ventilating and Air Conditioning.

IC Rated – Recessed light fixtures labeled IC when the fixture is approved for Insulation Contact

Infiltration - Uncontrolled (or controlled) inward air leakage through cracks or other openings in building elements, windows, and doors.

Interior Glazed - Glass that is set from the interior of the structure.

Jalousie Window - A window consisting of several slats of glass (similar in construction to Venetian blinds) which open simultaneously by means of a crank.

Jamb Extension - Trim board attached to the perimeter of a wood window frame; designed to fit within the rough opening to cover up rough framing for a more finished look.

Joists - Evenly spaced parallel beams supporting a floor or ceiling.

Knee Wall - A short wall between an attic floor and the sloping roof

Knob and Tube Wiring - A wiring method using knobs and tubes (usually made of ceramic) for the support of simple insulated conductive wiring concealed in walls and ceilings.

Laminated Glass - A type of safety glass consisting of two layers of glass laminated together with a plastic sheeting between the layers to help prevent a piece of glass from falling when broken. This type of glass meets the CPSC class 2 rating.

Liner - Similar to a Jamb Extension, although not necessarily attached to the window as an integral piece.

Lite - Another term for a pane of glass used in a window. Frequently spelled "light" in the window industry literature, but spelled "lite" in this text to avoid confusion with light as in "visible light."

Loose Fill Insulation - Insulation material (cellulose, fiberglass, perlite, rockwool, etc.) manufactured in a loose form which is usually blown or poured into place.

Low-E (Emissivity) Glass - A coating applied to glass which allows high solar heat gain and a low heat loss.

Mechanical Ventilator - A fan or other motor driven unit used for ventilating purposes.

Meeting Rail (window) - The frame located on one edge of an operable glazed lite which forms the center rail of a window or sliding glass door system. Usually interlocks with a companion rail on the fixed lite sash.

Mineral Fiber (Wool) - Thermal insulation material composed of mineral substances such as slag, rock, and glass.

Mullion - The vertical or horizontal bar or extrusion dividers in window combinations.

Multi-Glazed Window - A window constructed with either a sealed insulating glass unit certified under a SIGMA approved program, or two layers of glass specifically incorporated in the window sash having at least a 1/2 inch air spacing between layers with one layer of glass removable for cleaning.

Net Free Area - The net area of unencumbered vents (without screens or louvers) which provides free air access.

Noncombustible Insulation - Insulation of which no part will ignite and burn when subjected to flame, and conforms to ASTM E-136-(current)

Passive Ventilation - Natural ventilation (without the aid of fans or blowers) caused by temperature differences and convection.

Perimeter Insulation - Insulation installed on the sidewalls (foundation walls) of crawl spaces.

Perlite - Loose fill insulation material which is made from expanded volcanic rock.

Perm Rating - The unit of measurement of permeance to water vapor. It is equivalent to one grain of water passing through a membrane one square foot in area when the vapor pressure across the area is one inch of mercury. The lower this number, the smaller the amount of water vapor that can pass through the membrane. The rating is determined by performing the test standard as listed in ASTM E-96-(current).

Polyisocyanurate - A closed cell polymer foam, pale yellow in color, contains refrigerant gases instead of air. Similar to Polyurethane.

Polystyrene - A closed cell polymer foam containing a mixture of air and polymer gases. White or pale blue in color.

Polyurethane - A closed cell polymer foam containing gases instead of air.

Prehung - A window or door unit manufactured with the framing already fitted.

Pressure/Friction Channels - Spring or tension-loaded channels in the moving parts of a window. Allows window openings to be variable without latches or other supports.

Prime Window - A window assembly which is installed in a rough opening in the framing of the dwelling and which is secured to the structure framing.

R-Value - Unit of resistance to heat flow, expressed as temperature difference required to cause heat to flow through a unit area of a building component or material at a rate of one heat unit per hour.

Recessed Fixture - An electrical fixture (usually a light) mounted in such a fashion as to be recessed into a wall or ceiling.

Rock Wool - Thermal insulation material composed of threads or filaments of slag, produced by reprocessing the residual materials from metals smelting.

Safety Glass - Either laminated or tempered glass.

Sash - That part of a window, generally movable, into which panes of glass are directly set. The sash is then fitted into tracks of the master frame of the window.

Sealed Insulating Glass - Two or more panes of glass that are hermetically sealed together. During the process, the air between the panes is dried, so condensation is prevented from forming inside the unit.

Sealer - A paint, lacquer, varnish, or similar material applied to exposed wood to prevent degradation from exposure to weather elements.

Single Hung Window - A vertically operating window in which the top lite is fixed with the bottom sash operating vertically on spring or spiral lifts.

Sliding Window - A horizontally operating window in which one lite is fixed with a horizontally moving sash.

Slab on Grade - A concrete floor poured directly on the ground.

Sloped Ceiling - That portion of a ceiling which normally slopes from the top of the knee wall to the peak of the roof in "story and a half" structures.

Soffit - The area between the edge of the roof and the top plate of the adjacent wall. More generally, the underside of any architectural feature, usually not structural.

Soffit Vent - An attic vent located in the soffit under the eaves of the roof overhang. Also referred to as "intake venting."

Storm Window - An add-on window unit typically consisting of a single pane of glass in a frame which is installed over a prime window, thus creating an insulating air space to reduce heat flow. Storm windows can be installed on either the inside or the exterior of the Prime window.

Tempered Glass - Glass that has been heated to its molten state and then cooled at a controlled rate, after which the glass will shatter into very small pieces without sharp or jagged edges. This is one of the categories of safety glass and meets the CPSC class 2 rating.

Thermal Break or Barrier - A nonmetallic material positioned between metallic components of windows or doors to prevent a direct path of heat loss through thermal conduction.

Unconditioned Space - A space within a structure which is neither heated nor cooled by a mechanical system. The exterior of the structure is also unconditioned space.

U-factor (also known as U-Value) - A measurement of the thermal conductive capacity of a material. It is the reciprocal of the R-Value. The amount of heat flow in Btu's per hour/per square foot/per degree Fahrenheit temperature difference on either side of a body.

Vapor Barrier - A film, laminated duplex paper, aluminum foil, paint coating, or other material which restricts the movement of water vapor from an area of high vapor pressure to one of lower pressure. Material with a perm rating of 1.0 or less is normally considered as a vapor barrier.

Vent (window) - The moving or operable portion of any window.

Ventilation Baffling - Rigid material installed at intake ventilation points in the attic to prevent loose insulation from blocking or sloughing into the area.

Vermiculite - An expanded mineral insulation consisting of a mica-like substance which expands when heated. The resulting granules are generally used as loose-fill insulation.

Tacoma Power
High-Efficiency Heating
**Heat Pump
Specifications**

September 2011

KnowYourPower.com



TACOMA POWER

Heat Pump Program Specifications

September 2011

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1. INTRODUCTION

- a. Definitions of “Should” and “Shall”
 - i. Where “shall” or “shall not” is used for a provision, that provision is mandatory if compliance with the standard is claimed.
 - ii. Where “should” is used it will indicate provisions which are not mandatory but which are desirable as good practice.
- b. Deviations from this Specification
 - i. Deviations from these standards shall be pre-approved by Tacoma Power on an individual basis.

2. NEW EQUIPMENT REQUIREMENTS

- a. Approved Types of Heat Pumps
 - i. Split system Air Source Heat Pumps with ducted air distribution.
 - ii. A split system has a separate outdoor unit containing a fan, compressor and a coil along with an indoor unit (air handler or furnace) containing a coil, fan and backup heating capability. (Ductless mini-split systems are excluded from this program.)
- b. Approved Manufacturer
 - i. Equipment shall be manufactured by a company appearing in the Air Conditioning, Heating and Refrigeration Institute (AHRI) Unitary Directory.
- c. Ratings
 - i. Heat Pump equipment shall meet the performance, safety, and rating requirements as given in the latest revision of AHRI Standard 240. Units shall be listed by Underwriters’ Laboratories or equivalent and shall display the AHRI symbol of certification.
- d. Protective Devices
 - i. Equipment shall be provided with a crankcase heater and a liquid-line filter drier. Delay timers to protect against damage from short cycling of the compressor and compressor motor start-assist kits shall be installed when

recommended by the manufacturer. The compressor shall be protected from abnormal operating pressures, temperatures and loss of refrigerant by suitable pressure or temperature overload devices.

- ii. If a low ambient temperature compressor cutout option is installed, it shall not cutout the compressor at temperatures above 0 degrees Fahrenheit.
- iii. To prevent floodback of liquid refrigerant to the compressor, a suction line accumulator shall be installed, unless not recommended by the manufacturer.

e. Warranty

- i. Heat pump equipment shall be warranted by the manufacturer against defects in material and workmanship for a minimum of five years from the date of start-up of the equipment. In addition, the compressor shall be warranted by the manufacturer against defects in material and workmanship for a minimum of five years from the date of start-up. Warranties shall cover parts and labor. Participating Installers may offer to consumers the manufacturer's extended warranty or service agreement to comply with the warranty requirements. This warranty should not be considered to cover equipment failure caused by failure to perform normal maintenance, abuse or external causes beyond the control of the installing Participating Installer.

3. PARTICIPATING INSTALLER REQUIREMENTS

a. Training

- i. Participating installer shall be responsible for the technical competence and qualifications of their salespeople, installers, and service mechanics. These personnel should participate in at least one manufacturer's training session on heat pump application, installation or service annually or have equivalent training. System designers may be salespeople, bidder, technician or other installer staff provided the designer has received certification on system design using the Air Conditioning Contractors of America (ACCA) Manuals D, J and S through either RSES, ACCA, INWHVAC, a college HVAC program or other CPU approved programs. All personnel handling refrigerant shall be certified as a Type 2 Technician or Universal Technician recognized by the Environmental Protection Agency (EPA).
- ii. Alternately, duct design, heat pump sizing and installations may be certified by the utility if the utility has staff that is certified in ACCA's Manual D and Manual J.

b. Consumer Instruction

- i. Participating Installer shall instruct the consumer in proper operation and maintenance of the heat pump system. Participating Installer shall provide the consumer with the manufacturer's owner's manual, demonstrate filter replacement (or cleaning) and demonstrate the operation of all indoor thermostat controls and indicator lights to the consumer. The Installer shall explain to the consumer the different operating modes of the heat pump system (e.g. heating, emergency heat, defrost and the effects of obstructing registers). All this information shall be provided in an operation manual given to the owner.

c. Warranty Papers

- i. Copies of all permits, warranties and instructions shall be attached to the air handler in an appropriate holder or envelope.

4. NEW EQUIPMENT SELECTION

a. Heating and Cooling Calculations

- i. Heating and cooling load calculations shall be made using 70⁰ F indoor design dry bulb (db) temperature for heating and 75⁰ F db for cooling. Sizing shall be accomplished using a winter design temperature of 24⁰ F db and cooling design temperature of 85⁰ F db as per *Recommended Outdoor Design Temperatures for Washington State – ASHRAE 2001 Fundamentals Handbook*. The recommended method and form for calculations is available in the Air Conditioning Contractors of America (ACCA) Manual J. Alternate computer or manual methods of calculating heating and cooling loads may be used if approved in advance by the utility. A copy of the heating and cooling load calculations shall be submitted with the bid proposal. When sizing the system, either round up or down to the nearest 6000 Btu/hr capacity at the AHRI rating.
- ii. In cases where the home is to participate in the Tacoma Power Weatherization program and the recommended measures have not been completed, heating and cooling calculations shall take into consideration the thermal improvements to the home.

b. Heat Pump Sizing

- i. The heat pump system shall be sized using either of the following methods, rounding up or down to the nearest 6,000 Btu/hr capacity at AHRI rating conditions:
- c. Balance Point
 - i. Heat pumps shall be sized using a 30⁰ F Balance Point.
 - ii. Heat Pumps shall be sized in accordance with the sizing method specified by the utility.
 - 1. However in no case shall the Balance Point used for sizing be higher than 35⁰ Fahrenheit. A Balance Point Worksheet shall be submitted to the utility. The utility shall hold the Balance Point Worksheet on file and make it available to BPA, the RTF, or the RTF approved PTCS Service Provider upon request.
- d. Auxiliary Heat Sizing
 - i. Installed auxiliary heating capacity shall not exceed 125% of the heating design load.
- e. Control of Auxiliary Heat
 - i. New system installations and systems serviced in accordance with PTCS specifications shall employ control strategies that minimize the unnecessary use of auxiliary heat. In all systems, auxiliary heat shall not operate during a first stage heating call (unless system is switched to emergency heat). Auxiliary heat shall be controlled in the following manner depending on system type:
 - 1. For systems with a single stage of compression and for systems with multiple stages of compression but without supply air temperature sensor control:
 - a. Auxiliary heat shall be controlled in such a manner that it does not engage when the outdoor air temperature is about 35⁰ F, except when supplemental is required during defrost cycle or when emergency heating is required during a refrigeration cycle failure.
 - b. Exception: If the minimum setting available for auxiliary cutout on the indoor thermostat is 40⁰ F, it may be used.

2. For systems with a single stage of compression and the option of supply air temperature sensor control, supply air temperature sensor shall not be allowed to bring auxiliary heat when the outdoor air temperature is above 35⁰ F, except when supplemental heating is required during a defrost cycle or when emergency heating is required during a refrigeration cycle failure.
3. For systems with multiple stages of compression and supply air temperature sensor control:
 - a. Auxiliary heat shall be controlled in such a manner that it engages only after all stages of compression have been engaged and the supply air temperature falls below 85⁰ F, OR
 - b. If the staging temperature is set higher than 85⁰ F, the system shall be equipped with an outdoor thermostat or equivalent control that prevents auxiliary heat from operating when outdoor temperatures are above 35⁰ F, except when supplemental heating is required during a defrost cycle or when emergency heating is required during a refrigeration cycle failure. Method of controlling auxiliary heat shall be documented by the certified heat pump Technician and submitted to the RTF-approved PTCS Service Provider.

5. NEW EQUIPMENT INSTALLATION

- a. Permits
 - i. The contractor and/or the customer shall be responsible for all permits required by State and local ordinances for the installation of the heat pump system.
- b. Access
 - i. Equipment shall be located to allow easy service access and adequate working space for servicing any component without removal of piping, ductwork, or other permanently installed fixtures. Special care shall be taken in locating components which require frequent attention such as filters. New installations located in the attic or crawlspace is not recommended.
- c. Location and Support of Indoor Units

- i. Indoor units shall be located to permit smooth duct transitions and shall be adequately supported or placed in a suitable platform in accordance with manufacturer's instructions and recommendations. Secondary drain pan shall be included in attic installations and shall extend at least 1" past all sides of attic equipment.
 - d. Location and Support of Outdoor Units
 - i. Outdoor units shall be located to avoid restrictions in the outdoor airstream. Units shall be mounted on an adequate, solid, secure pad which provides proper drainage and prevents a buildup of water, snow or ice. A minimum clearance shall be provided as per manufacturer's instructions and recommendations. In any installation there shall a minimum of 3" of free and clear area under the outdoor coil drainage area. Defrost melt or condensate shall not drain onto areas where ice formation may create a hazard (walkways etc.).
 - e. Refrigerant Charge
 - i. Technician shall follow manufacturer's guidelines when charging a new system and make any needed adjustments for non-standard line set lengths or mismatched coils.
 - ii. Technician shall perform a refrigerant charge verification test on all systems installed or serviced in accordance with PTCS specifications. Refrigerant charge testing shall include at least one of the following:
 - 1. Discharge and (if needed) suction pressure(s) compared to manufacturer's table of expected pressures at various outdoor and indoor temperatures
 - 2. Heat pump system capacity in heating mode compared to expected capacity at outdoor conditions
 - 3. Superheat, subcooling, or (Lennox) Approach temperature compared to manufacturer's targets
 - iii. Refrigerant charge test shall be performed and documented using one of the following:
 - 1. Proctor Engineering's CheckMe program
 - 2. Honeywell's ACRx hand tool

3. "PTCS Heat Pump Startup Form"
 4. Other approved PTCS methods
- iv. Results from refrigerant charge test or documentation of refrigeration charge shall be submitted to the RTF-approved PTCS Service Provider.

6. DUCT WORK

a. Design Requirements

- i. All new ductwork shall be designed and installed in accordance with recommended practices as outlined in ACCA Manual G (Selection of Distribution Systems); Manual E (Room Air Distribution Consideration) and Manual D (Residential Duct Design and Equipment Selection); Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Residential Comfort System Installation Standards Manual.

ii. Flex Duct

1. Flex duct shall not be used for main supply trunks in areas that could be subject to physical damage from normal occupant activities, weather or animals. Flex duct size shall be determined using the *Wire Helix Flexible Duct* scale on an ACCA Duct Sizing Slide Rule, or equivalent.
2. Flex duct shall not be used for supply air runs and return air runs over 30 lineal feet.

iii. Static Losses

1. Supply and return ducts shall be designed on the basis of not more than 0.10 and 0.08 inches loss per 100 feet, respectively. Supply and Return Ducts shall be designed so that the total system static pressure does not exceed the available static pressure provided by the air handler at design CFM. Flex duct shall be supported in a manner that does not create restrictions in airflow and located to minimize bending.
2. Where existing ductwork is to be utilized the contractor shall be responsible for inspecting accessible ductwork and shall correct any defects found (i.e.-unsealed joints, disconnected ducts, sagging due to lack of supports, etc.).

iv. Maximum Velocities

1. Velocity shall not create unacceptable noise levels. Ductwork shall be designed so air velocities do not exceed the following:
2. Main Ducts 900 FPM
3. Branch Ducts 600 FPM
4. Supply Outlet Face Velocity 700 FPM
5. Return Grills Face Velocity 500 FPM
6. Filter Grill Face Velocity 300 FPM

v. Diffusers and Registers

1. Proper diffusers and registers shall be selected and installed in the proper locations as per ACCA Manual G.

vi. Branch Ducts

1. Branch out runs should be a minimum of 6 inches in diameter except to bathrooms.

vii. Duct Connections and Sealing Standards

1. All duct joints, plenum drives and metal joints to include all slips and drives shall be screwed and sealed to secure the joint and seal air leaks. All duct sealing shall be done with mastics that meet NFPA class 1 requirements and shall be UL listed, meet the ASTM standards C557 and C919-79 or as approved by Tacoma Power. Where taping is necessary to provide service access, only UL-181 listed tape shall be used. Cloth duct tape is not acceptable.
2. Air Tightness- Where a substantial amount (greater than 50%) of ductwork is in the unconditioned space, duct air tightness shall be certified by a PTCS Certified Duct Technician to meet PTCS standards and duct test results recorded and submitted to an RTF approved PTCS Service Provider.

3. Duct leakage in **new construction** shall not exceed 0.06 cfm50 x floor area in square feet served by the system or 75 CFM50, whichever is greater when tested in accordance with the PTCS duct leakage measurement protocol for “Total Leakage Testing” or “Leakage Testing to Exterior”. If the air handler is located completely within conditioned space, it is not required to be in place during the test. If the air handler is located in unconditioned space and it is not in place during the test, the leakage limit shall be decreased to 0.04 x floor area served by the system (in square feet) or 50 CFM50, whichever is greater.
4. Duct leakage in **existing homes with new ducts** shall not exceed 0.10 CFM50 x square footage of floor area served by the system, or 75 CFM50, whichever is greater.
5. Duct leakage in **existing homes with existing ducts** shall not exceed 0.10 CFM50 x square footage of floor area served by the system; or it shall be documented that a 50% reduction in leakage to the exterior by comparing duct leakage before and after sealing when tested in accordance with the PTCS duct leakage measurement protocol for “Leakage Testing to Exterior”.
 - a. Exception: Where return ducts are inaccessible, compliance with either 0.10 CFM50 x square footage of floor area served by the system or a 50% reduction in leakage to the exterior (whichever is less) may be accomplished by testing the supply side only.
 - b. NOTE: initial tested leakage of 0.15 cfm50 or less x floor area square feet does not require duct sealing.
6. Duct leakage in **manufactured homes** shall not exceed 100 CFM50 for single wide homes, 150 CFM50 for double wide or 225 CFM50 for triple wide homes or a documented 50 percent reduction in leakage to the exterior by comparing duct leakage to the exterior before and after sealing.
7. Based on the protocol for “Combustion Appliance Zone Pressure Testing” forced air system operation shall not depressurize a combustion appliance zone by more than 3 Pascals with reference to outside. A Utility certified contractor must do all testing.

b. Duct Installation

- i. All newly installed rigid metal ducts and plenums and accessible uninsulated existing rigid metal duct work outside the heated space shall be insulated to R-8 minimum.
- ii. All new ducts and plenums that are internally lined with insulation located outside the conditioned space shall be installed in accordance with SMACNA's Duct Liner Application Standard, second edition. The total R-value of this ductwork shall be no less than R-8.
- iii. All flexible HVAC ducts located outside the conditioned space shall be Air Diffusion Council (ADA) certified to a minimum of R-8.
- iv. In "2x6" wall construction, all HVAC ducts routed within the exterior wall cavities shall be insulated to a minimum of R-8 between the duct and the exterior wall sheathing.
- v. All duct insulation shall be installed and supported using mechanical fasteners such as permanent plastic straps or nylon twine. Tape is not a mechanical fastener. Approved tape may be used at insulation seams to provide a continuous barrier.

c. System Air Flow

- i. All existing ductwork shall be inspected by the HVAC contractor for conditions that will affect the efficiency or operation of the new heat pump system. It is the HVAC contractor's responsibility to ensure existing ductwork is compatible with the equipment that is installed.
- ii. The air distribution system design and installation shall be such that air flow across the indoor coil is as specified in the heat pump manufacturer's literature or between 350 to 425 cfm per ton (12,000 BTU/hr output) at AHRI rating conditions if manufacturer's literature is not specified.
- iii. After installation and start-up, the HVAC contractor will measure total airflow across the heat pump coil. It shall be measured using a TrueFlow plate or using duct pressurization fan matching method per plate or fan manufacturer's instructions. This shall be reported to the RTF approved PTCS Service Provider using the "PTCS Heat Pump Startup Form".
- iv. The total external static pressure acting on the system air handler shall be tested with approved instruments and recorded at time of startup and

submitted to the RTF approved PTCS Service Provider using the “PTCS Heat Pump Startup Form” or RTF approved equivalent form. A measured external static pressure of more than 0.8 inches water gauge (or 200 Pa) should cause installer to consider taking corrective measures with system ductwork.

7. FILTERS

- a. Air filters shall be installed in the return air system in a location that will be easily accessible for filter servicing and in a position where all return air and outside air will pass through the filters before crossing the indoor coil. Filter types and sizes shall meet the standard manufacturer’s instructions and recommendations. Filters that are not an integral part of the equipment and selected by the manufacturer shall be accepted if the total CFM is within the range as specified by the manufacturer. Any installed filter that exceeds .22 inches initial static shall not be allowed. Filters should not be installed in crawl spaces or attics.

8. NOISE AND VIBRATION ABATEMENT

- a. Outdoor Unit
 - i. Outdoor units should be located to avoid transmission of objectionable noise to adjacent properties, sleeping areas or other areas where noise control is critical. Outdoor units shall comply with all state and local noise control ordinances. The participating installer shall be responsible for any modifications necessary to reduce noise. Unit base shall not be connected to the foundation.

9. REFRIGERANT PIPING

This section applies to new piping and repairs made to existing piping.

- a. Materials
 - i. Field-supplied refrigerant piping shall be clean, dehydrated and sealed Types K and L seamless copper tubing or the manufacturer’s pre-charged tubing. Fittings shall be wrought copper. Field supplied tubing shall be evacuated to 500 microns and purged and pressure tested as per manufacturer’s recommendation, soft solders shall not be permitted.
- b. Sizing
 - i. To maintain oil return to the compressor and avoid inefficiency and capacity loss, refrigeration piping or refrigeration line set shall be sized and installed in accordance with the manufacturer’s instructions and recommendations. Piping

between the two sections of split units shall not exceed the manufacturer's maximum recommended length, horizontally or vertically, and shall be run parallel to building lines and in a straight and workmanlike manner to prevent oil traps.

c. Support

- i. Refrigerant piping shall be properly supported in accordance with manufacturer's specifications, AHRI and IMC (International Mechanical Code).

d. Penetrations

- i. Refrigerant piping passing through openings in the unit cabinet or the building structure shall be installed to prevent wear or sound generation due to contact with the cabinet or building structure. All penetrations shall be properly sealed.

e. Line sets and/or electric wires

- i. When attached to the exterior walls shall be in conduit to protect them from contact and exposure. On new installations, long line or underground line sets shall follow accepted engineering practice and shall be noted on the layout submitted at time of bid application.

f. Insulation

- i. Suction lines shall be insulated with a minimum of ½" thick continuous closed-cell foam rubber. Where insulation is exposed to the elements, it should have a weatherproof covering. Vapor and liquid lines shall be separated so that heat exchange does not take place. Factory insulated pre-charged lines will be accepted.

g. Exposed Piping

- i. All refrigerant piping exposed to possible damage from foot traffic around or near an outdoor unit shall be protected or buried in PVC or other corrosion-resistant pipe, in accordance with the manufacturer's instructions, to prevent damage to piping or pipe insulation or injury to people and to permit replacement if necessary.

h. Leak Testing, Evacuation and Charging

- i. Factory as well as field-fabricated joints shall be checked, and any leaks found shall be repaired. Evacuation and charging shall be done in accordance with the manufacturer's instructions and recommendations.

10. CONDENSATE PIPING

a. Manufacturer's Recommendations

- i. Condensate drain piping shall meet IMC and should be copper, plastic or other corrosion-resistant material.

b. Drains

- i. Condensate drain lines shall be trapped and run to an open drain or outside of the building foundation. Under no circumstances may condensate be drained into a crawl space or direct connected into a sewer line. When indoor units are located in attics, the installation should include a secondary drain to collect condensate when a problem exists in the primary drain line. The secondary drain pan should be connected to a drain line that will drip at a location that will draw attention to the problem in the primary drain line.

c. Condensate Pump

- i. Condensate drain lines shall be pitched in the direction of flow to prevent backup of overflow water in the drain pan. If the indoor unit is lower than the floor drain or dry well, a condensate pump shall be installed to pump condensate to the level of the drain or dry well. Automatic controls to shut down system in case of pump failure shall be installed. A check valve shall be installed if pump is not equipped with one.

11. ELECTRICAL

a. Field Wiring

- i. All field wiring, line and low voltage, shall comply with the manufacturer's recommendations, the National Electrical Code and all applicable local codes and ordinances.

12. INDOOR THERMOSTATS

a. Installation

- i. Indoor thermostats should be located and installed according to the manufacturer's instructions and recommendations. Thermostats generally are installed 5 feet off the floor on an inside wall in the return airflow pattern and where they are not in the sun or any other heat source at any time.
- b. Heating and Cooling
 - i. Thermostats used for both heating and cooling shall have a heating/cooling lockout to prevent cross-cycling between heating and cooling. Thermostats shall indicate when auxiliary stage is active.
- c. Automatic Setback
 - i. Indoor thermostats shall have the capability of automatically reducing the heating set point during unoccupied hours.
- d. Emergency Heat Relay
 - i. All indoor thermostats shall include a manual selector switch to permit all supplemental heaters or the furnace to be energized under control of the indoor thermostat (with the compressor and outdoor thermostats bypassed). An indicator light on the indoor thermostat, or some means of notifying the homeowner when emergency heat is energized, shall be provided.

Appendix F: Sample Contractor Agreement

Tacoma Power Conservation Contractor Agreement

THIS AGREEMENT is made and entered into this _____ day of _____, 201_ (“Effective Date”) by and between the City of Tacoma, Department of Public Utilities, Light Division, Tacoma Power (hereinafter referred to as Tacoma Power) and Company Name (hereinafter referred to as the Contractor).

RECITAL

WHEREAS, at this time a customer is seeking to improve the efficiency of their home located in Tacoma Power’s service territory by the installation of energy conservation related measures and it is in Tacoma Power’s interest to encourage the customer to purchase and install these measures.

NOW, THEREFORE, in consideration of the mutual benefits to be derived hereunder, Tacoma Power and the Contractor agree to the following.

Terms and Conditions

- A. **Term.** This Agreement shall commence on the Effective Date stated above and shall continue until terminated by either party. Either party may terminate this Agreement without cause with a seven (7) day advance written notice to the other party. Tacoma Power may terminate this Agreement without cause due to programmatic changes. In such event all agreements for contractor listing will be terminated at the same time. Termination for cause by Tacoma Power shall be in accordance with procedures for deleting the Contractor from the qualified contractor list, as specified in Section G.
- B. **Exhibits and Attachments**
- i. Attachment A.
 - a. Approved measures, general program procedures and descriptions are listed in Attachment A. Tacoma Power may expand or reduce this list of measures or activities at its discretion. Attachment A may be changed at Tacoma Power’s sole discretion.
 - ii. Attachment B.
 - a. Upon execution of this Agreement, the Contractor will indicate in writing on Attachment B:
 - i. Each measure or activity for which the Contractor will submit bids.
 - ii. Identify known subcontractors who may be providing services for the contractor under this agreement.
 - b. Contractor will provide copies of the documentation listed in Attachment B
 - c. Contractor selections in Attachment B are subject to Tacoma Power approval.
 - d. Attachment B may be changed at Tacoma Power’s sole discretion.
- C. **Independent Contractor.** The Contractor is and shall act as an independent contractor with regard to the sale, installation, warranty and performance of the conservation measures installed. The Contractor shall not represent that it is or hold itself out as an agent or representative of Tacoma Power. In no event shall the Contractor be authorized to enter into any agreements or undertakings for or on behalf of Tacoma Power or to act as or be an agent or representative of Tacoma Power. The Contractor shall be fully responsible for the acts, omissions, conduct, and performance of all of its employees, agents, representatives, subcontractors and suppliers. The Contractor represents that it is, and at all times it shall be, fully experienced and properly qualified, licensed, bonded, equipped, organized, insured, and financed to be a contractor. The Contractor shall provide Tacoma Power, at Tacoma Power’s request, with any information or records pertaining to the Contractor’s qualifications, representations or performance under this Agreement. The Contractor agrees to

provide customers with information on the requirements of the program, including but not limited to any permits, inspections, and program required measures or additional program required testing.

- D. **Non-Exclusive Agreement.** The Contractor understands and agrees that this is not an exclusive commitment to the Contractor by Tacoma Power and that Tacoma Power may, at its option, sign agreements similar to this one with a number of Contractors. Nothing in this Agreement shall constitute a commitment by Tacoma Power that any Owner will request a bid from the Contractor or will enter into a contract with the Contractor.
- E. **No Warranty.** Tacoma Power makes no implied or express warranties or representations with regard to the conservation work represented in Attachment A and B, and the Contractor will not represent to the purchaser that Tacoma Power makes any warranty, representation or promise regarding this work or its savings in terms of energy consumption.
- F. **Indemnification.** To the fullest extent allowed by law, the Contractor agrees to indemnify, defend, and hold harmless Tacoma Power and its officers and employees, from all claims, loss, damages, or litigation including personal injury, death or property damage arising from or in connection with the performance of this Agreement, except to the extent caused by the sole negligence of Tacoma Power or its employees acting within the scope of their employment. In this regard, the Contractor recognizes that by indemnifying Tacoma Power with respect to the claims set forth above, the Contractor is waiving immunity under the Washington State Industrial Law, Title 51 RCW. The Contractor expressly acknowledges that this indemnification provision, along with all others in this Agreement, has been mutually negotiated. The Contractor is not an employee, agent, contractor, independent contractor, or in any manner a representative of or for Tacoma Power. Tacoma Power does not assume responsibility nor shall it be liable for any acts or omissions of the Contractor, nor for faulty or defective materials or workmanship furnished by Contractor. Tacoma Power is not responsible for any loss resulting from delisting or failure to list the Contractor.
- G. **Business Practices** The Contractor agrees to abide by all laws, ordinances, rules and permitting regulations applicable to work undertaken as a result of being included on the qualified contractor list and, in addition, agrees to the following:
1. **Licensing and Bonding**
Except for non-profit entities, all Contractors must possess a current, appropriate Washington State contractor's license or an appropriate specialty license. A copy of the current license must be provided to Tacoma Power initially and at each renewal period (prior to expiration) as specified by Tacoma Power. Except for non-profit entities, all Contractors must possess a current surety bond as required by applicable Washington State laws and regulations. Performance bonds may be required depending on the program. Attachment A will indicate if a program requires a performance bond. The Contractor must notify Tacoma Power in writing of any changes to its license or bond status within 10 business days.
 2. **Liability Insurance**
Contractor agrees to carry Commercial General Liability Insurance, including coverage for completed operations and Blanket Contractual Coverage for damage to property or injury to persons which may result from work performed as a result of being included on the qualified contractor list. Limits of liability shall not be less than \$1,000,000 combined single limit for Personal and Property Damage. The insurance required of the Contractor hereunder must be satisfactory to Tacoma Power in all respects. The policy must contain a clause providing for thirty (30) or more days prior written notice to Tacoma Power of any change in coverage afforded by the policy or policies, including cancellation thereof. Certificates evidencing all such required insurance are to be submitted to Tacoma Power under the policy or policies prior to being listed as available to perform work.

The Contractor shall require each of its subcontractors to take out and maintain, during the life of its subcontract the same insurance and bond coverage required of the Contractor as stated above.

3. Program Specifications

Contractor agrees that they have received and read program specifications and that they will install measures according to these specifications. Tacoma Power reserves the right to adopt changes to the program specifications at any time and will notify participating contractors 30 days prior to enforcement of any specification change.

4. Warranty

- a. Contractor will comply with warranty requirements as outlined in program specifications.
- b. The Contractor shall assign to each customer any and all warranties furnished by manufacturers of all materials installed.
- c. The warranty requirements set forth in the program specifications and (i) above are minimum requirements only and are not meant to restrict the Contractor from furnishing additional warranties to customers. All warranties must be provided in writing to the customer by the Contractor.
- d. Tacoma Power does not guarantee or warrant the workmanship of the Contractors listed or materials supplied by the Contractors or material suppliers. Any representation by Contractor to the contrary shall be grounds for termination of this Agreement
- e. The Contractor agrees to repair or replace at its sole cost and expense any defects in workmanship or materials which are discovered and reported to the Contractor. This promise to repair and replace is made for the express benefit of customers affected and is enforceable by them as well as by Tacoma Power.
- f. Contractor agrees to participate in good faith, and at no cost to Tacoma Power or the customer, in any conciliatory conference that results from a customer grievance about work performed by the Contractor.

5. Assignment and Subcontractors

This Agreement and the performance of the work hereunder may only be assigned or delegated by the Contractor to a party or subcontractor who is at all material times either registered as a contractor or licensed as an electrical contractor by the State of Washington. Contractor will provide Tacoma Power written notification before using any subcontractor – see Attachment B.

6. Kickbacks and Fraud Prohibited

The Contractor's bid(s) shall represent offers for work actually to be performed and there shall be no payment for work not performed. Kickbacks, rebates or other non-program benefits from owners, suppliers, subcontractors or others are strictly prohibited. Violation of this provision shall be grounds for Contractor deletion pursuant to Section G.

7. Collusion Prohibited

The Contractor agrees and represents that the prices in said bids submitted or proposed for work to be eligible for assistance under any Tacoma Power Program will be neither directly nor indirectly the result of any formal or informal agreement with another bidder. It is further agreed that the Contractor shall not submit a bid on any Program project on which a bid has been submitted by another business entity which is owned or controlled by the Contractor, or is a subcontractor of that Contractor.

8. Accessibility

The Contractor must be accessible to customers during standard business hours.

9. Misrepresentation

The Contractor shall not provide information to customers regarding the Program that is inaccurate or misleading.

10. Principles

At the annual anniversary date, or as may be requested by Tacoma Power, the Contractor shall provide a listing of all company owners.

11. Marketing

Tacoma Power agrees to provide marketing materials for distribution to prospective customers to include, but not be limited to, brochures. From time to time, Tacoma Power may advertise that information regarding conservation measures, including the qualified contractor roster itself or portions thereof, are available to the public. Contractors are not eligible to use Tacoma Power's logo without the express written consent of Tacoma Power. Contractor agrees to cooperate with advertising efforts offered by Tacoma Power.

H. **Contractor listing and deletion procedures.** To be listed on the Tacoma Power Qualified Contractor Roster, prospective contractors must meet the following requirements:

1. Attend a Tacoma Power contractor orientation.
2. Meet all other requirements set forth in this Agreement.
3. Meet specific program requirements listed in Attachment A under "Additional Listing Requirements".

To continue to be listed:

1. The Contractor agrees to complete six (6) Tacoma Power qualified conservation projects every six months beginning at the time of execution of this Agreement.
2. Must attend the annual contractor meeting.

A Contractor may be deleted from the Tacoma Power Qualified Contractor Roster for cause for any of the following occurrences:

- (a) Accepting kickbacks, rebates or other non-Program benefits from owners, suppliers, subcontractors or others associated with Tacoma Power.
- (b) A failure rate on the initial Tacoma Power inspection in excess of twenty five percent (25 %) of the jobs undertaken by the Contractor in a given 90 day period.
- (c) A complaint rate in excess of twenty percent (20%) of jobs undertaken within a given 90 day period, concerning Contractor workmanship, materials, or business practices, providing that said complaints are considered valid by Tacoma Power. Complaints considered valid include but are not limited to: missed appointments, abusive behavior or language, verified threatening behavior, bodily harm to the customer or customer's pet(s), damage to customer's property, failure to complete corrective work within thirty (30) days, failure to respond to request for bids, three or more failed inspections of any individual job.
- (d) Failing to comply with the terms and conditions of this Agreement within fifteen (15) working days of notification of said failure by Tacoma Power.
- (e) Providing false or misleading information concerning material or labor warranties, Tacoma Power or its programs.

Prior to deletion for cause from the qualified contractor roster, Tacoma Power will notify the Contractor of the proposed action and afford the Contractor an opportunity to discuss and propose a resolution of the problem(s). If the proposal of the Contractor is acceptable to Tacoma Power, deletion action may be withdrawn or postponed pending completion of any promised action by the Contractor. Tacoma Power reserves the right to delay the providing of any financial arrangements to customers of the Contractor during this period and any subsequent probationary period. If a Contractor fails to complete the promised action in the time agreed upon, the Contractor will be deleted from the qualified contractor roster.

If a Contractor completes the promised action in the time agreed upon, the Contractor may remain on the qualified contractor roster on a probationary basis. The terms and conditions of probationary listing shall be specified in writing and agreed upon by the Contractor and Tacoma Power.

An initial case of deletion shall be for one (1) year, after which time the Contractor may be reinstated to the qualified contractor roster upon meeting all the requirements in effect at that time. A subsequent deletion is grounds for permanent delisting.

- I. **Inspections**. Tacoma Power may, but shall have no obligation to, inspect the work of the Contractor for the sole purpose of determining the Contractor's compliance with this Agreement.
- J. **Non-Discrimination**. The Contractor agrees to take all steps necessary to comply with all federal, state, and City laws and policies regarding non-discrimination and equal employment opportunities. The Contractor shall not discriminate in any employment action because 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 handicap. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, national origin or ancestry, sex, gender identity, sexual orientation, age, marital status, and/or familial status. Such action shall include, but not be limited to the following areas: employment, upgrading, demotion, transfer, recruitment advertising, layoff, termination, rates of pay, other forms of compensation, and selection for training, including apprenticeship. These guidelines shall also be followed in regard to the use of subcontractors. In the event of non-compliance by the Contractor with any of the non-discrimination provisions of this Agreement, Tacoma Power shall be deemed to have cause to terminate this Agreement.
- K. **Legal Disputes**. Contractor and Tacoma Power agree and stipulate that in the event any litigation should occur concerning or arising out of this Agreement, the sole venue of any such legal action shall be the Pierce County Superior Court of the State of Washington and the interpretation of the terms of this Agreement shall be governed by the laws of the State of Washington.
- L. **Non-Waiver**. Failure of Tacoma Power to insist upon strict performance of, or a waiver by Tacoma Power of any breach of any of the terms, conditions, or obligations of this Agreement shall not be deemed a waiver of any other term, condition, covenant or obligation, or of any subsequent default or breach of the same or any other term, condition, covenant or obligation herein contained.
- M. **Entire Agreement**. This Agreement and its Attachments contain the entire Agreement between the parties as to the services to be rendered hereunder. All previous and contemporaneous agreements, representations, or promises and conditions relating to the subject matter of this Agreement are superseded hereby. If any term, condition or provision of this Agreement is declared void or unenforceable or limited in its application or effect, such event shall not affect any other provisions hereof and all other provisions shall remain fully enforceable.
- N. **Modification**. No modification or amendment of this Agreement shall be effective unless set forth in writing and signed by all Parties.

III. SIGNATURE and ACCEPTANCE. Each Party hereto represents that it has the authority to enter into this Agreement and by his/her signature below accepts the terms and conditions hereof.

TACOMA POWER

Stephen Bicker (Date)
Conservation Resources Manager

Approved as to form & legality:

Assistant City Attorney (Date)

Approved:

Finance (Date)

CONTRACTOR

By: _____
(Signature) (Date)

(Print Name)

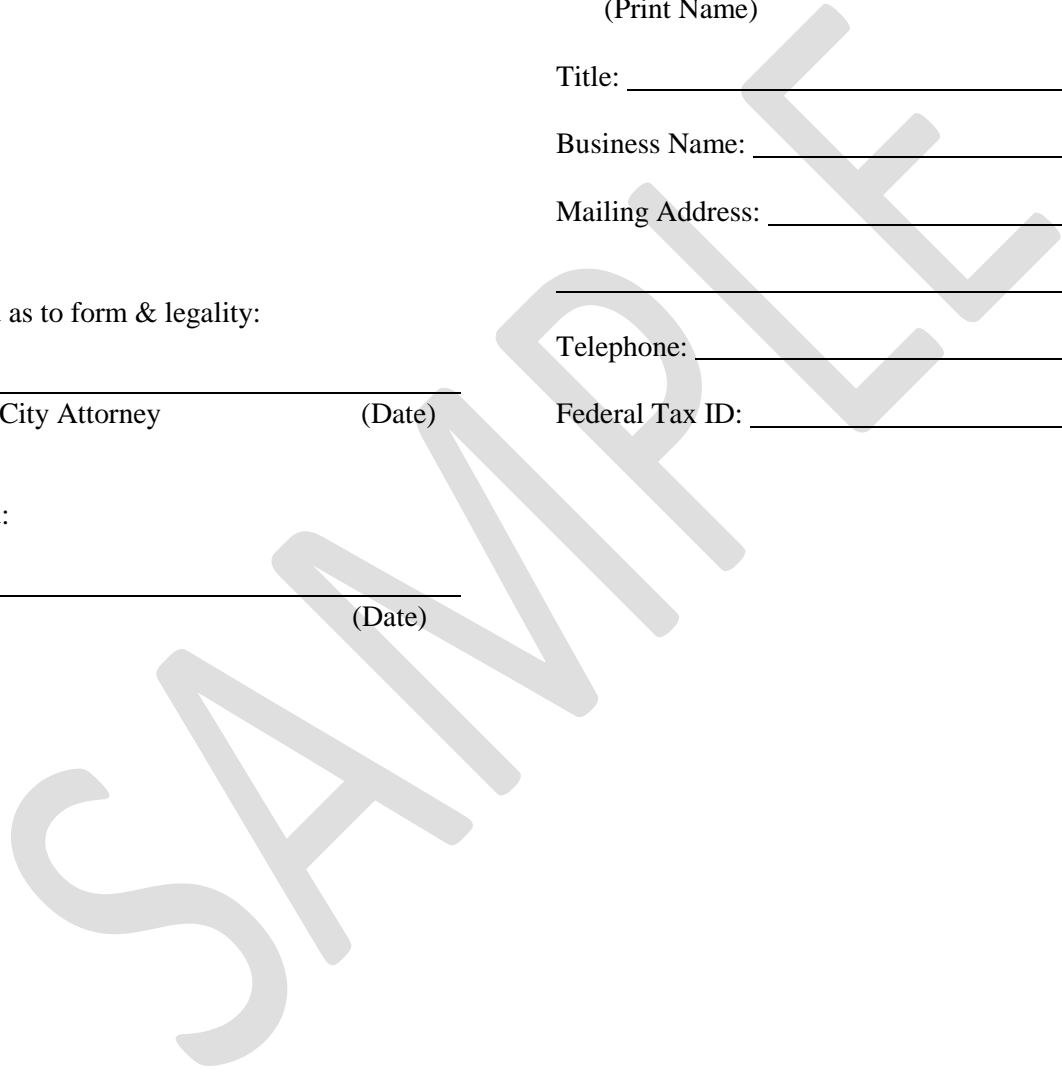
Title: _____

Business Name: _____

Mailing Address: _____

Telephone: _____

Federal Tax ID: _____



ATTACHMENT A – Weatherization Program

PROGRAM DESCRIPTION

The weatherization program offers incentives for customers to upgrade their home's thermal shell. This program is offered to customers who own, single family homes (1-4 units), manufactured homes and multifamily properties (5 or more units per building) built before 1988 that have primary electric heating systems. The incentives are paid to contractors with approval from the property owner(s). The weatherization programs have unique low income and non-low income components to reduce customer's upfront costs:

- Low income customers may receive weatherization grants. These grants may pay 100% of the project cost and enable low-income customers to upgrade the energy efficiency of their homes. Property owners with low income renters may weatherize their rental properties through this program.
- Non-low income customers may receive incentives and financing for the weatherization project through Tacoma Power. No interest loans are offered upon approval of credit. Loans, combined with incentives, potentially eliminate upfront costs for non-low income customers.

ADDITIONAL CONTRACTOR LISTING REQUIREMENTS

- A new Tacoma Power Qualified Contractor Roster will be established in November 2011. To stay on the list, currently listed Contractors must have passed inspections on three Tacoma Power weatherization projects in the past six months.
- To be added on Tacoma Power's Qualified Contractor Roster, new Contractors must pass inspections on three Tacoma Power weatherization projects within six months of application date.
- Performance Bonds are required for multifamily weatherization projects where the total project cost exceeds \$50,000. A performance bond will be secured in the name of the property owner and Tacoma Power for the amount of the proposed project cost. Proof of the bond shall be provided to Tacoma Power prior to installing any measures at the approved site.

APPROVED MEASURES AND INCENTIVES

The following measures are approved under Tacoma Power's Weatherization program:

Single family stick built:	Non-low income	Low income
• Floor, wall and ceiling insulation upgrades	\$0.50 sq ft	Grant*
• Single pane window replacement	\$4.00 sq ft	Grant up to \$20 sq ft
• Double pane, metal-frame window replacement	\$2.00 sq ft	Grant up to \$20 sq ft
• Duct testing and sealing	Up to \$450	Grant up to \$600
Manufactured Homes:	Non-low income	Low income
• Floor and ceiling insulation upgrades	\$0.50 sq ft	Grant*
• Single pane window replacement	\$4.00 sq ft	Grant up to \$20 sq ft
• Duct testing and sealing	Up to \$450	Grant up to \$600
Multifamily buildings (5 or more units per building):	Non-low income	Low income
• Floor, wall and ceiling insulation upgrades	\$0.50 sq ft	Grant*
• Single pane window replacement	\$4.00 sq ft	Grant up to \$20 sq ft

*Grant and Loan limits apply

GENERAL PROGRAM PROCEDURES

Procedures provide an overview of the process and should be used as a guide. These procedures do not replace program specifications.

1. Attend a weatherization contractor orientation to review procedures, forms and answer questions
2. Complete bid form(s). Note: To be eligible for window replacement, home must meet minimum insulation levels. Duct sealing must be performed by a PTCS certified technician. See program specifications for details.
3. Customer completes weatherization application form and submits bid(s) for pre-approval.
4. Tacoma Power reviews the application form and bid, if approved, sends customer a Tacoma Power weatherization agreement.
5. Customer signs agreement and returns document to Tacoma Power,
6. Tacoma Power signs the agreement and issues a Summary of Measures to the contractor
7. Contractor schedules project with the customer.
8. Contractor completes the work and schedules an inspection.
9. Contractor submits invoice to Tacoma Power for payment.
10. Tacoma Power inspects project.
11. Project passes inspection, Tacoma Power pays from contractor invoice.

ATTACHMENT A – High Efficiency Heating Program

PROGRAM DESCRIPTION

Tacoma Power provides an incentive to residential customers upgrading the efficiency of their heating system when:

1. A high efficiency central heat pump system is installed. The central heat pump installations must be installed and commissioned to PTCS standards by a PTCS technician. The customer incentive is discounted on the contractor's bid and final customer invoice. Upon Tacoma Power's approval of the completed job the incentive is paid to the installing contractor.
2. HVAC contractors test and seal electric forced air central heating system ductwork to PTCS standards. Duct sealing must be performed by a PTCS technician, approved by Tacoma Power and verified in the PTCS database.

ADDITIONAL CONTRACTOR LISTING REQUIREMENTS

- Contractor must pass inspection on three Tacoma Power conservation projects before contractor will be listed on the Tacoma Power Qualified Contractor Roster.

APPROVED MEASURES

The following measures are approved under the Tacoma Power High Efficiency Heating program:

- Install a new heat pump system commissioned to PTCS requirements
- Tested and sealed ductwork in unconditioned space to PTCS requirements

INCENTIVES

- New central heat pump system HSPF 9.0/SEER 14 and requires PTCS commissioning along with PTCS required duct sealing \$ 1250
- New central heat pump system HSPF 9.0/SEER 14 and requires PTCS commissioning with no PTCS required duct sealing \$ 750
- New central heat pump system with HSPF less than 9.0 and requires PTCS commissioning along with PTCS required duct sealing \$ 500
- New central heat pump system with HSPF less than 9.0 and requires PTCS commissioning with no PTCS required duct sealing \$ 150

GENERAL PROGRAM PROCEDURES

Procedures provide an overview of the process and should be used as a guide. Procedures do not replace program specifications.

1. Attend a HVAC contractor orientation to review procedures, forms and answer questions
2. Complete bid and present customer with Tacoma Power rebate application

3. Install a qualifying heat pump system to program specifications
4. Send rebate application, billing invoice and all required documentation to Tacoma Power
5. Tacoma Power reviews application and inspects completed heat pump installation
6. Upon successful inspection, Tacoma Power pays contractor from invoice
7. For quality assurance, PTCS staff will perform random inspections and notify Tacoma Power and the HVAC contractor. If the job fails inspection by PTCS staff, the contractor is responsible for correcting the issues

SAMPLE

ATTACHMENT B –Contractor Information

Company Name: _____

Representative: _____

Title: _____

Date: _____

Please indicate below the measures or services your company will install or provide:

- Insulation
- Window Replacement
- Central Heat Pump System
- Duct Leakage Testing & Sealing

The following documentation is required by Tacoma Power. Please provide copies of the following:

1. EPA Lead Safe certification for firm (window and insulation contractors only)
2. EPA Lead Safe individual certification (window and insulation contractors only)
3. Valid WA. State General Contractor license or WA. State Specialty Contractor license
4. Proof of General Liability Insurance and Surety Bond

The following subcontractor(s) will be providing services for the above named company. List all contractors, if additional space is needed use additional pages if necessary)

Company: _____

Services Provided: _____

Representative: _____

Title: _____ Date: _____

Company: _____

Services Provided: _____

Representative: _____

Title: _____ Date: _____