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**The Pepper Building
Terra Cotta/Masonry Façade Review
Evaluation and Recommendations**

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Prepared for:

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I. INTRODUCTION

General Introduction

As authorized by Mr. Wm. Anthony McGee, Masonry Preservation Services (MPS) teamed with Mr. Charles Ernest, PE, of Sutton-Kennerly & Associates (SKA) to conduct a masonry façade review and evaluation of The Pepper Building located at 4th & Liberty Streets, Winston-Salem, North Carolina. The fieldwork was performed during the week of December 8, 2003. The field portion of this review/survey was performed by MPS President Jeffrey L. Erdly and Mason Craftsmen Robert Vajda and Joseph Biacchi. SKA employees also participating during the fieldwork include Mr. Charles Ernest, Mr. Tom Hayes and Ms. Linnea Linton.

During the course of the investigation, both the owner's representatives and employees of the Frank L. Bloom Construction Company were granted access to study areas via swing stage scaffold.

Objectives

The intent of this review is to document observations, photographs and as-built conditions specifically regarding the exterior masonry façade (building envelope) of the Pepper Building. A limited inspection of two bays, both starting at the corner of 4th and Liberty Streets extending both south and west encompassing one bay on each elevation was performed. At these two bays only, a systematic hands-on examination of portions of the façade and related elements generally following applicable portions of ASTM Standards E 2128-01 "*Standard Guide for Evaluating Water Leakage of Building Walls*" and E 2270-03 "*Standard Practice for Periodic Inspection of Building Facades for Unsafe Conditions*" was performed. This work is based on an MPS proposal dated October 23, 2003. The work scope as outlined in our proposal included the following:

1. Provide rigging to access the structure's main elevation using beams and weights.
2. Provide additional materials including sidewalk barricades, tools and miscellaneous materials to infill probe holes with Dow blue board and wood shoring to maintain a watertight enclosure.
3. Provide mason craftsmen to create the probe holes and infill as listed above.
4. Provide senior management onsite for a minimum of two days as required for support.

5. Rent an 80' - 0" high lift to assist in the evaluation of the former demising wall (1 day rental).
6. Provide design assistance and pricing for repair scenarios generated by SKA.

II. The Structure

The six-story (above grade) structure measuring approximately 70' X 100' in plan was constructed in 1928. The drawings indicate that the building was designed by Northup & O'Brien Architects of Winston-Salem, NC. The two primary elevations include a first floor storefront arrangement incorporating single bay canopies and vertical terra cotta column covers which extend to the mid-second floor elevation. Floors two (2) through six (6) consist of 3 over 3 double hung steel sash windows including terra cotta sills and lintels. On floors 2 through 5, the spandrel panels consist of a basket weave patterned iron spot brick typically used over the primary elevations. Located above the sixth (6) floor window lintel, there is an elaborate 24 piece spandrel assembly which is capped by coping which also blends into adjacent outset pier cap assemblies all constructed of terra cotta. The primary structure is comprised of a structural steel frame encased in a mass masonry assembly which resists air and water infiltration as a barrier wall. This type of construction is generally categorized as a transitional wall system. The remaining two walls include common brick masonry and/or were originally constructed against an existing masonry wall whereby the masonry coursing and finish would be described as informally constructed.

Masonry Façade Materials

The primary component visible over the main elevations is a well-fired iron spot face brick. The variation in the individual brick unit's colors range from a light buff to a dark copper color. The wide range of brick colors would have originally been highlighted by mortar joints which were raked back 3/8" deep, thereby accentuating the shadow lines between each individual brick adding texture and varying the masonry's appearance when viewed under different lighting conditions. During the structures service life, these raked brick mortar joints were infilled (shell pointed) in a misguided attempt to maintain the façade.

A matte finished, buff colored glazed architectural terra cotta is used extensively on the structure's first and sixth floors. Additionally, windows on the remaining floors incorporate the same terra cotta at window lintel covers and sills. The masonry used on this building's primary elevations included various earth tone

colors, detailed and complex brick coursing (basket weave patterned window spandrels) and high grade, matte finished glazed architectural terra cotta.

III. Investigation, Probes and Observations

During the investigation, primary access to the main elevation was obtained through the rigging and use of swing stage scaffold. Masonry located on the structure's west elevation (former demising wall) was inspected with the use of a 64'-0" aerial boom lift. Since this investigation was limited in nature, only specific portions of the façade were accessed and inspected.

Visual Inspection, Photographic and Condition Survey

Visual inspection of the structure was performed. During the course of this investigation, approximately 200 photographs were taken, along with extensive field notes and location sketches. Thirty-two (32) photographs were chosen for inclusion in this report (See Appendix A). Also, specific photographs are located on elevation drawings (See Appendix B) as noted. The following commentary pertains to these photographs:

Series 1 – Overall Elevations

Photo 1a: Overview of the structure's two primary elevations.

Photo 1b: Partial north elevation, which was the site (northeastern corner bay) of the hands-on inspection conducted on this elevation.

Photo 1c: East elevation showing the site of the second hands-on inspection.

Series 2 – Terra Cotta Detailing

Photo 2a: Close-up view of the sixth floor window spandrel terra cotta assembly, which is an extension of the typical window lintel, cover trim (typically detailed over the entire structure). These spandrel assemblies also blend into the coping/pier cap assembly.

Photo 2b: Termination detail of 1st floor column cover assemblies, which are embellished with classical order Greek detailing.

Photo 2c: Integral supports for the original canopies were incorporated within the terra cotta assembly.

Series 3 – Terra Cotta Window Lintel Cover Assemblies

- Photo 3a:** On both primary building elevations, a 3-piece terra cotta assembly serves as the window head and is suspended from a steel lintel, which frames the window opening. At all locations viewed, (85 total on the project) displacement caused by the hidden framing lintel was evident in varying degrees. This photograph shows a north elevation site exhibiting the minimum displacement observed.
- Photo 3b:** Severe corrosion and resulting oxide jacking at a north elevation window lintel assembly.
- Photo 3c:** North elevation oxide jacking at lintels where the adjoining brick pier is also displaced, cracked and bowed outward. Also note that the terra cotta has rotated outward and that while difficult to discern from this photo, horizontal cracking within the brick spandrel above was also noted.
- Photo 3d:** East elevation oxide jacking at lintels again affecting the adjacent brick pier, rotation of the terra cotta, etc.

Series 4 – Parapet Component Cracking

- Photo 4a:** Horizontal cracking is evident through the terra cotta spandrels and adjacent brick piers. Also visible is the inward rotation of the entire parapet assembly. This phenomenon (parapet dumping) is caused by oxide jacking of various internal steel supports. See Appendix B, SK-1 for general location.
- Photo 4b:** Vertical and horizontal displacement of a masonry pier cap assembly, see Appendix B, SK-1 for location.
- Photos 4c/d:** Overview and close-up respectively of terra cotta spandrel, brick pier and coping/pier cap displacement. See Appendix B, SK-1 for location.

Series 5 – Probe Site One (1)

- Photo 5a:** Condition of a window lintel cover exhibiting cracking and incipient spalls. Also note the horizontal crack contained within the decorative brick spandrel above (See Appendix B, SK-1 for probe and photo location).

- Photo 5b:** Note how the window frame has bowed downward in reaction to oxide jacking from above.
- Photo 5c:** After removal of the center section of the three piece lintel cover, the corrosion below the steel lintel leg measured in excess of 3/8" which combined with the original steel equaled 3/4". Close observation will show that the topside corrosion by-product build-up would make the total expanded cross section of the original 3/8" lintel leg in excess of 1 1/8" or 200%.
- Photo 5d:** Mild steel hanger and pin assembly which suspends the three-piece decorative lintel cover (left hand 1/3) over the window. Note how this pin is the starting point for the face cracking visible on the terra cotta surface.
- Photo 5e:** Pin and hanger assembly at the right hand 1/3 where the cracking emanating from the pin is only visible on the rear half of the terra cotta component.
- Photo 5f:** After removal of the three (3) terra cotta components, brick were excavated to locate how far the steel lintel penetrated the adjacent masonry piers. A minimum of 8 1/2" was measured at this site.

Series 6 - Probe Site Two (2)

- Photo 6a:** Condition of a 6th floor terra cotta spandrel exhibiting cracking, incipient spalls, previous cementitious patch sites and displacement with cracking of adjacent brick piers (See Appendix B, SK-1 for probe and photo location).
- Photo 6b:** The terra cotta was removed by hand along with an adjacent brick. Corrosion of a 12" I-beam was identified as the cause for the cracking.
- Photo 6c:** Corrosion buildup by-product, located on the beam's web full height.
- Photo 6d:** Where the terra cotta components were slotted to interface and bear onto the projecting beams bottom flange, corrosion by-product (oxide jacking) was identified as the cause of the cracking.
- Photo 6e:** The adjacent brick pier cracking occurs at the same elevation as the beams upper flange projection.

Series 7 – Probe Site Three (3)

Photo 7a: Vertical cracking located at the north elevation of the buildings northeast corner (See Appendix B, SK-1 for probe and photo location).

Photo 7b: Probe site after removal of face brick and back-up.

Photo 7c: Masonry crack site in relation to structural steel column. Note that corrosion by-product (oxide jacking) is visible at the steel to masonry interface.

Photo 7d: Masonry crack viewed upward through the probe excavation.

Series 8 – East Elevation Parapet Spandrel & Probe Site Four (4)

Photo 8a: Spandrel panel, terra cotta coping and pier cap assembly located on the east elevation. Only minimal brick cracking and no discernable dumping of the east elevation parapet was evident including little or no terra cotta spandrel component cracking (See Appendix B, SK-2 for probe and photo location).

Photo 8b: Only one small (cracked) terra cotta panel was removed from this assembly to investigate the back-up construction.

Photo 8c: Upon removal of the cracked terra cotta unit, it was confirmed that the horizontal beam in this axis was encased in concrete and set back further into the wall assembly than the unit identified in photos 6b through 6d.

Probes

Probe sites were chosen based on surface cracking, displacement of surrounding masonry and a field evaluation as to whether the remaining masonry would be sufficiently stable after probe removal. Photographs regarding each probe site are contained in Appendix A with specific probe sites also located on elevation drawings, see Appendix B.

Probe Site #1: Included the removal of a complete terra cotta clad window lintel assembly, which exhibited severe cracking, and displacement of adjacent masonry. Corrosion was identified at the steel lintel, which both suspended the terra cotta components and framed the

window opening below (see Appendix A, photos 5a through 5d, and Appendix B, SK-1).

Probe Site #2: An incipient spall was removed from a 6th floor terra cotta spandrel assembly. This site was chosen because of wide spread panel cracking and significant displacement and cracking of adjacent brick assemblies. The steel supports used to both frame the roof and suspend the terra cotta assembly had corrosion build-up causing the masonry assemblies to crack (see Appendix A, photos 6a through 6e, and Appendix B, SK-1).

Probe Site #3: Located on the structure's northeast corner on the north face, brick were removed at a vertical crack site. The probe revealed that a main steel column oriented with its flange facing north had also corroded sufficiently to displace face brick causing the vertical cracking (see Appendix A, photos 7a through 7d, and Appendix B, SK-1).

Probe Site #4: Located on the structure's east elevation, the 9th floor spandrel panel assemblies exhibited little or only minimum cracking when compared to identical units located on the north elevation. In order to understand how these panels differed from the north elevation units, a small selective probe was removed to investigate their attachment. It was discovered that the roof framing perimeter beam at this location was concrete encased and that the terra cotta panels attachment detailing was significantly different from that uncovered in Probe #2 (see Appendix A, photos 8a through 8c, and Appendix B, SK-2).

IV. Research and Opinions

General Envelope Condition

The condition of the Pepper Building's exterior masonry envelope would be categorized as poor to fair based on its 75 plus years service and current abandoned status. However, its current state of disrepair, including a failed roof membrane and the condition of the roof to parapet interface left unaddressed, could be expected to accelerate the deterioration of the building's exterior envelope exponentially. Additionally, this review identified specific masonry façade components, which have deteriorated to a point where they pose a life safety threat to pedestrians using the surrounding sidewalks. This review is intended to address only the structure's two primary masonry elevations and make recommendations for their repair, preservation and/or improvements to original

detailing intended to maximize the long-term viability of the structure and its historic masonry façade.

Terra Cotta Window Lintel Cover Assemblies

On the two primary elevations, 85 double hung windows located on floors two through six share common detailing as identified previously in photo series #3 and probe site one (1). All of these sites exhibit varying levels of advanced deterioration, which if left unaddressed, will fail. Along with the failure of the terra cotta cladding, the deteriorative mechanism identified (corrosion of the exterior window frame lintel located directly above the terra cotta) also causes distress within adjacent components. Façade components that are compromised because of the lintel corrosion include: 1) the terra cotta lintel cladding; 2) the window frames below the lintel; 3) the masonry clad piers in which the lintel bears; 4) the decorative brick masonry spandrel panels located above the lintel floors two (2) through five (5) of which it supports; and 5) the sixth floor terra cotta spandrel/parapet assembly.

Terra Cotta Spandrel Assemblies Sixth (6th) Floor

On the north elevation only, ten (10) terra cotta spandrel assemblies exhibit advanced deterioration (see photo series #6 and probe site #2). Again, these assemblies currently pose a life safety concern. The mechanisms, which are the primary cause of this deterioration, include corrosion of the 6th floor window lintel (see above), and corrosion of a roof-framing beam, which also provides bearing for the primary terra cotta spandrel assemblies components. Adjacent components and assemblies adversely affected by this condition include: 1) the terra cotta spandrel panel (made up of twenty-three (23) individual pieces); 2) the terra cotta coping which also caps the spandrel; 3) the masonry clad piers which also provide cover for the roof framing beam; and 4) the entire parapet/pier cap assembly which is lifted and rotated inward (dumped) toward the building's interior.

Miscellaneous Items

Additional repairs to the masonry façade required to preserve this asset would include the following items:

- A. The pinning and introduction of a vertical control joint at or near existing vertical pier/column cracking, see photo series #7 and probe site #3.
- B. The removal and flashing of the east elevation copings and pier caps where the 6th floor terra cotta spandrel panels exhibit only displacement caused by the window lintels. See photo series #8 and probe site #4.

- C. Miscellaneous repointing of terra cotta and masonry not included in major repairs identified previously. Sometime during the course of the structure's service life, there are indications that a major repointing project was undertaken most probably in an attempt to slow or repair deterioration associated with the window lintels and cracking of the 6th floor spandrels. It appears that this repointing (shell pointing) was simply installed into the original masonry joints, which have been constructed using a raked (recessed) joint configuration as an intricate visual component of the original masonry's appearance. We would not recommend removing all of this remedial repointing due to cost and/or possible damage to the masonry unit joint interfaces.

V. Recommendations

Critical Life Safety Issues

Based on this review, specific components have been identified which could fall to the adjacent sidewalks without warning. Consideration should be given to either cordon off the surrounding sidewalks or construct a sidewalk canopy designed by a licensed professional engineer to protect pedestrians and adjacent property.

Preservation and Repair of the Masonry Façade Components

The following preliminary work scopes are intended to stabilize critically deteriorated assemblies identified, repair structural elements hidden from view behind these elements and make provisions in the repairs to circumvent future deterioration caused by original design and construction errors. This work scope is intended to address the masonry envelope components only and will not identify related required work items including removal of the windows, roof replacement, etc.

Work Item #1 – Final Design and Pilot Work

Extensive experience gained from working on similar projects leads us to recommend approaching this work using the pilot project concept. We would recommend completing one complete bay, which would allow the preservation team to fully understand the deterioration of hidden structural components, identify the best replacement materials for the glazed architectural terra cotta, matching brick replacements and the installation of flashings at numerous

locations designed to stop future deterioration and maximize the effectiveness of the new roof. This initial work area would encompass all of the applicable following work scopes.

Work Item #2 - Access

- A. Investigate the condition of sidewalk vaults detailed along both 4th and Liberty Streets, with regard to their capacity to carry scaffold and/or mast climbing work platforms.
- B. Establish the most cost effective access scaffolding, erect and maintain for the duration of the project.

Work Item #3 – Terra Cotta Window Lintels

- A. Access and stabilize brick or terra cotta spandrels located above the lintel assemblies.
- B. Remove the terra cotta lintel covers.
- C. Remove the steel lintel (exterior) including its bearing areas which extend outward into the adjacent brick column covers or piers.
- D. Design and install a new lintel to support the masonry above and accommodate the replacement terra cotta materials meeting applicable codes. Also include proper flashing for protection.
- E. Replace the original terra cotta with either precast concrete coated to approximate the original glaze finish, glass fiber reinforced concrete (GFRC) or new terra cotta.
- F. Repair the adjacent brick masonry removed to access the lintel, toothing out brick units and matching the original configuration.
- G. Stabilize and repair the spandrel material above the new lintel, either basket weave brick or terra cotta.

Work Item #4 – North Elevation 6th Floor Terra Cotta Spandrel Panels & Parapet

- A. Design temporary roofing interface to protect the structure below the parapet.

- B. Carefully remove starting at coping, all terra cotta including pier caps, copings, and spandrel panel components down to the 6th floor window lintel.
- C. From the 6th floor window lintel up, strip all displaced face brick to solid back up.
- D. Repair or replace the steel-framing member across this elevation after structural assessment. This work could be expected to include removal of all corrosion byproduct preparation and coating with an appropriate rust inhibitive coating system.
- E. Provide replacement components for broken and damaged terra cotta units, reusing all salvageable materials.
- F. Rebuild the spandrel panels, brick piers and column covers incorporating new thru-wall flashings with provisions to properly interface with the new roof. Install thru-wall flashing beneath all pier caps and copings to include pinning as required by code.

Work Item #5 – East Elevation Parapet

- A. Design temporary roofing interface to protect the structure below the parapet.
- B. Carefully remove all terra cotta copings and pier caps saving them for reuse.
- C. Install new thru-wall flashing with provisions to terminate the new roof.
- D. Reset terra cotta coping and pier caps to include pinning as required by code.

Work Item #6 – Miscellaneous Repairs

- A. Install new vertical control/expansion joints at columns exhibiting corrosion induced cracking.
- B. At intermediate levels (every two floors), at vertical columns which exhibit corrosion-induced cracking, install horizontal flashings designed to drain the assembly.

- C. Saw cut and tuck point 100% of all remaining terra cotta components not scheduled for rebuilding.
- D. Perform spot pointing at all deteriorated brick masonry joints not rebuilt under other work items.
- E. Wash masonry per the Secretary of the Interior's standards.

Summary

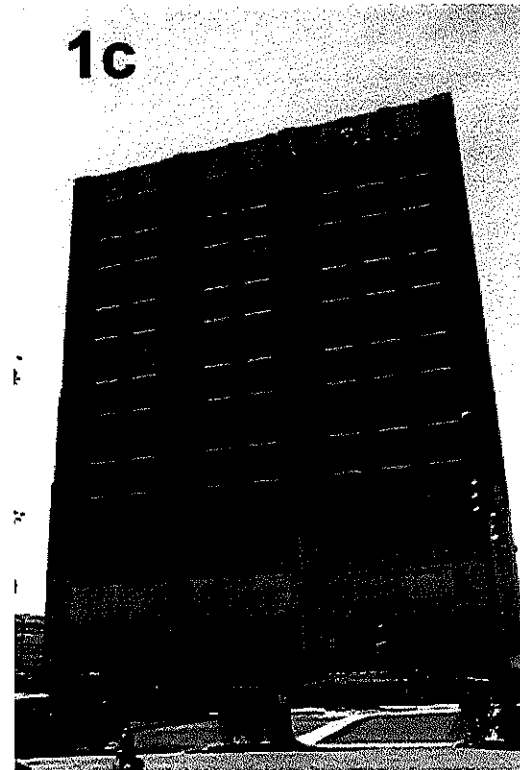
The primary elevations of the Pepper Building's masonry exhibit deterioration consistent with similar buildings of this age and construction. While the repairs recommended are substantial, good preservation which includes the introduction of appropriate flashings, along with addressing original detailing deficiencies, will ensure that this interesting colorful façade is preserved for another 75+ years.

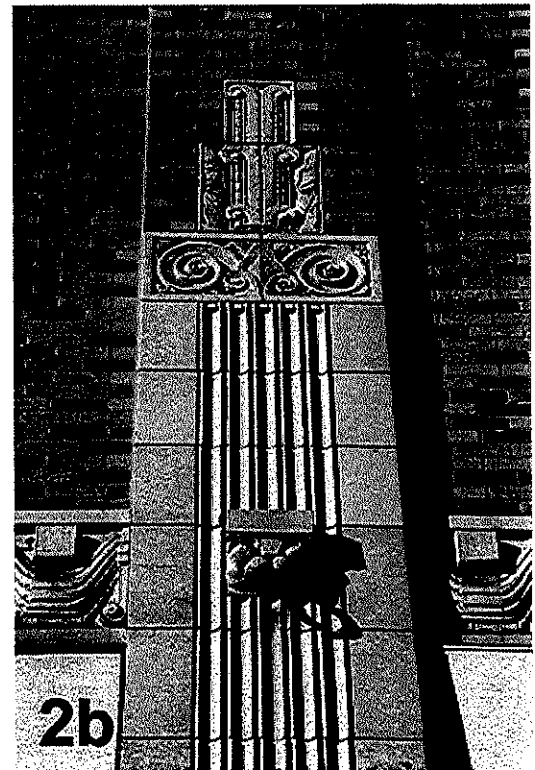
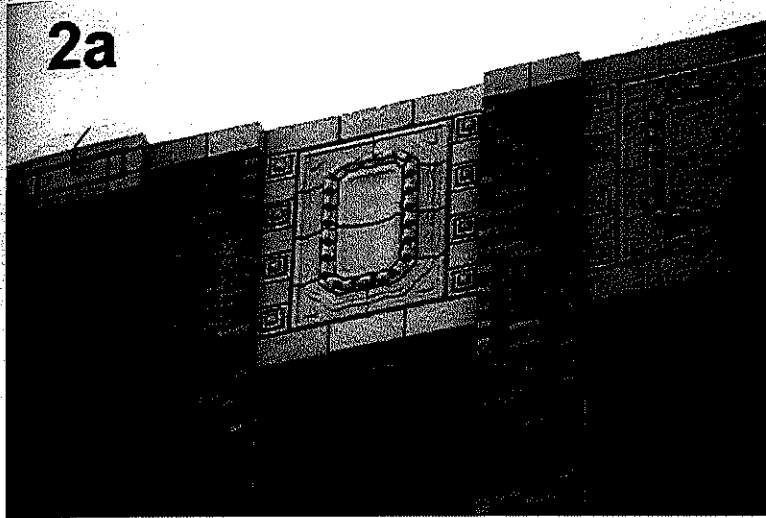
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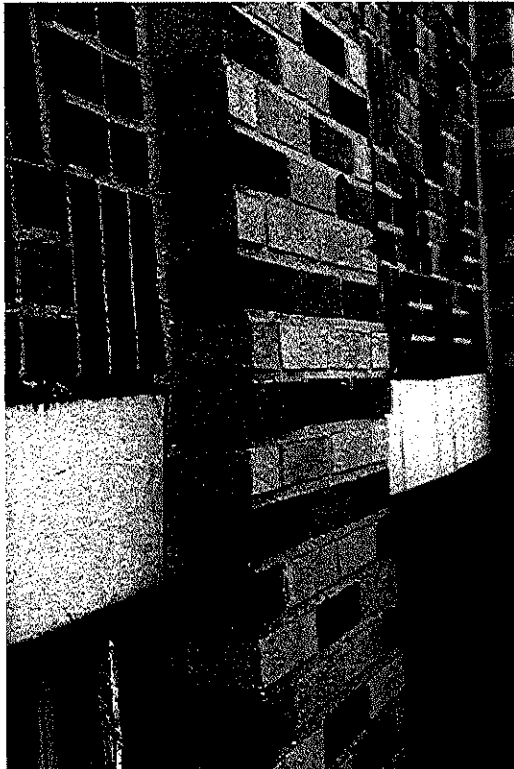
Jeffrey L. Erdly, President
Masonry Preservation Services, Inc.

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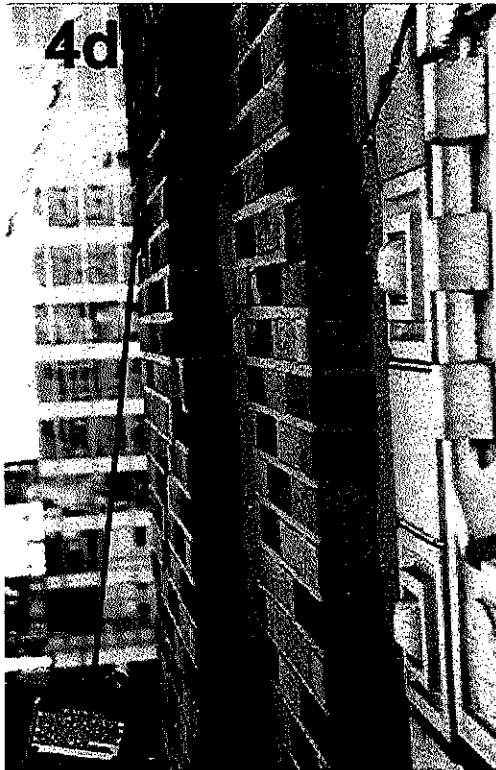
Attached: Appendix A Photographs
 Appendix B Elevation Drawings



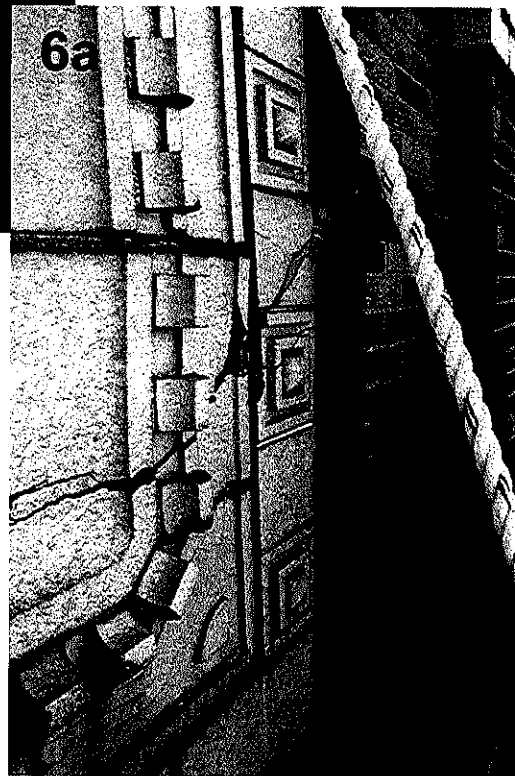
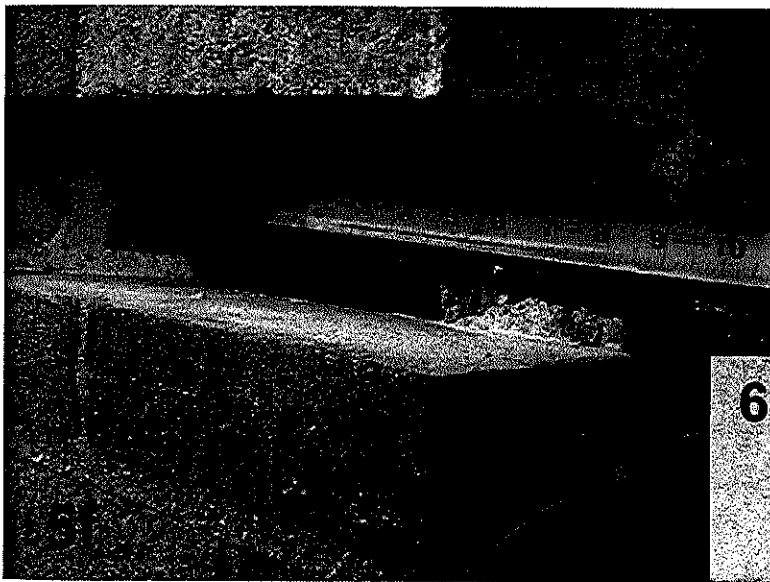
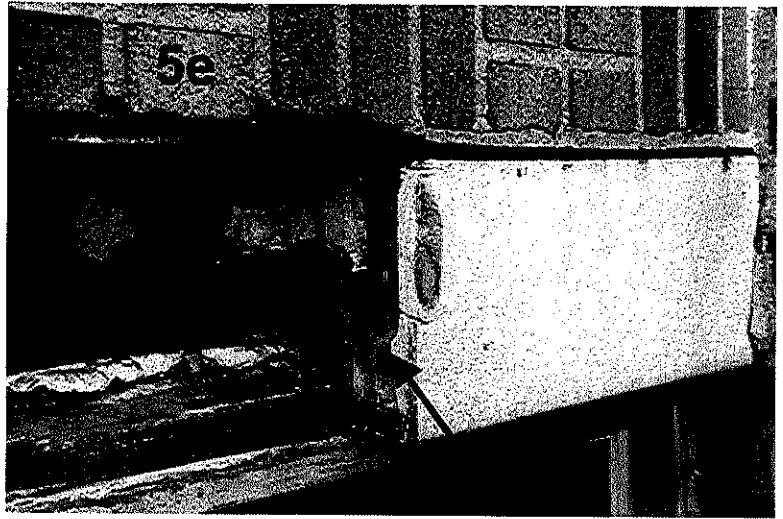




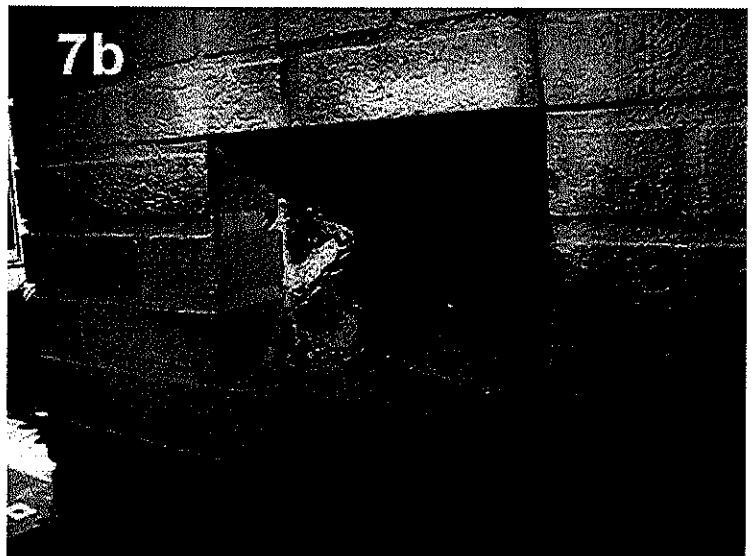
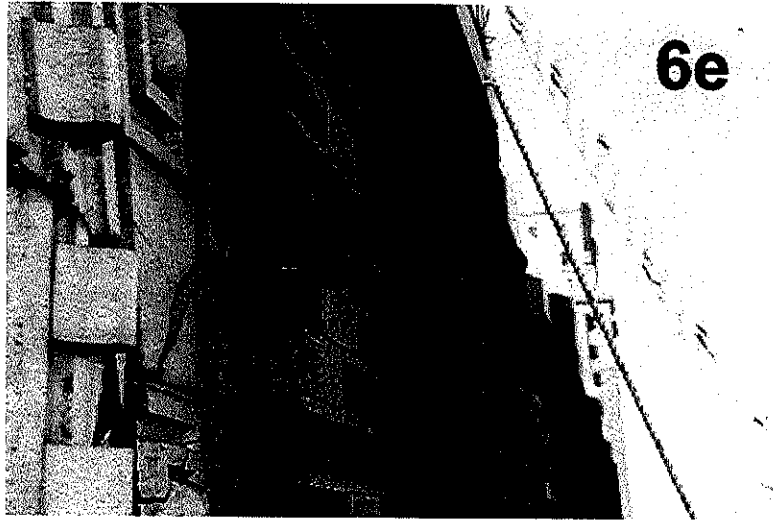


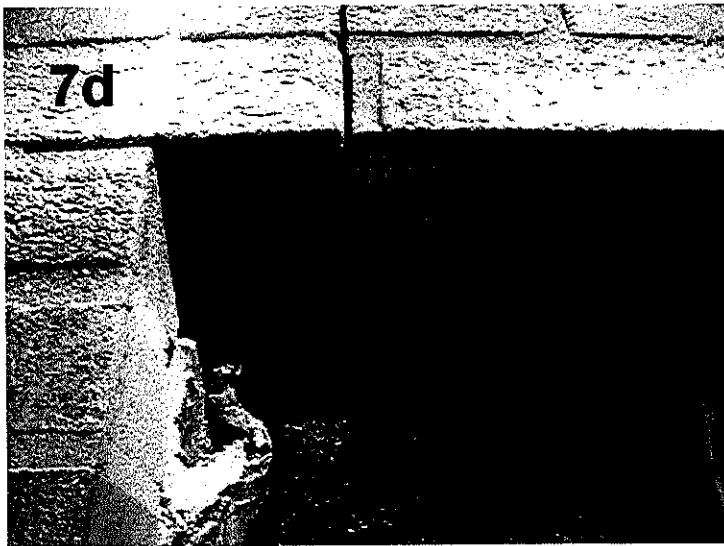


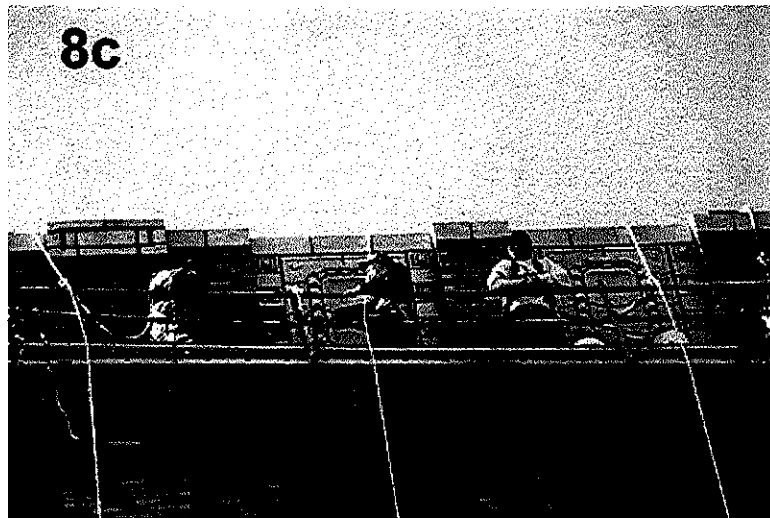












Probe Site 2 - Photos 6a through 6e

Photo 4b

Photo 4a

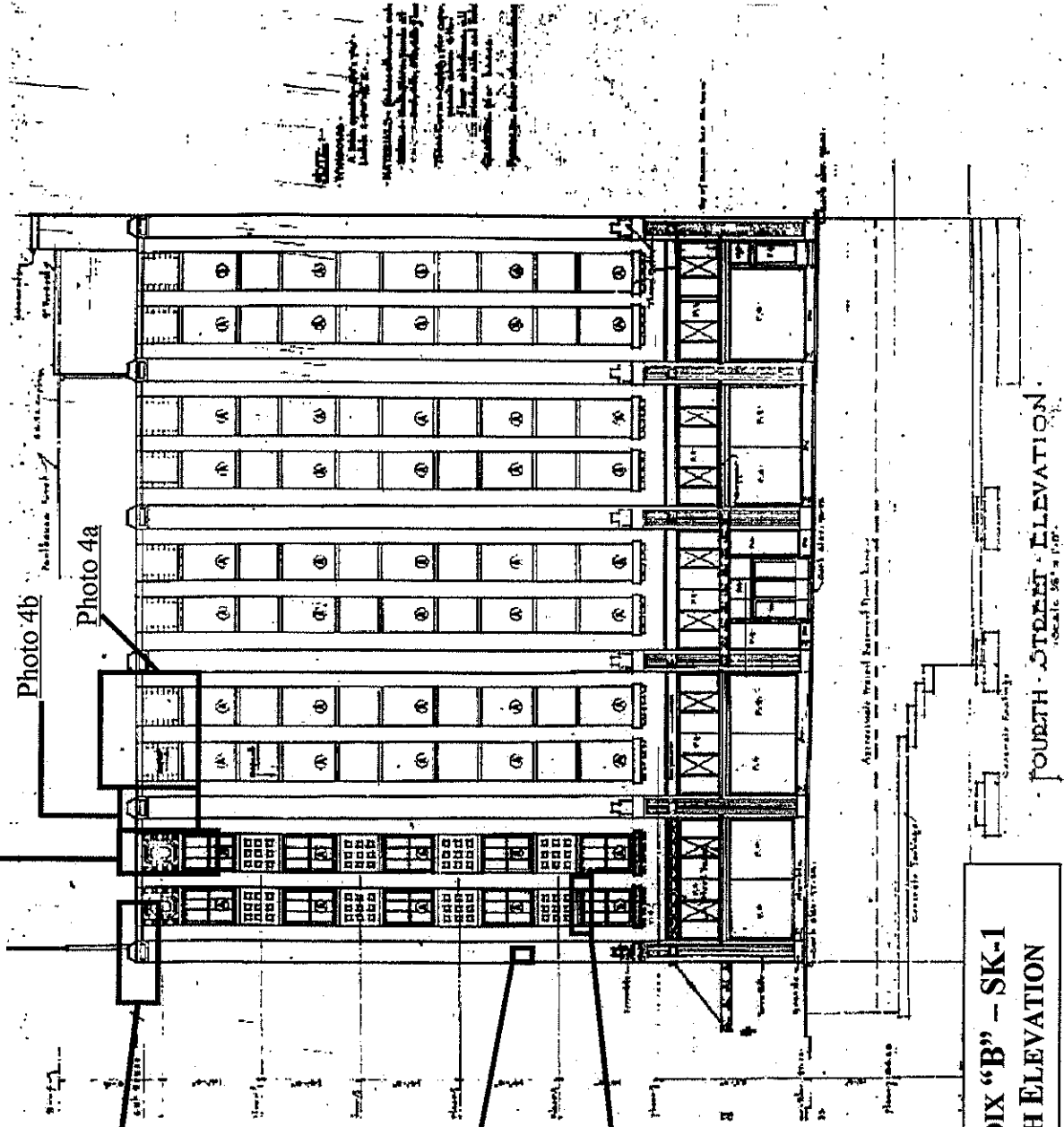
Photos 4c and 4d

Probe Site 3

Photos 7a through 7d

Probe Site 1

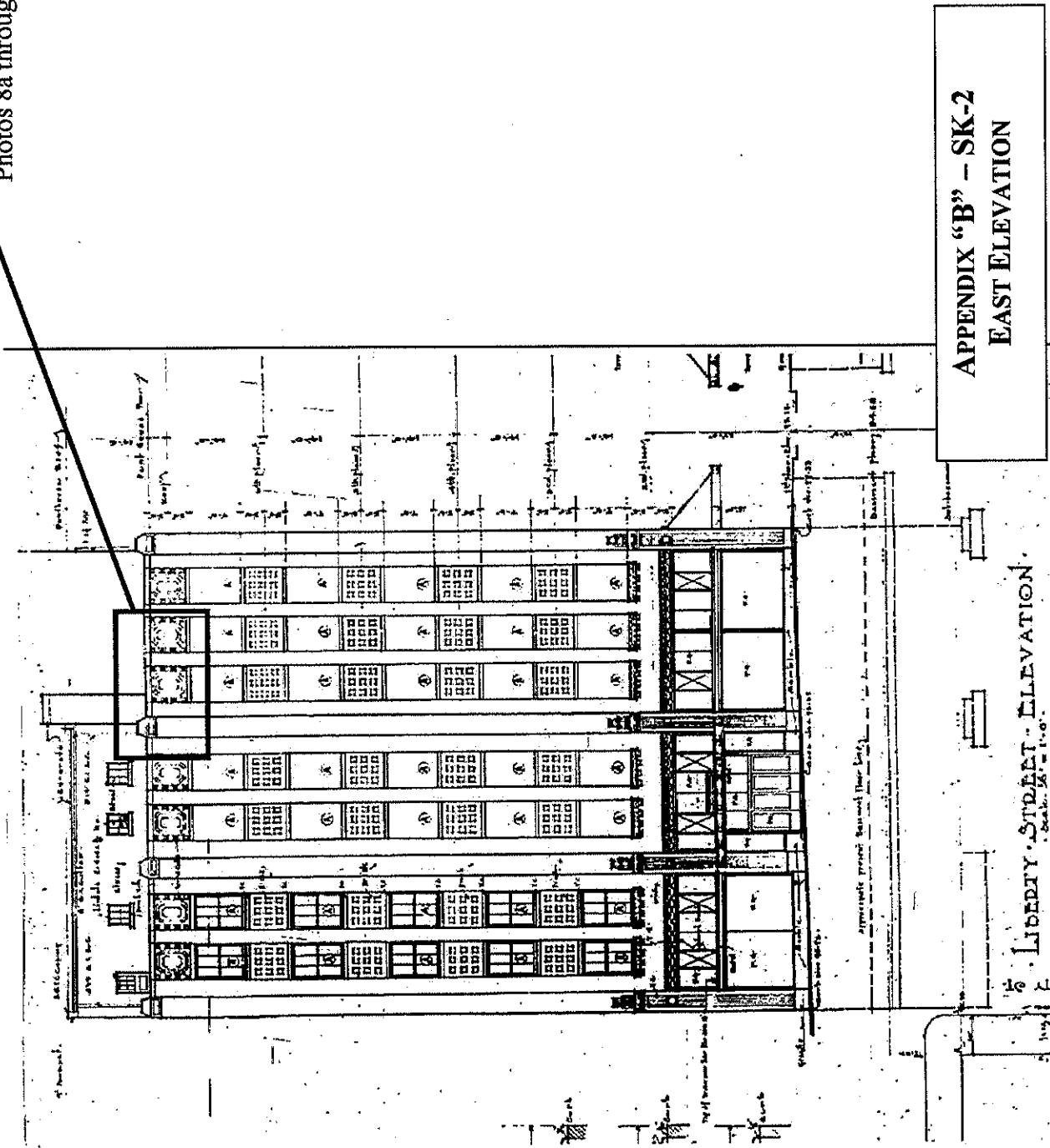
Photos 5a through 5f



APPENDIX "B" - SK-1
 NORTH ELEVATION

FOURTH STREET ELEVATION
 SCALE 3/8" = 1'-0"

Probe Site 4
 Photos 8a through 8c



APPENDIX "B" - SK-2
 EAST ELEVATION

LIBERTY STREET - ELEVATION