FEASIBILITY STUDY OF INTEGRATING THE NEW DEVELOPMENT WITH THE EXISTING BUILDING

AT

48 ABELL STREET, TORONTO

Client: Verdiroc Project Management Inc.

Consultants: HALSALL ASSOCIATES LIMITED

Project No.: 206xR217

Date: June 19, 2006

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Authorization

This report was prepared at the request of Verdiroc Project Management Inc.

1.2 Objective

The purpose of our investigation was to determine the general condition of the existing structure, and to review the viability of incorporating some or all of the existing building at 48 Abell Street into the new development of the site. Two optional strategies have been considered to incorporate the existing building or portions of its facades into the proposed development of the site. Option 1 would involve converting the building to form part of the proposed new structure. Option 2 would involve integrating the elements of the existing brick façades into the new building elevations at the lower storeys. To assess the existing conditions and these 2 options, a visual review of the building structure was undertaken and strength and water absorption tests were also performed on the brick.

1.3 General Description and Background

We visited the site on May 11, 2006 for a general overview of the condition of the structure and to meet with the representatives from Verdiroc (Project Manager), AREA (Architects Rasch Eckler Associates) Ltd. (Heritage Architects), Bousfields Inc. (Consulting Planners), and Merv Hollander of Aristocrat Property Management (Owner).

The proposed redevelopment of the land includes the demolition of the existing structure. It is our understanding that the new proposed structure will consist of two phases. Phase 1 is a 9 to 19 storey residential building at the west side of the property. Phase 2 is a 12 to 19 storey building at the east side of the property and a mid-rise portion on the north side of the property ranging from 6 to 9 storeys. Both phases will incorporate 2 levels of underground parking. Phase 2 is proposed to have an underground parking facility that has a larger footprint than the existing structure. However, the Heritage Preservation Services staff at the City is currently evaluating the cultural heritage attributes of the existing building, in particular the north and east facades and small portions of the south and west facades

1.4 Limitations

This work is intended solely for the Client(s) named. The scope of work and related responsibilities are defined in the Conditions of Assignment. Any use which a third party makes of this work, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Decisions made or actions taken as a result of our work shall be the responsibility of the parties directly involved in the decisions or actions. Any third party user of this report specifically denies any right to any claims, whether in contract, tort and/or any other cause of action in law, against the Consultant (including Sub-Consultants, their officers, agents and employees).

The work reflects the Consultant's best judgement in light of the information reviewed by them at the time of preparation. Unless otherwise agreed in writing by Halsall, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. This is not a certification of compliance with past or present regulations. No portion of this report may be used as a separate entity; it is written to be read in its entirety.

This work does not wholly eliminate uncertainty regarding the potential for existing or future costs, hazards or losses in connection with a property. No physical or destructive testing and no design calculations have been performed unless specifically recorded. Conditions existing but not recorded were not apparent given the level of study undertaken. Only conditions actually seen during examination of representative samples can be said to have been appraised and comments on the balance of the conditions are assumptions based upon extrapolation. We can perform further investigation on items of concern if so required.

2. DOCUMENTS REVIEWED

Existing structural drawings do not exist as the building was constructed in circa 1887. The proposed new plans and elevations were available and provided by Climans Green Liang Architects and AREA Ltd. Also available was the City of Toronto Heritage Preservation Services staff report dated May 4, 2006 to provide background information about the building.

3. OBSERVATIONS AND ASSESSMENT

3.1 Existing Structure

The structure consists of three buildings that were likely constructed at different times. The buildings are approximately 120 years old. The type of framing is generally consistent, however there are minor differences in the type of framing through each of the buildings. There are two sections with three storeys plus a basement (north and east wings), and a two storey section without a basement (west wing). It appears that each of the sections may have been built at different times. The buildings are currently occupied.

During our visit we performed a visual review of the various types of structural components. The entire structural condition was not determined due to the limited time available in order to respond to the City staff prior to the next Toronto Preservation Board meeting. The interior finishes concealed portions of the structure, hence, it was not visible in all the areas reviewed. Connections were not evaluated.

The typical construction is heavy post and beam timber construction. Wood joists span from beam to beam (figure 1). The type of floor deck was not determined at the time of the visit. Exterior walls are load bearing clay brick masonry (figure 2). The exterior walls are tied using what appears to be a cast iron tie-rod construction that ties the timber floor structure to the exterior walls terminating at round plates on the facades (figure 3). In some cases, the exterior plates do not appear to have proper bearing (figure 4). It is not clear if these iron rods and plates were part of the original (c.1887) design and construction, or if they were installed later in order to remedy bowing of the exterior masonry walls away from the floor structure.

It appears that the exterior grade has been raised since the date of construction given that there are blocked windows in the basement, but the change of grade height is not known (figure 5). The footings were not visible at the time of the visit, but the owner reported that the bottom of the basement walls were only 1 to 1½ feet below the basement slab on grade. Mr. Eckler of Architects Rasch Eckler Associates Ltd. (AREA) advised us of his opinion that the foundation walls may rest directly on soil without any footings underneath, however, the bottom of the walls were not visible for confirmation. Timber columns are presently supported on concrete piers of varying heights at the basement slab level. It was apparent that several modifications/reinforcements were done to the structure over the life of the building and may need to be considered if these options are to be implemented. The upper floors had a slope toward the center of the building but it was not evident whether this was original construction or settlement of the columns and footings.

Generally, the condition of the structure varies as would be expected for the age of the structure. Several structural deficiencies were noted and will be itemized in the following section. For example, we noted checking (minor splitting due to drying shrinkage) of the heavy timber beams (figure 6) and twisting in the south-east corner of the basement (figure 7) and at the roof of the east wing. The beams that had twisted had been packed previously for bearing. Some areas of the roof had visible signs of leaks through the interior finishes, but the condition of the roof structure at these locations was not visible. The roof of the west wing consisted of an indeterminate wood deck and steel beams (figure 8). Cracking in the brick was noted along the south elevation adjacent to an overhead door (figure 9). It was also noted that there may have been a fire along the south east elevation (figure 10). Further investigation is required as to the impact the fire may have had to the structure. These deficiencies should be addressed as part of regular maintenance.

3.2 Structural Deficiencies & Immediate Action Required

One location of concern requiring immediate action was in the basement. An interior wood column of the east wing had been removed (reason unknown) and replaced with a shoring post (figure 6). This post likely supports columns that support the additional floors above. This type of post is usually only considered as a temporary measure for unoccupied spaces. We are unsure as to how long this post has been in place. However, we recommend that the owner retain an engineer to investigate the adequacy of this post further to ensure that it meets the code requirements. This is required immediately regardless of the direction of the project to ensure the structural integrity of the building.

A more comprehensive inspection of the building complex may uncover other deficiencies requiring rectification. In this preliminary review, however, several conditions were found that may require remedial measures to maintain the building structure:

- Some timber beams have sagged and the deck may not be fully supported.
- Some timber beams are twisted and may require improvements to the bearing supports.
- Basements wood posts have deterioration at their base caused, according to the owner, by water infiltration on the floor.

3.3 Masonry Testing & Evaluation

In a general review of the exterior masonry, numerous brick units had been damaged by exposure to the ambient freeze-thaw conditions typical to the southern Ontario climate (figure 11). Clay bricks typical of the time of the structure's construction were manufactured by similar methods as employed today. However, the ability of these bricks to resist fluctuations in temperature, relative humidity, and moisture absorption is significantly less than bricks used in current building construction. In particular, bricks from the 19th century are known to deteriorate once the exterior face of the brick has been damaged due to freeze-thaw exposure.

The majority of the clay brick masonry on the west wing was exposed; however, the brick on the north and east wings had been rendered with stucco material. The stucco rendering was a soft and porous material, the age of which could not be determined. The stucco was observed to be delaminating in isolated locations and it is uncertain to us what the condition of the brick would have been at the time the stucco was applied. This stucco treatment may have contributed to the brick deterioration due to the moisture absorption of the stucco, which could have contributed to the freeze-thaw damage, i.e., the cracking and spalling which was observed (figure 11) on the north and east stucco facades. The damage in these areas was more significant than the on other elevations.

In order to assess the condition of the brick, we were requested by AREA to conduct testing of the exterior clay-brick masonry to determine its strength and to review the condition of the mortar. A copy the compressive load testing is attached in Appendix B. We selected several brick units from the building that were not visibly damaged as yet by freeze-thaw exposure at locations at the south-east corner and the at the north elevation (figure 12). Golder Associates confirmed that the three specimens of brick submitted for compressive load testing, as required by CSA-A82.2, yielded an average compressive strength of 20.8 MPa. This result is considered to be within the average range for bricks used during the timeframe in which these buildings were constructed. Although these results suggest the masonry units are in satisfactory condition, the result is indicative only for those units not damaged due to freeze-thaw exposure. The freeze-thaw damaged masonry units have significantly less compressive strength.

Key observation we made during the removal of the brick specimens include:

- The mortar was soft, i.e., hand pressure was sufficient to break the mortar or abrade the surface.
- The brick units removed were very brittle and cracked easily when handled after removal

Although the mortar was not tested for compressive strength at the time of this report, the mortar exhibited physical properties that raise our concern as to its structural capacity. The strength and durability in the mortar is not sufficient to rely upon, in its current condition, to preserve the structural integrity of the exterior masonry walls.

In addition to the brick compressive strength testing, we performed water uptake testing and determined that the water absorption capacity was substantively greater than would be considered acceptable for durable exposure. Three different conditions of the brick were sampled for this test (figure 13).

According to the table of results below, the water absorption capacity was substantively greater because of the rendering of the stucco, i.e. Test Sample 2.

Water Head	Test 1 Unit 101 – North Wall	Test 2 Unit 103 – North Wall	Test 3 Southeast Corner
Stucco/Brick	Debonded Stucco	Stucco on Brick	Stucco Removed
0.5 mL	0:06 min	0:05 min	0:08 min
5.0 mL	3:20 min	1:10 min	1:32min

Test Location 1 – North Elevation, Unit 101, the stucco had debonded from the exterior brick wythe.

Test Location 2 – North Elevation, Unit 103, the stucco was still bonded to the brick

Test Location 3 – East Elevation, South-East Corner, the stucco was removed from brick

In our experience, it is typical for the following range of water absorption to occur with clay brick masonry, the lower threshold of which leads us to be concerned about the freeze-thaw durability:

- 0.5 mL water head pressure, 0:05 to 6:00 minutes or greater
- 5.0 mL water head pressure, 2:00 to 20:00 minutes or greater

The water was more readily absorbed into the stucco rendering than the brick area tested. In the areas where the brick had deteriorated due to freeze-thaw exposure, it is our opinion that the stucco does not provide a significant level of moisture protection. The removal of the stucco rendering to reinstate the original exterior walls would risk the integrity of the facing of the brick units and would adversely affect the freeze-thaw durability for these units.

4.0 OPTIONS FOR RETENTION OF EXISTING BUILDING COMPONENTS

4.1 Option 1: Upgrade and Integrate the Existing Structure

Although there are code-related issues for the type of occupancy inside the building (non-structural) that will need to be addressed during the conversion to a residential space, the scope of this report is limited to potential structural issues. The condition of the structure will still need to be evaluated in several locations that were not accessible.

In our experience, floors designed for industrial use generally are designed for a higher load than is required for residential use. Since no drawings are available, the design loads are not known and further evaluation of the structure would be required to determine the allowable loads. Since the buildings' construction in the late nineteenth century, design codes and structural methods have changed and been upgraded. For instance, the allowable stress in wood has been decreased from the original design values. However, it is our opinion that upon further investigation, the floors' structural capacity will still likely satisfy current codes for a residential occupancy.

However, it is apparent that the fire protection of the existing structural elements may not meet the requirements of the Ontario Building Code (OBC) and does not have the durability requirement necessary for parking garage use. Mr. Eckler of AREA has advised us that a fire separation between units, for example, is compromised by the continuity of the heavy timber beams across unit partitions. Even if all the combustible wood construction were completely protected in fire-rated drywall assembly, the fire separation of the structure from one unit to another would still not be achieved with the existing structure. A new supplementary structure would have to be added to or replace the existing wood structure. A code consultant and the city officials can offer guidance for these issues of compliance with the fire separation and other aspects of the OBC.

The existing structure cannot support the gravity loads of the proposed new buildings. It is our understanding that previous investigations for vertical expansion have been undertaken determining that the existing structure cannot support any additional loads. We were not involved in this investigation but based on the type of construction and the scope of the new construction, we would not recommend adding any additional load to the structure. A previous development application in 1999 prepared by the owner, Mr. Hollander, encompassed only the existing building envelope specifically because further loads from additional floors could not be supported. Therefore, any new structure would have to be constructed by extending columns through the existing structure to a new foundation system. The vertical loads from the new structure would be independent of the existing structure. The new structure would have to be designed as if the existing structure could fall away without compromising the new structure above. Due to the height of the existing building, this would increase the structural member sizes that pass through the three existing storeys.

The code requirements for lateral loads (wind and seismic) are considered independently from the type of structural load when changing the use from industrial to residential. Since the building has been standing for 120 years, it is our opinion that it has likely experienced the design wind load and has been able to resist this load satisfactorily. However, the code requires a seismic upgrade if a major change in occupancy will occur or if there is an increase in the hazard index. AREA has advised us that a change from industrial to residential occupancy generates a hazard index -- increase from 4 to 6 according to Part 11 Renovation, articles 11.2.1.1(1) and (2). The new structure could be designed for the additional seismic loads. However, the existing building may have to be seismically upgraded independently from the new structure in this case of an increase in the hazard index. A code consultant or city official can offer guidance for issues of earthquake design requirements.

The existing basement does not have the proper clearance for cars and is constructed with a combustible timber structure. The existing column layout is also not ideal for parking lanes. Therefore, an entirely new substructure, probably constructed of reinforced concrete, would have to be constructed below or replace the existing heavy timber basement structure. Deeper beams will be required to support the ground floor together with additional mechanical services such as sprinkler pipes and ramp structures will require additional clearance. Since the bottom of the foundation walls are relatively shallow, underpinning of the existing foundation walls is highly likely. This sub-basement work will extend lower than the existing structure and would undermine the original building. The preceding description contemplates a single parking level whereas 2 underground parking levels are proposed to satisfy the City By-Law parking requirements. This would involve the excavation shoring of the site, shoring of the wall at grade level (needling, etc.), new beams and columns installed below grade to support the wall and existing structure above. The two subgrade levels would significantly undermine the existing structure. Since the exterior brickwork has been shown to be sensitive to modifications, significant damage to the exterior wall may result in costly repairs. Cracking, settlement and buckling problems with the exterior masonry is likely to occur to some degree. There is a risk of destabilizing the masonry during the process of inserting a new ground floor slab and supporting structure for these exterior walls. The risk of damage and potential safety hazards of performing this work, based on the condition of the existing masonry, does not make this alternative viable.

In summary, this option of integrating the existing structure into the new development bears several concerns:

- A supplementary or replacement structure in the existing building will be required to maintain fire separations.
- The new columns serving the floors above 3-storeys will interrupt and compromise the existing timber structure. Reinforcing will be required at these locations.
- Constructing a new substructure of 2 parking levels is a hazardous and cost-prohibitive alternative. Based on the condition of the exterior masonry, it is likely that a safe and economical solution to temporarily support the structure is not possible.

4.2 Option 2: Incorporate Elements of the Existing Façade

The second option that could be considered is to incorporate a portion of the existing building facade either through retention or reconstruction.

Typically building facades could be stabilized and integrated into the new structure by first temporarily bracing the wall to the ground beyond the excavation shoring line using a temporary steel bracing system fastened to the full height of the wall. The new structure is then constructed and the wall is connected to the new structure for support.

We understand that the amount of parking required for this development requires two subgrade levels that would extend well below the existing foundation walls. In addition, the new perimeter foundation wall of the parking garage will be outside of and not aligned with the proposed above-grade building floor plate. It is generally more cost effective if the façade is on the new exterior foundation wall or if the existing foundation can be retained and the new foundation wall is built inside of the existing foundation wall. The existing structure, as described above, has foundations that are shallow relative to the new proposed parking structure. Significant savings will be achieved if the parking facility is shifted such that exterior walls line up. However, the space requirements for a functional parking garage area (with sufficient parking stalls) cannot fit within the current footprint of the buildings. Since the underground parking extends beyond the above-grade floor plate, the bracing of the existing facades from the outside and below is significantly more difficult with an increased risk of damage to the building and expensive to construct safely.

The method of exterior bracing for preserving the exterior walls typically depends on the type of wall foundations. Unfortunately, the type of footing and its condition is unknown without further investigation. However, the method of bracing exterior walls typically depends on the stability of the support for the exterior walls. Both the interior and exterior substructure would require significant shoring to sub-excavate and construct the new supporting structure. This would involve the excavation shoring of the site, shoring of the wall at grade level (needling, etc.), new beams and columns installed below grade to support the wall, and a temporary bracing system to maintain the existing façade while the structure behind is removed. Since the exterior brickwork has been shown to be extremely sensitive to modifications, significant damage to the façade may occur resulting in an unacceptable cladding element or an unacceptable structural element. Temporary anchorages to the wall may also result in unacceptable damage to the materials. We do not recommend this alternative be considered based on this investigative work.

One variation on this second option that may be considered is to recreate the existing façade in some form using salvaged clay brick units although this should be considered only in a limited extent due to variability of the brick and the cost. The salvaged brick should be selected subject to further analysis that will be required to determine if the materials are suitable for use in construction of a new building envelope. Current practice would be to utilize the salvaged brick as a masonry veneer within the present-day standards of a rainscreen cavity wall, however, the brick would not conform to current standards for freeze-thaw durability so its use should be limited to low exposure to wind-driven rain, the dynamics of which should be considered in the architecture of the new development.

5. CONCLUSIONS

Two options were presented based on the general condition of the structure. The first option is to integrate the new structure with the existing by upgrading or, more likely, replacing the existing framing as required. The second option is to incorporate elements (aesthetic or physical) of the existing brick facade within the new construction. The remaining structure would then be demolished.

Many brick units have been damaged by freeze-thaw exposure. The brick units covered with stucco are of concern because the integrity of the covered bricks is unknown. The mortar was observed to be soft and easily damaged during the brick removals, which indicates that movement or vibration imposed upon the walls during the course of new construction could cause significant damage to the exterior wall assembly. The bricks removed for testing were observed to crack easily, and this indicates to us that the brick units may be easily damaged if made part of the new construction.

The structural deficiencies noted are typical for this type and age of construction. These deficiencies are of concern insofar as to how current methods may be utilized to update the structure to current code requirements.

Our general conclusion is that neither option is considered viable for this development. The variation on Option 2 involving the reconstruction of the existing facades using selected salvaged clay brick masonry units may be possible in limited extent. The qualification for this reconstruction strategy must be predicated on the further testing and analysis of the brick units' durability. Also, the architecture of the new building should consider the use of these bricks for portions of the façade that limited in exposure to wind-driven rain and wetting, thus reducing the effect of potential freeze-thaw damage.

6. RECOMMENDATIONS

Both options that attempt to retain either the existing structure or the existing façade are not viable due to the risk of damage to the existing building elements. The structural design considerations discussed above that could be used to maintain some of the existing building would, in any event, be cost-prohibitive due to the measures that would have to be undertaken to preserve the exterior masonry walls due to the condition of the brick.

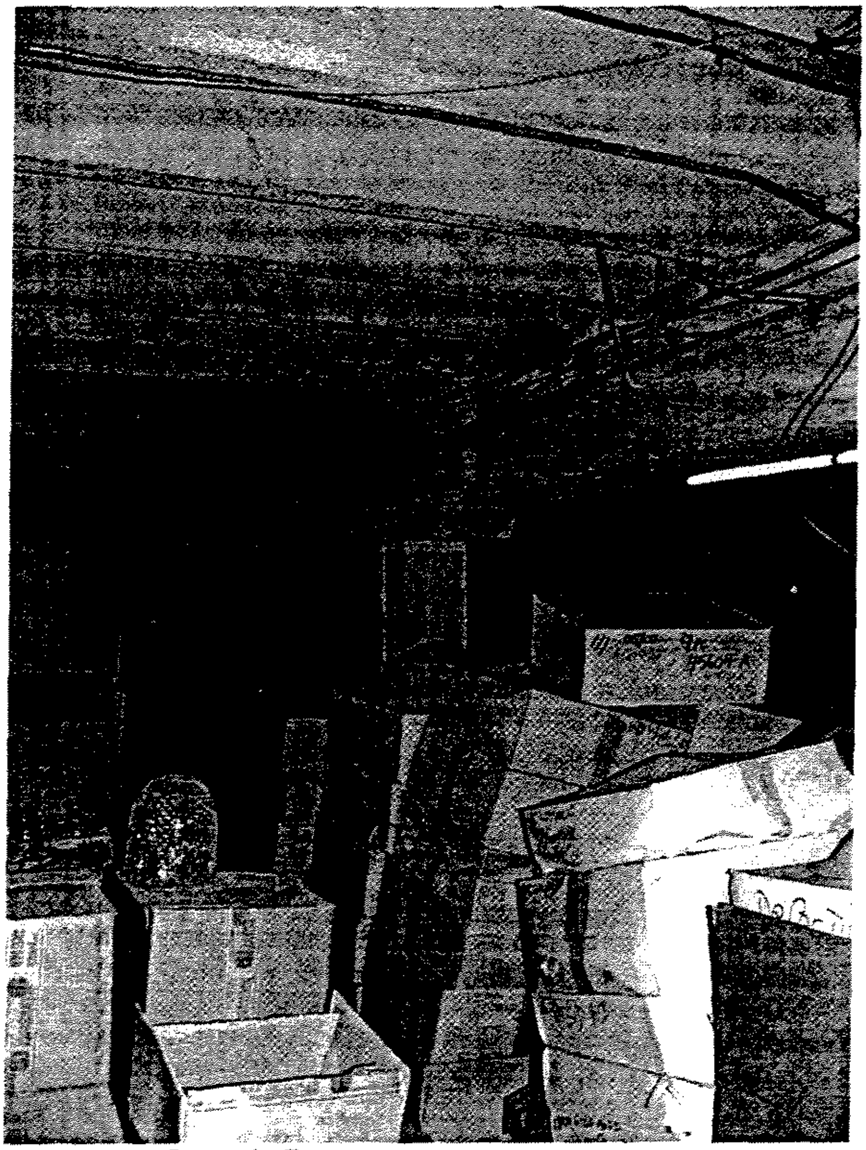

PHOTO 1: TYPICAL BASEMENT CONSTRUCTION

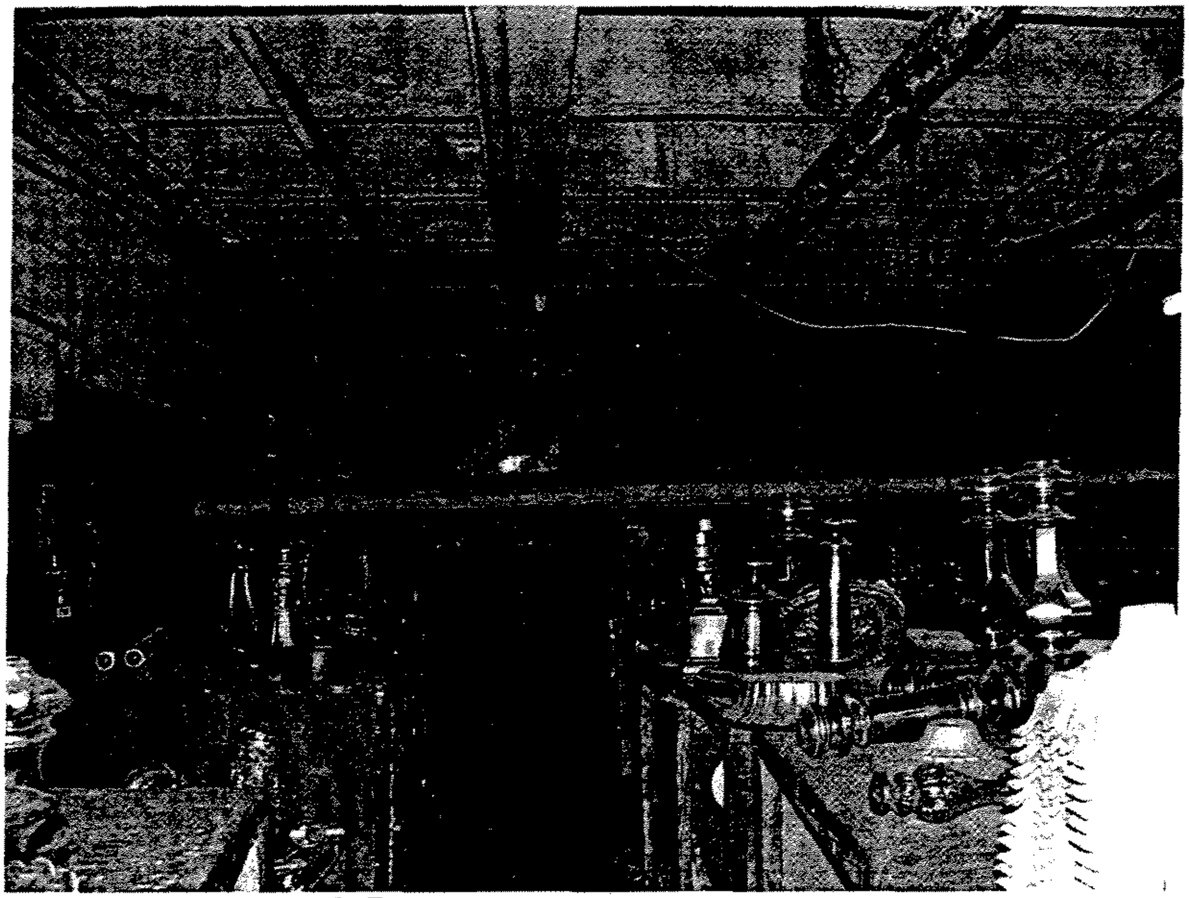

PHOTO 2: TYPICAL EXTERIOR BASEMENT WALL

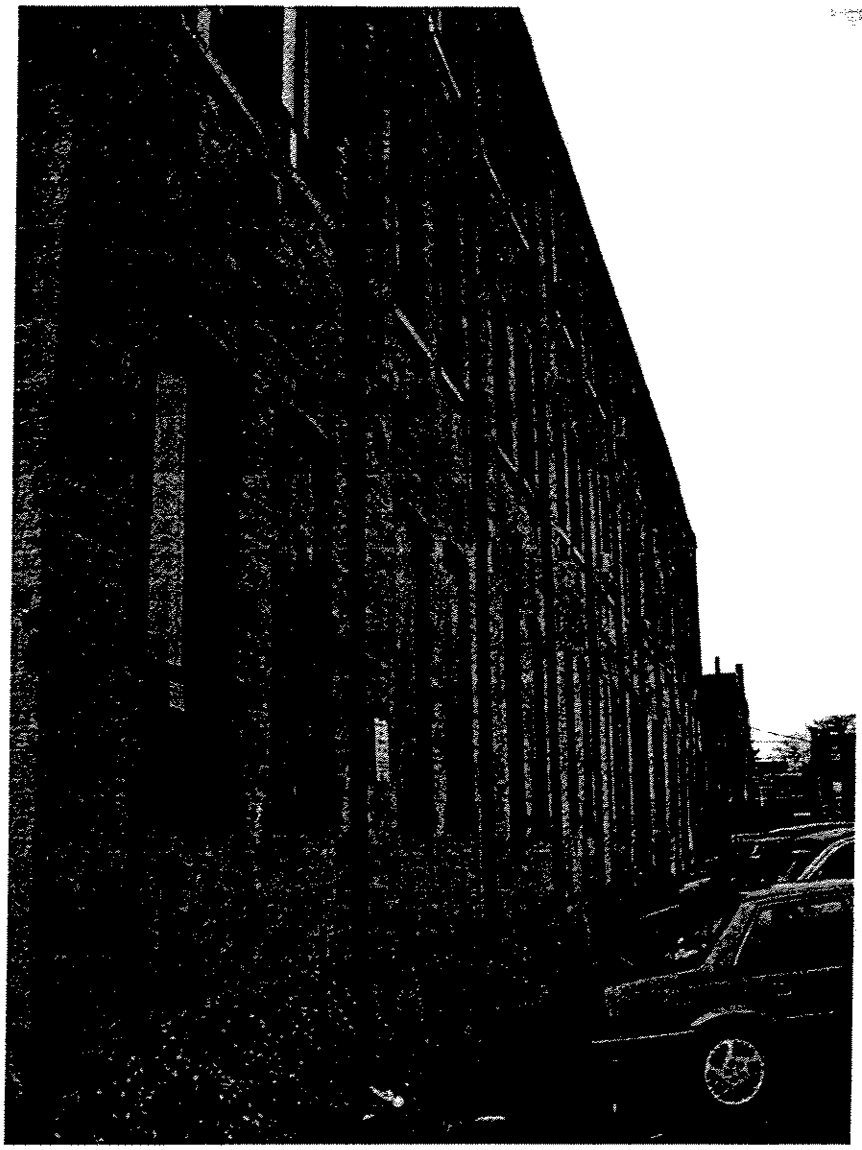

PHOTO 3: EAST ELEVATION (TIE RODS)

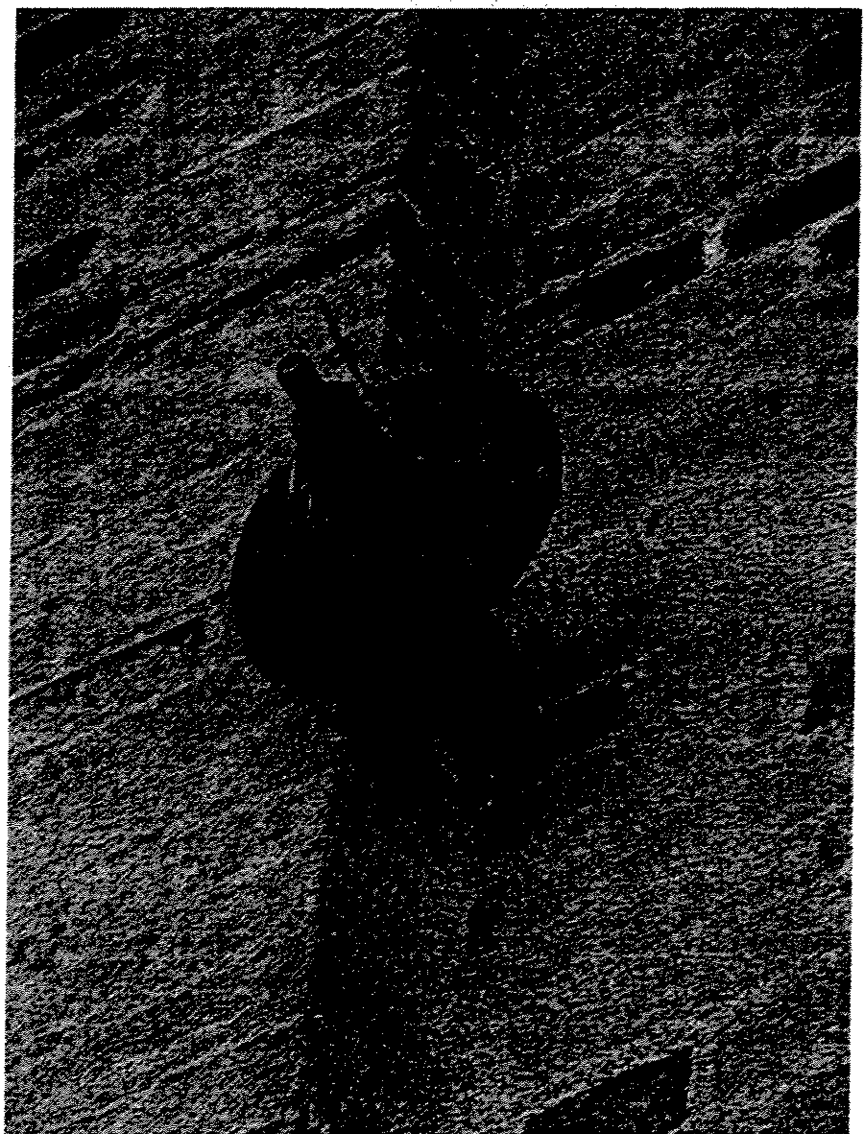

PHOTO 4: SOUTH EAST CORNER TIE ROD

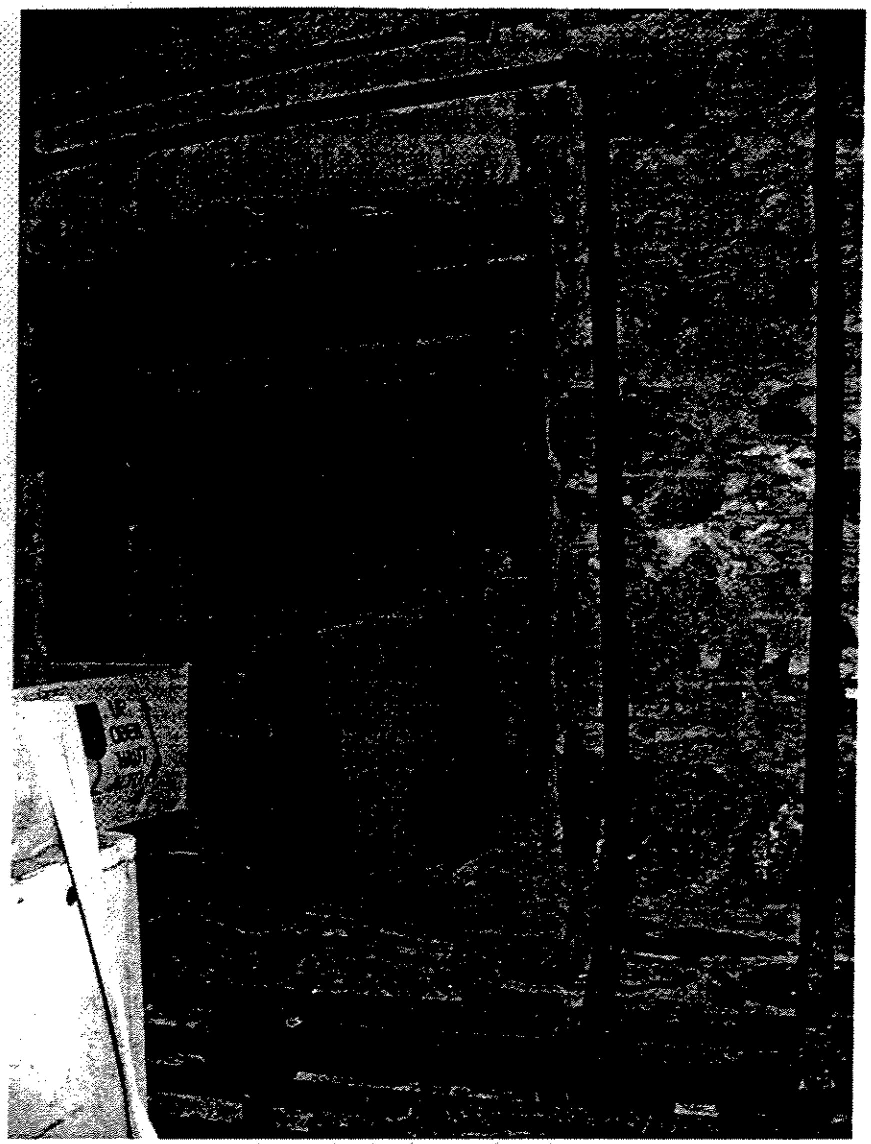

PHOTO 5: BASEMENT WINDOW

PHOTO 6: CHECKING AND "SHORING" POST

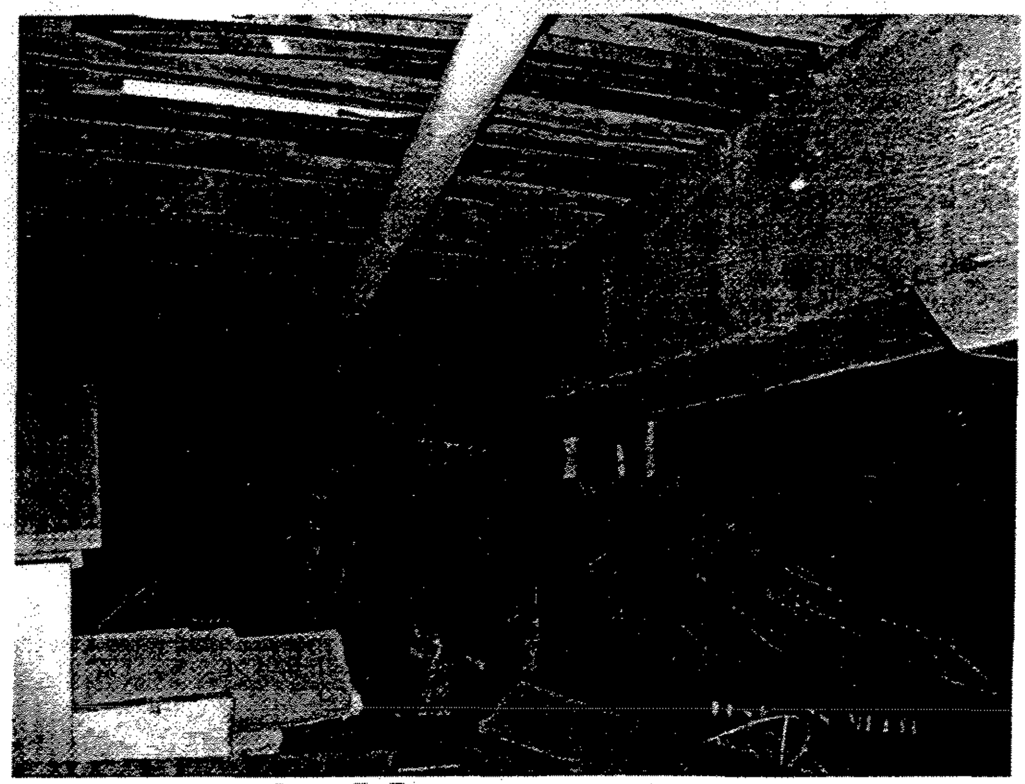

PHOTO 7: TWISTING BEAM IN BASEMENT

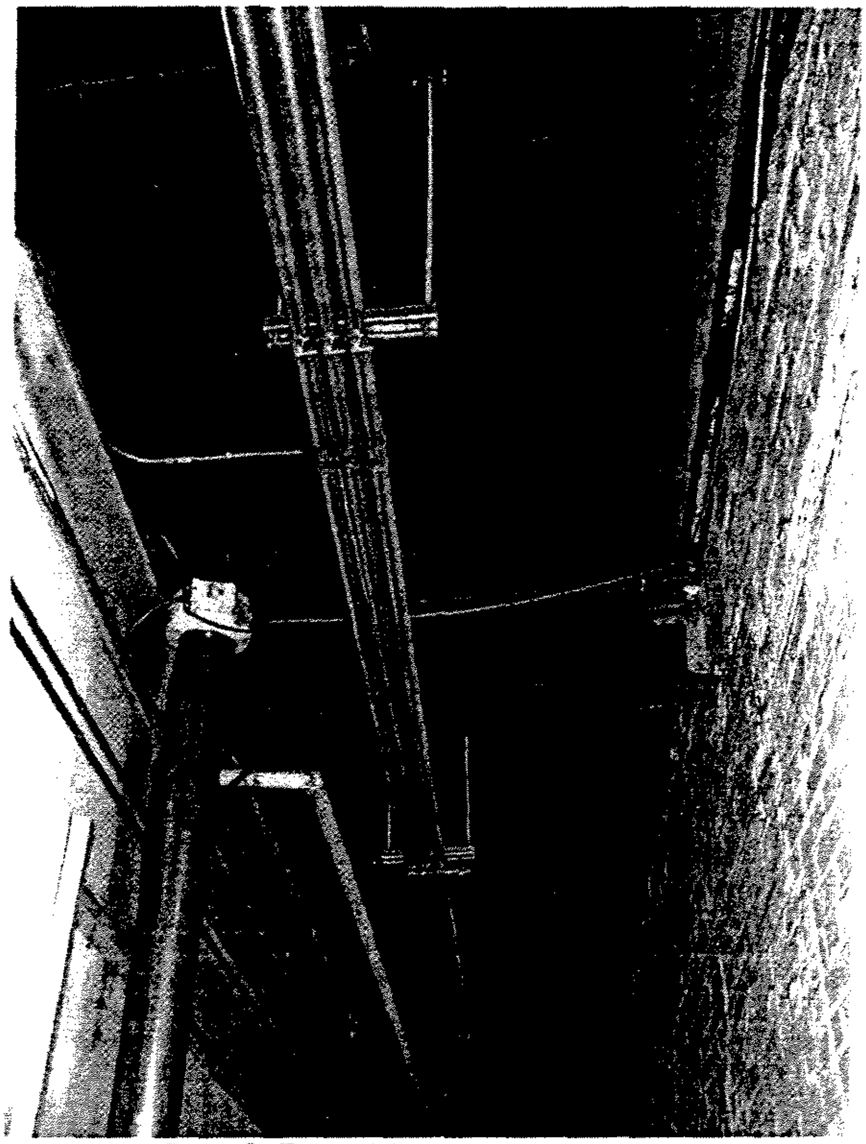

PHOTO 8: TYPICAL WEST WING ROOF FRAMING

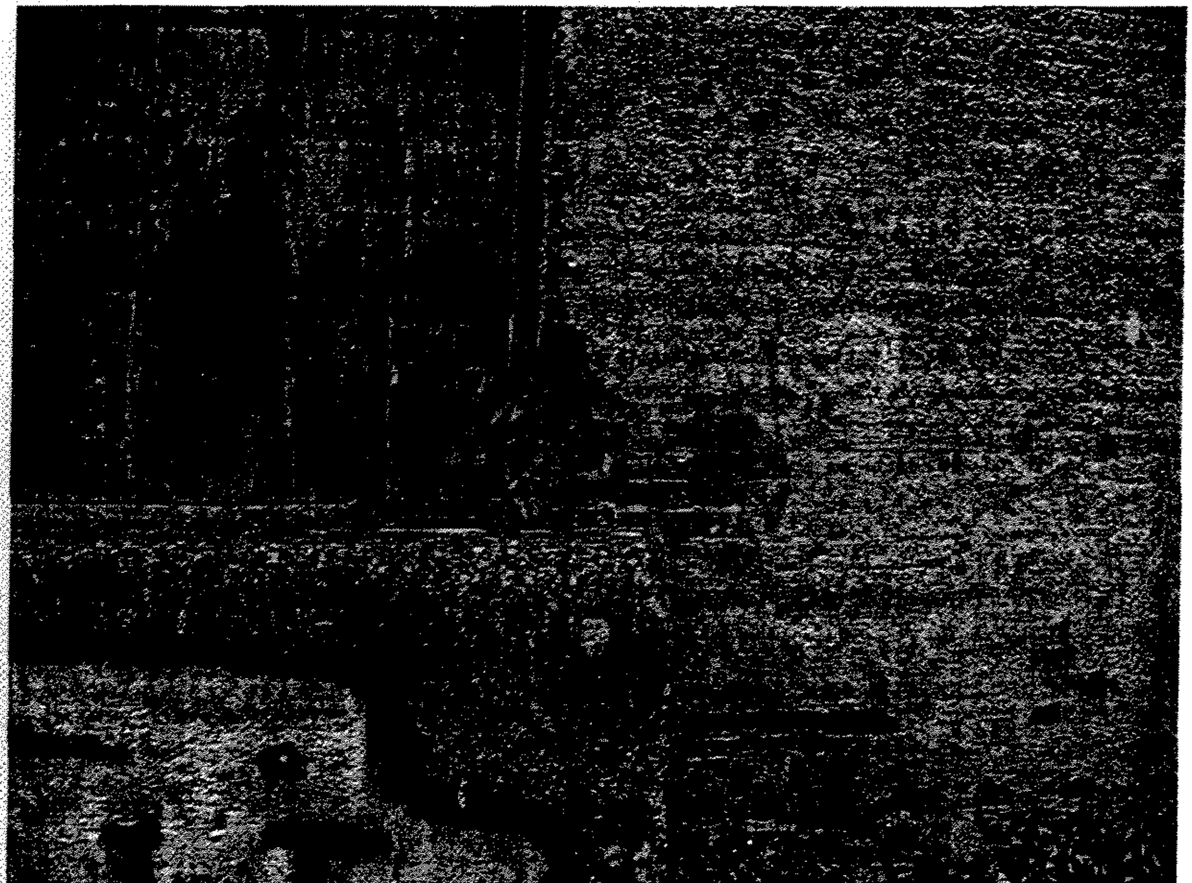

PHOTO 9: BRICK SPALLING

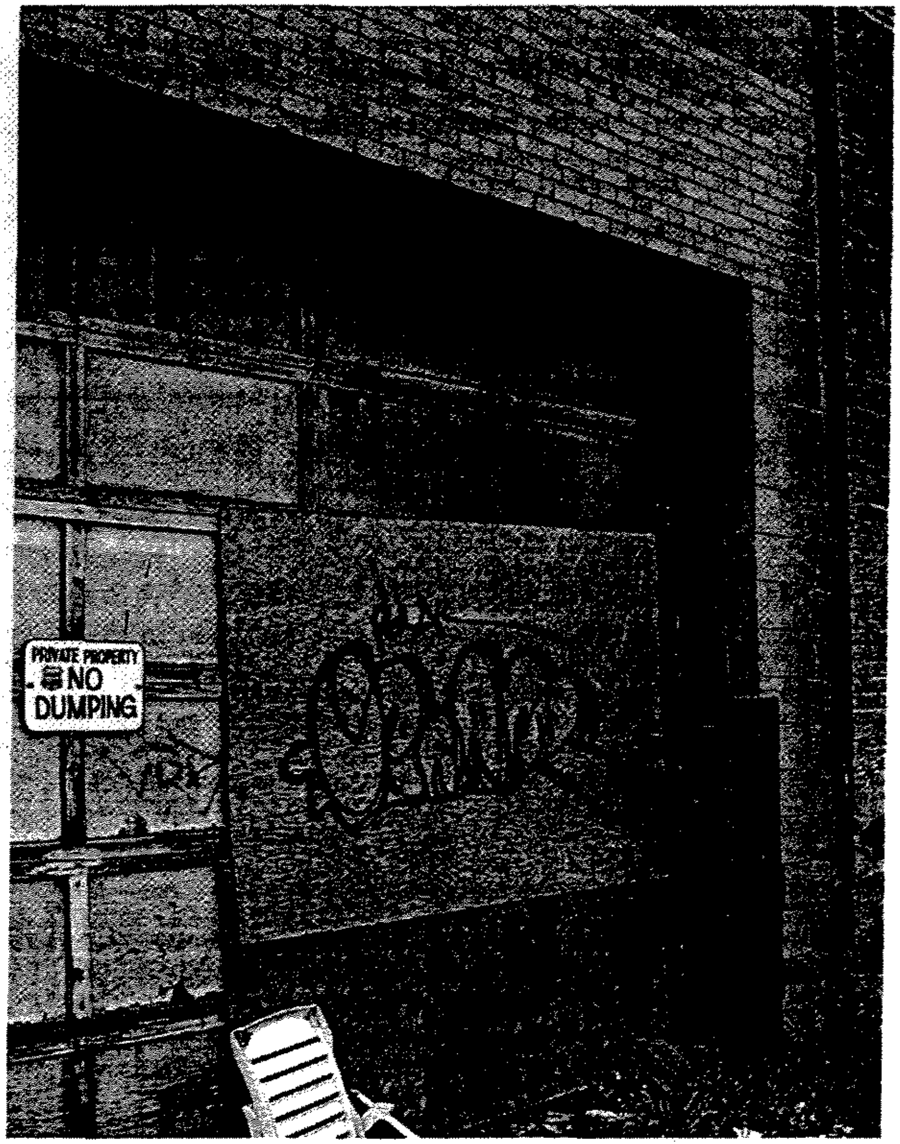

PHOTO 10: FIRE DAMAGE

PHOTO 11: DEBONDED STUCCO AND FREEZE-THAW DAMAGE TO EXTERIOR CLAY BRICK MASONRY.

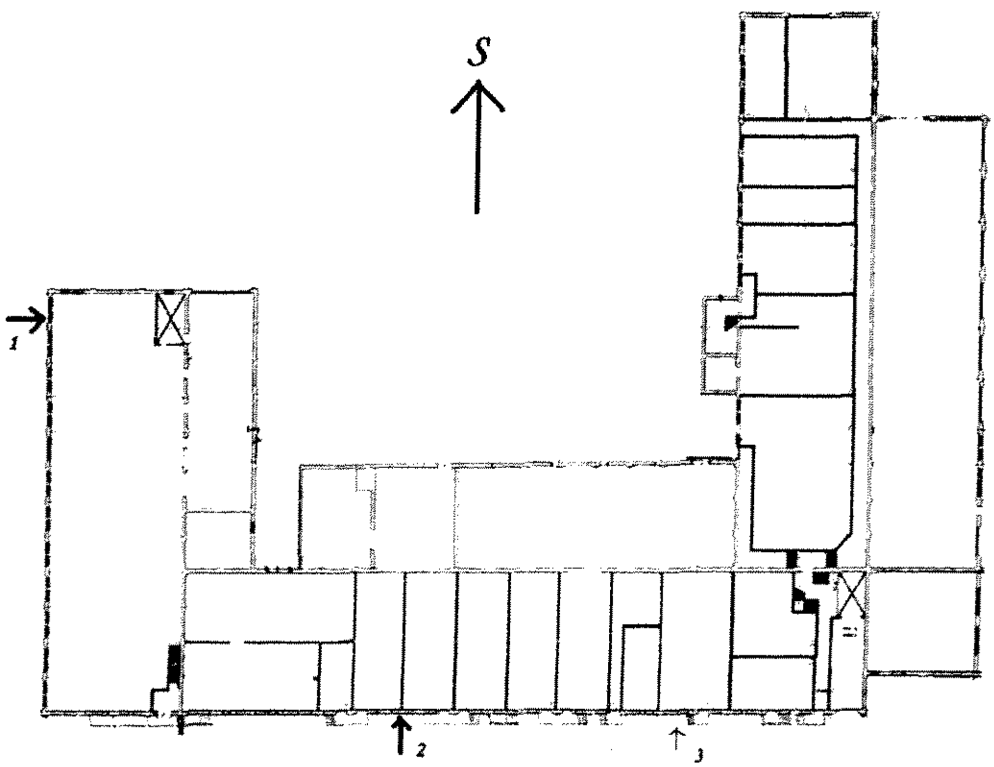

PHOTO 12: ILLUSTRATION PROVIDED BY AREA RECORDING THE SAMPLING OF THE BRICKS FOR TESTING.

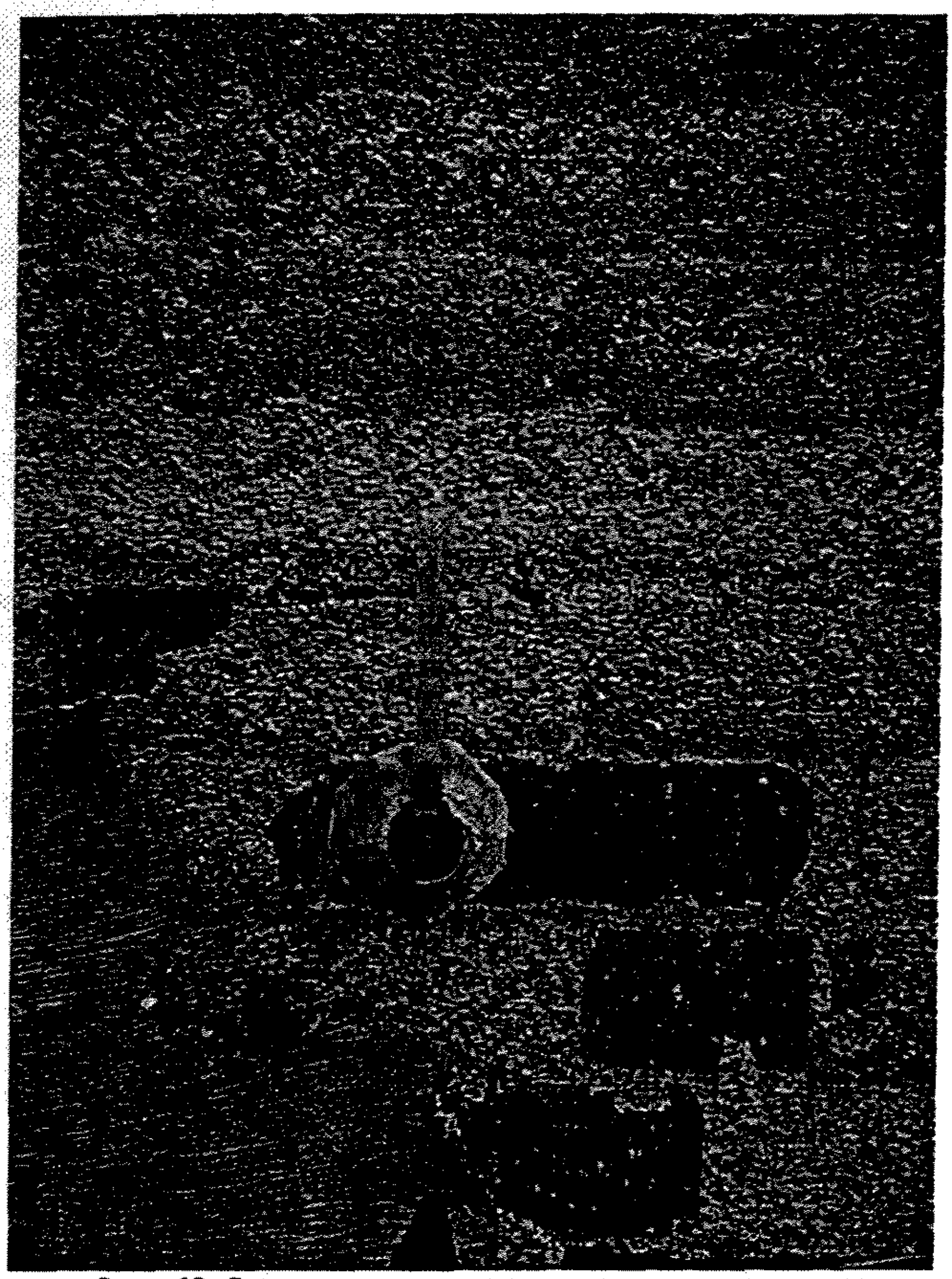

PHOTO 13: RILEM WATER ABSORPTION TESTING ON THE EXPOSED EXTERIOR BRICK (WATER TEST NO. 3).

FACSIMILE TRANSMISSION

Golder Associates

Golder Associates Ltd.
100 Scotia Court
Whitby, ON, Canada L1N 8Y6

Telephone: 905-723-2727
Fax Access: 905-723-2182

DATE:	June 8, 2006	**JOB NO:**	06-1181-513
TO:	Halsall	**FAX NO:**	416-487-97~~34~~66
ATTENTION:	Sal MacInnes	**TOTAL PAGES:**	2
FROM:	John Watkins		
EMAIL:	jwatkins@golder.com		
RE:	**PO NUMBER 06336 – BRICK TESTING**		

Sal,

Please see attached. If you have any questions regarding this fax, please contact this office.

Hard copy to follow by mail ☒ Yes, ☐ No

Please advise immediately if any pages are not received

OFFICES ACROSS NORTH AMERICA, SOUTH AMERICA, EUROPE, AFRICA, ASIA AND AUSTRALIA

Golder Associates Ltd.

100 Scotia Court
Whitby, Ontario, Canada L1N 8Y6
Telephone 905-723-2727
Fax 905-723-2182

Golder Associates

June 8, 2006

06-1181-513

Client: Halsall Engineers Consultants
2300 Yonge St., Suite 2300
Toronto, Ontario
M4P 1E4

Attention: Mr. Sal Marra-MacInnes

Project: **48 Abell Street, Toronto**
Halsall Project No. 206XR217A

SUMMARY OF BRICK TESTING

Halsall Identification	A1	B1	B2	Average
Golder Sample Number	C-06-381	C-06-382	C-06-383	
Location	East Elevation, Ground Floor, SE corner	North Elevation , Ground Floor, between units 102 and 103		
Compressive Strength (MPa)	23.5	19.8	19.1	20.8
<u>Remarks:</u>				

Note:

1. Laboratory testing carried out in accordance with CSA-A82.2.

Issued by: ___________________
John A. Watkins, Laboratory Manager

GM/JAW/jr

50 BEST EMPLOYERS IN CANADA 2005

50 BEST MANAGED COMPANIES

09-Jun-06 10:26am From-GOLDER ASSOC LTD +9057232182 T-860 P.02/02 F-299