

P1 655

HAER INVENTORY										Historic American Engineering Record Department of the Interior, Washington, D.C.											
1. SITE I.D. NO																					
2. INDUSTRIAL CLASSIFICATION										3. PRIORITY		4. DANGER OF DEMOLITION? (SPECIFY THREAT)									
Bridges, Trestles, and Aqueducts										1		<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN									
5. DATE										6. GOVT SOURCE OF THREAT											
1910/1911										OWNER: <span style="border: 1px solid black; padding: 2px;">  </span> ADMIN: <span style="border: 1px solid black; padding: 2px;">  </span>											
7. OWNER/ADMIN										8. NAME(S) OF STRUCTURE											
City of Tacoma										North 21st Street Bridge											
9. OWNER'S ADDRESS																					
City Public Works Department City-County Building Tacoma, Washington 98402																					
10. STATE		COUNTY		COUNTY NAME		CITY/VICINITY		CONG DIST		STATE		COUNTY NAME		CITY/VICINITY		CONG DIST					
WA		053		Pierce		Tacoma		03													
11. SITE ADDRESS (STREET & NO.)										12. EXISTING SURVEYS											
between North Fife and Oakes Crossing: Buckley Gulch S.T.R. 31 21N 3E										<input type="checkbox"/> NR <input type="checkbox"/> NHL <input type="checkbox"/> HABS <input type="checkbox"/> HAER-I <input type="checkbox"/> HAER <input type="checkbox"/> NPS <input type="checkbox"/> CL6 <input type="checkbox"/> CONF <input type="checkbox"/> STATE <input type="checkbox"/> COUNTY <input type="checkbox"/> LOCAL <input type="checkbox"/> OTHER											
13. SPECIAL FEATURES (DESCRIBE BELOW)																					
<input type="checkbox"/> INTERIOR INTACT <input type="checkbox"/> EXTERIOR INTACT <input type="checkbox"/> ENVIRONS INTACT																					
14. UTM ZONE		EASTING		NORTHING		SIGN		SCALE		QUAD NAME		UTM ZONE		EASTING		NORTHING					
10		540120		5234800				1:24    1:62.5		Tacoma North, Washington											
								1:24    1:62.5													
15. CONDITION										16. INVENTORIED BY											
70 <input type="checkbox"/> EXCELLENT    71 <input type="checkbox"/> GOOD    72 <input type="checkbox"/> FAIR    73 <input type="checkbox"/> DETERIORATED    74 <input type="checkbox"/> RUINS    75 <input type="checkbox"/> UNEXPOSED    76 <input type="checkbox"/> ALTERED    82 <input type="checkbox"/> DESTROYED    85 <input type="checkbox"/> DEMOLISHED										Lisa Soderberg    AFFILIATION: HAER/Washington State Bridge Inventory    DATE: April 1973											
17. DESCRIPTION AND BACKGROUND HISTORY, INCLUDING CONSTRUCTION DATE(S), HISTORICAL DATE(S), PHYSICAL DIMENSIONS, MATERIALS, EXISTANT EQUIPMENT, AND IMPORTANT BUILDERS, ENGINEERS, ETC.																					
<p>This continuous concrete rigid-frame girder bridge, designed by Waddell and Harrington in 1910, is similar to the longer spanned concrete rigid-frame bridge on 23rd Street which was also designed by the renowned firm. The 21st Street Bridge carried a double track street railway down the middle of its 48 foot wide roadway, providing railway transportation to a residential area in northern Tacoma.</p> <p>The bridge consists of three 60' reinforced concrete spans with four continuous girders. It is supported on gravity abutments and separate reinforced concrete columns spaced 16' apart. The truncated corners of the columns reflect observations that J.A.L. Waddell made about column design in his book <u>Bridge Engineering</u>: "The architectural treatment of the columns should be in conformity with the lines of the remainder of the structure. For plain, massive work in which there is no ornamentation, rectangular columns with vertical sides will prove quite satisfactory. For more</p>										(CONT OVER)											
18. ORIGINAL USE										19. REFERENCES—HISTORICAL REFERENCES, PERSONAL CONTACTS, AND/OR OTHER											
Bridge/vehicular										City Public Works Department Files. Carl W. Condit, <u>American Building Art</u> , (New York; 1961), p. 207. Bridge plate: "City of Tacoma, 1910". J.A.L. Waddell, <u>Bridge Engineering</u> , 2 Vols., (New York; 1916) pp. 925, 936.											
20. URBAN AREA 50,000 POP OR MORE?										21. MCRS REGION											
<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO										N    W											
22. PUBLIC ACCESSIBILITY										23. EDITOR INDEXER											
<input type="checkbox"/> YES, LIMITED <input checked="" type="checkbox"/> YES, UNLIMITED <input type="checkbox"/> NO <input type="checkbox"/> UNKNOWN																					
24. LOCATED IN AN HISTORIC DISTRICT?										DISTRICT I.D. NO											
<input type="checkbox"/> YES <input type="checkbox"/> NO    NAME																					

## Description (continued)

elaborate structures, it will be best to batter the sides of the shaft." The stark geometric concrete form of the 21st Street Bridge is by no means elaborate. However, it is noteworthy that the battered corners were used as ornamental embellishments in an attempt to break the rigid rectangular exterior lines.

Like the 23rd Street Bridge, the width and thickness of the slabs and beams are massive and oversized. The slab is 9' thick. The beams range from 4' to 7' in width, and from 9' to 11' in depth.

The configuration of the steel reinforcement reflects the specifications that J.A.L. Waddell outlined in Bridge Engineering. In his 2 volume book, he warned that "the arrangement of the reinforcement in continuous girders requires considerable care...Bars bent up from the bottom reinforcement should be used in the reinforcement over the supports as far as possible; and they should be arranged so as to reinforce for diagonal tension in the most effective manner. Bars should be extended some distance past the points where they could theoretically stop, in order to ensure that the bond stresses will be low. This procedure will also keep the unit stresses in the steel low, which will strengthen the girder considerably in diagonal tension...When stirrups are required as web reinforcement, those in the central portion of the girder should be of the type shown in Figure 37tt; while those in the end portions, where the moment is negative, should be similar but inverted." The reinforcement in the 21st Street Bridge is almost identical to that prescribed in the diagram.

The 21st Street Bridge was built for the City of Tacoma by the contractors Creelman, Putnam and Healy at a cost of \$52,000. It is significant as an early example of a continuous concrete girder bridge. It was built almost simultaneously with the 950 foot Asylum Avenue Viaduct in Knoxville, which Carl Condit documented in American Building Art, as the first continuous concrete girder bridge to be constructed.



#### REFERENCES, CONTINUED.

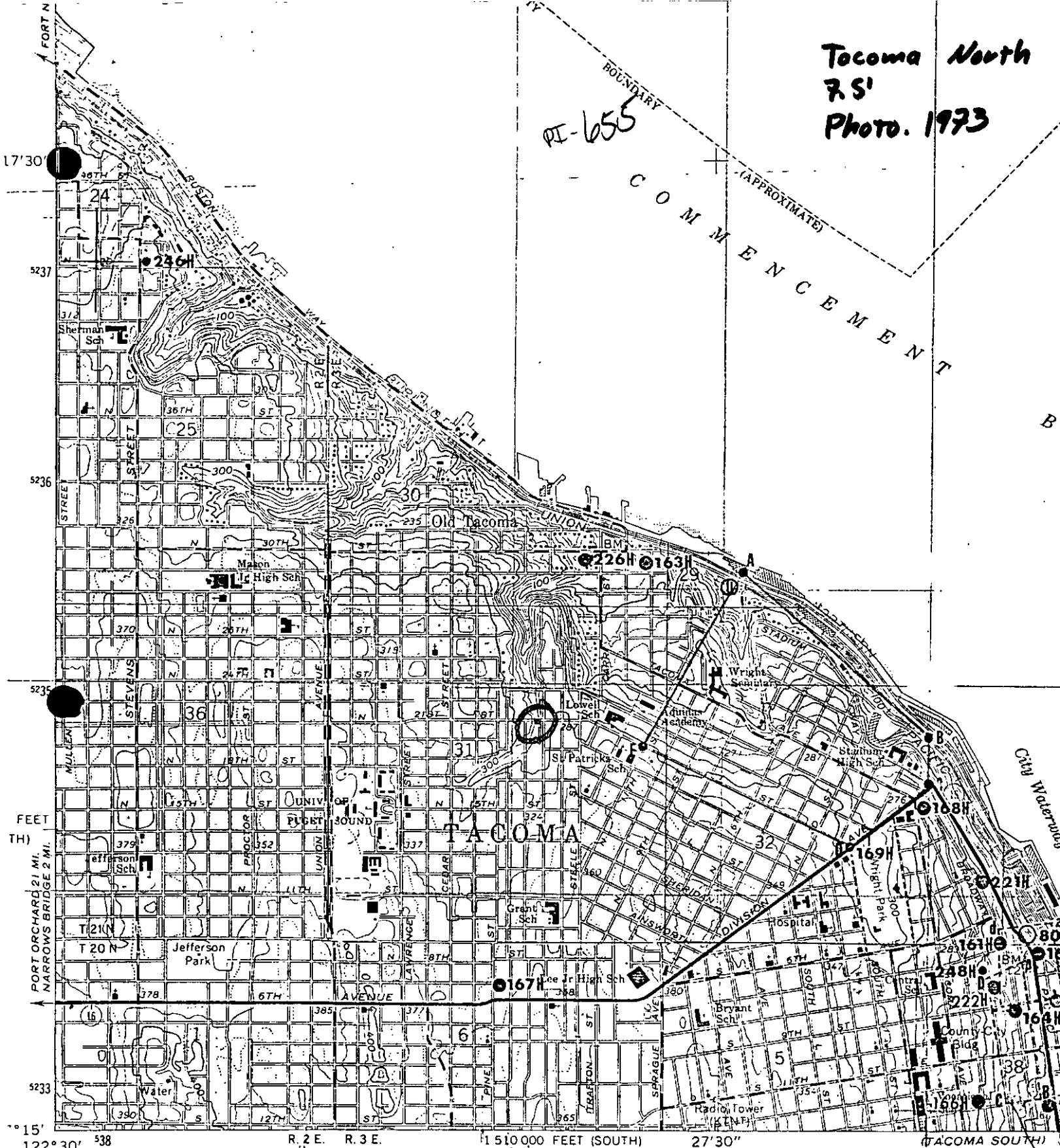
ABSTRACT																																																																																															
HARRNO								LC								TECH REPORT								HIST REPORT								CONTEMP PHOTO								HIST PHOTO								CONTEMP DRWG								HIST DRWG								COLOR PLATE								PHOTOGRAM								SW								FILM							

Tacoma North  
7S'  
Photo. 1973

PI-655

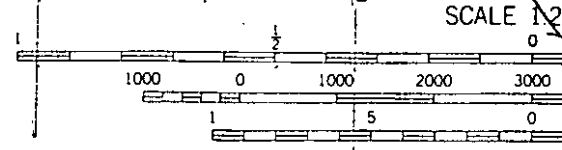
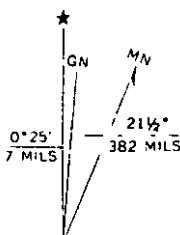
BOUNDARY

COMMENCEMENT



Mapped, edited, and published by the Geological Survey  
Control by USC&GS  
Topography by photogrammetric methods from  
photographs taken 1957. Field checked 1961  
Selected hydrographic data compiled from USC&GS Charts  
6407 and 6460 (1958)  
This information is not intended for navigational purposes  
Polyconic projection. 1927 North American datum  
10,000-foot grids based on Washington coordinate system,  
south and north zones  
1000-meter Universal Transverse Mercator grid ticks,  
zone 10, shown in blue

UTM GRID AND 1973 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET



CONTOUR INTERVAL  
DOTTED LINES REPRESENT  
NATIONAL GEODETIC VERTICAL  
DEPTH CURVES AND SOUNDINGS IN FEET—  
SHORELINE SHOWN REPRESENTS THE APPROXIMATE  
MEAN RANGE OF TIDE IS

THIS MAP COMPLIES WITH NATIONAL

25. Photos and Sketch Map of Location

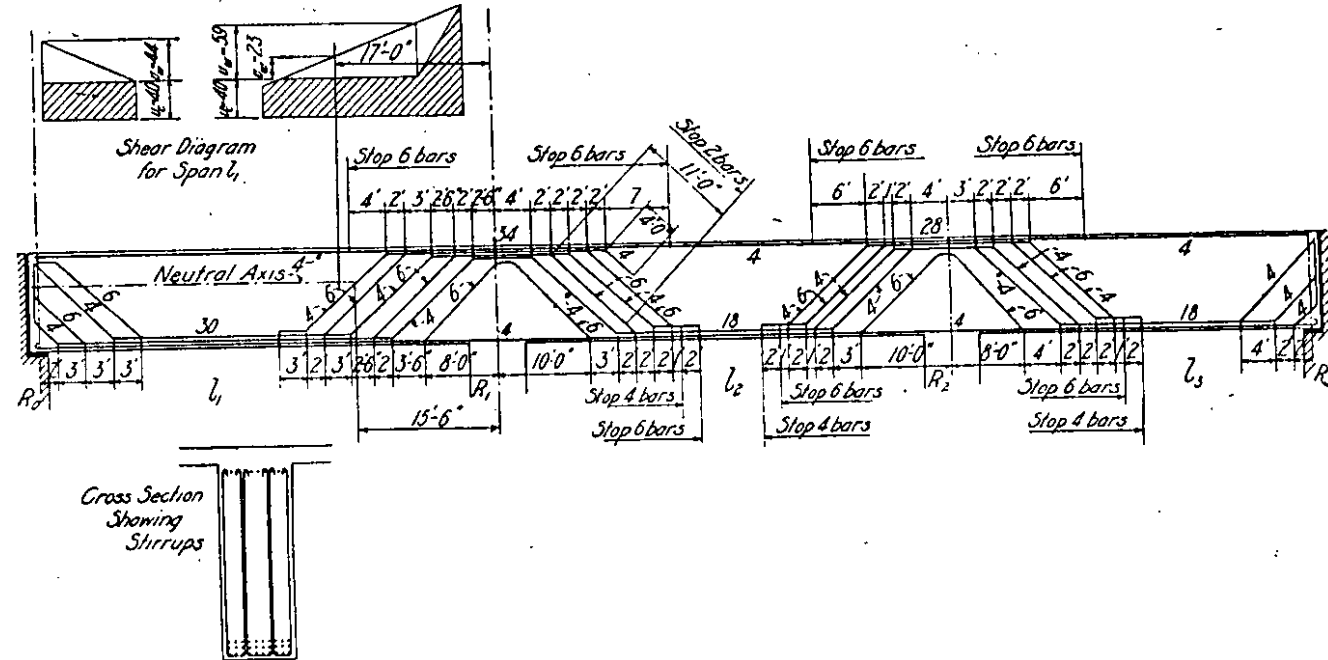
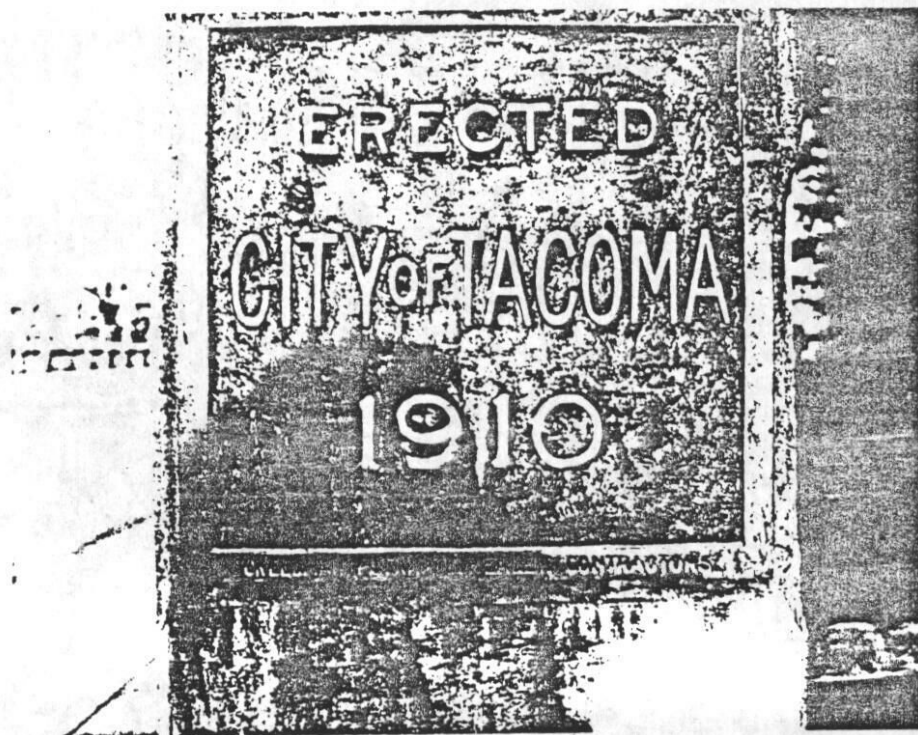
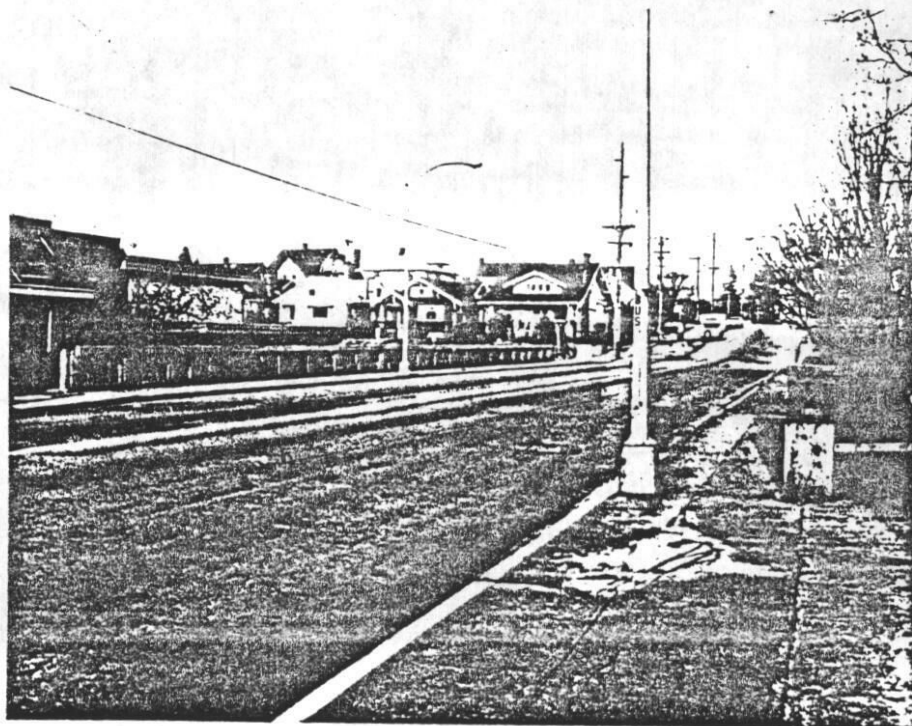


FIG. 37U. Shear Diagram and Details of Reinforcement for a Three-Span Continuous Girder.

from J.A.L. Waddell, Bridge Engineering, 2 Vols., (New York, 1916), 1:933.

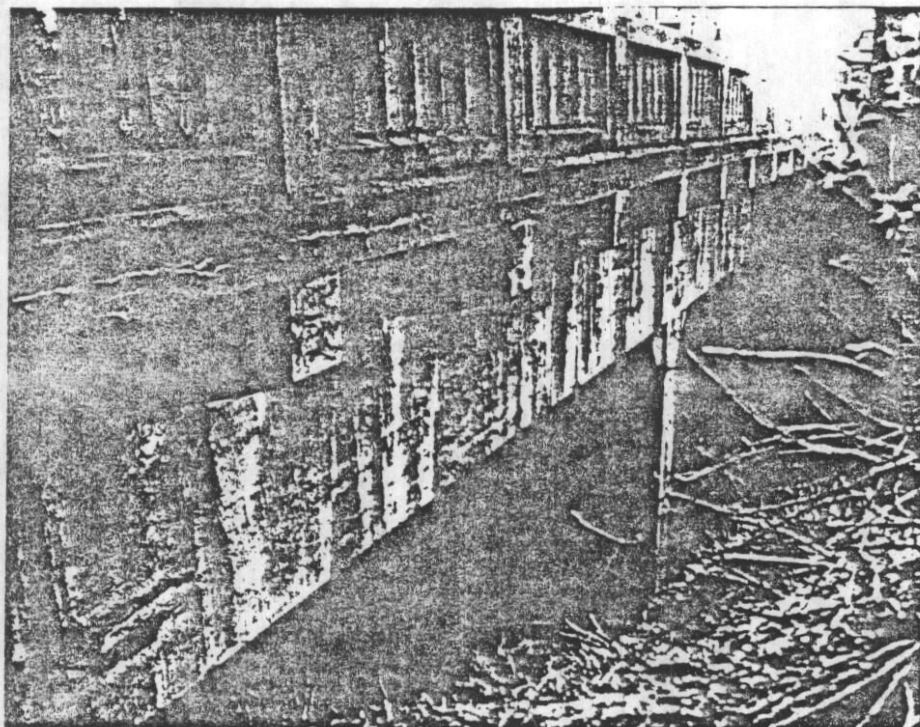


North 21st Street Bridge



North 21st Street Bridge





North 21st Street Bridge