

October 30, 1998

United Evangelical Church  
3200 Dillon Street  
Baltimore, MD 21224-5028Attention: Mr. John Price, Property Manager  
Re: Bowed masonry walls over window openings

Gentlemen:

At your request, concerning the bowed masonry windows openings, on Tuesday, October 6, 1998, your contractor, Structural Restoration Services, Loganville, PA provided a lift whereby masonry above the window openings could be observed along the alley (south, I believe) side of the building. This letter is a summary of observations. There are in addition, additional exterior masonry conditions that were seen from the lift. Attached are photos of what was observed.

Water has been penetrating both interior and exterior surfaces of the building in all probability, originally from the roof parapet. In addition freeze thaw cycles have resulted in deterioration of both brick and mortar. As I had suspected, water penetrating between the steel lintels has resulted in corrosion of the lintels and expansion between the face of the exterior lintels and the brick masonry. Conditions as observed in photo # 4 and 6 occurs when water is absorbed into the brick and freeze - thaw cycles which cause the brick to deteriorate over time. These conditions worsen when the water permeating conditions are such that the brick is unprotected at the top of copings, by leaky parapets and inadequate drainage. Photo 1 and 9 locate cracking and movement of the parapet "around the corner". Some cracking was also observed near the base of the building.

Moisture trapped in the walls and openings in both mortar and masonry will severely degrade the building life. When masonry roof parapets expand and contract more than the walls below, conditions such as the cracking shown on photos 4, 5 and 6 can occur and have occurred. The parapets are subjected to temperature and moisture extremes and sometimes pressure differentials which can drive the moisture through the wall to the wall cavity. Flashing and weep holes (holes which allow moisture to drain to the outside surface) when incorporated into the building design allow the moisture to drain to the exterior. Differential expansion from the building wall below can cause the parapets to bow, crack horizontally at the roofline and to overhang the corners. Observations from the exterior reflect both inward and outward movement. Actual determination of the cause of such movement is extremely complex. However we know that concrete slabs in the building can curl from shrinkage, deflect and if the slab warps it can damage the masonry. While these conditions can be planned for in new construction as numerous changes have been made to construction methods involving masonry walls and parapets, whereby allowances are made for construction and environmental tolerances.

Expansion joints are incorporated at closer intervals, and drainage and flashing construction details are now provided that did not exist years ago.

## CONCLUSIONS

Water penetrating the building envelope has resulted in serious corrosion of steel angles (lintels) which support the brick above window openings. Oxidation of the steel has resulted in expansion of the steel resulting in bowing of the masonry supported by it above the windows. In some locations this expansion has forced a separation in the mortar bond in bricks whereby a distinct movement of brick can be observed. (Photo 2,4&6). The corrosion has decreased the original thickness of the steel angles to the extent that they have deflected. The supported brick has moved with the deflection and has begun to crack at mortar joints and through the brick thickness at some locations. Exterior brick should be manufactured with a hard-fired surface to restrict water absorption and deterioration. Brick specifications now require such specifications for manufacturing. Brick however is not completely impermeable nor is the mortar, and over time therefore, some deterioration in both is not unlikely.

It is also likely that in addition to the conditions described above some settlement of the structure may have occurred over time and some cracking could be attributable to this. It is my opinion at the present time however; that the majority of the damage observed is from water penetration into the wall cavity as a result of cracks and openings in the mortar joints which were left unrepaired. Common and current techniques for preventing such problems over time were not observed (weep holes, flashing, adequate joints for movement) due to the age of the building. At the present time the steel lintels have corroded to the extent that they should not be depended upon to support the masonry at window openings. They have deflected and the remaining strength is uncertain and unpredictable. If they failed, damage to the building would occur and portions of cracked brick would be expected to fall to the street and walks below. Therefore, immediate support is required. Large portions of the wall surfaces require mortar tuckpointing and some of the bricks may require realignment and complete replacement. At the exterior wall location opened up it was observed as shown on photo 3 that vertical legs (vertical side of the steel angle) of the interior lintel were also observed to be corroded.

It is also not unlikely that brick cracking and damage not presently observed from the exterior and interior could be uncovered during the process of performing such work requiring brick replacement through the entire wall thickness at specific locations and that any such work should be inspected and completed by an experienced masonry contractor.

It is my understanding that a new roofing system investigation is currently underway and this work is to include parapet water proofing provisions. The accompanying work described above should be considered in light of the possibility that without incorporation of provisions to accommodate movement and prevent water penetration and an on-going maintenance program of replacing brick, continual building deterioration over time would be expected. During the day of

this site visit, it was pointed out that the stone arch located on the East<sup>AVE.</sup> Side of the building has also begun to deteriorate. Observations from the sidewalk indicate that similar conditions (water penetration, spalled and failed mortar) exist and has loosened portions of the arch. This area will also require repairs by an experienced masonry contractor. I have sketched on one of the copies of this letter (original copy) to emphasize the conditions described or where the photocopies may not be clear enough.

Neither the observations nor this letter is intended to cover mechanical, electrical, architectural or any other part of this structure. This report is not intended to be technically exhaustive in description of the conditions observed. The observations do not incorporate destructive testing and/or investigation and is based solely on the location accessed. Concealed faults and defects could exist at the observed area and areas not observed. No claim is made that all faults and defects in the observed area indicated have been identified in this letter and no warranty or certification either expressed or implied as to the building or the various systems therein of the fitness for any specific use or of merchantability is made. This letter has been solely prepared for the benefit of Mr. John Price, United Evangelical Church. Should you have any question on this or if I may be of additional assistance to you on this matter please do not hesitate in contacting me.

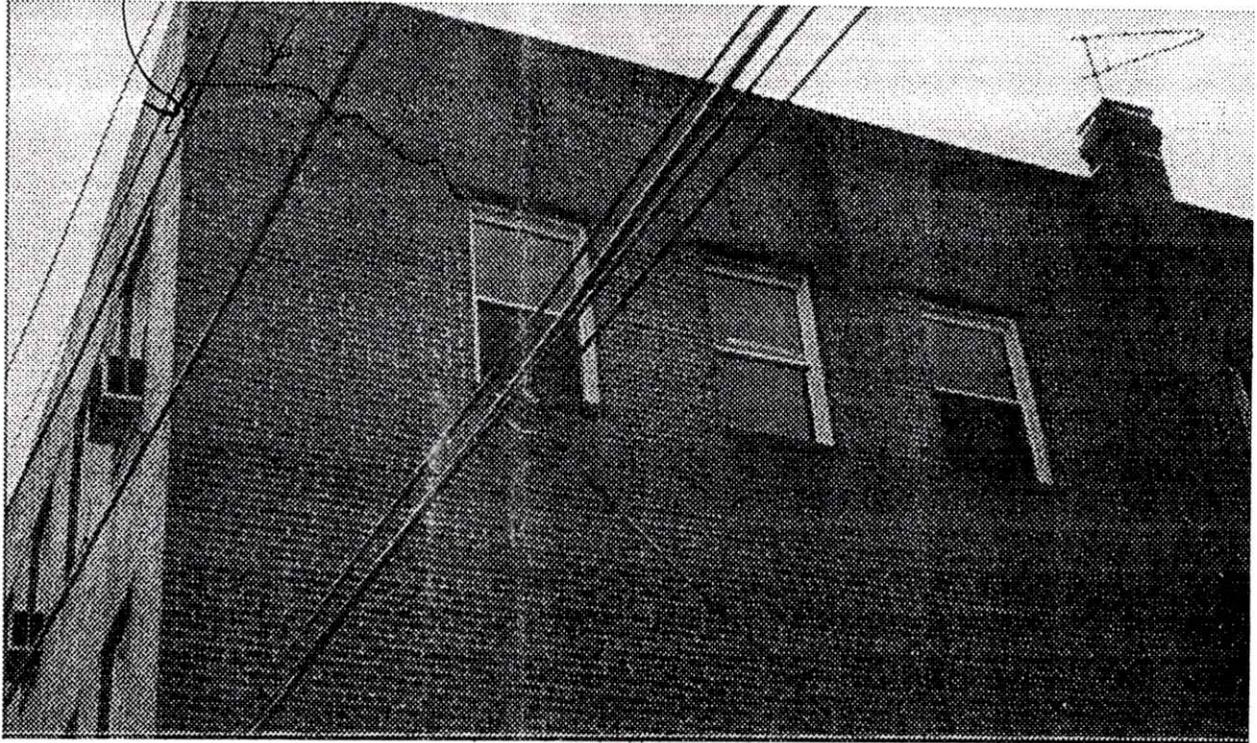
Very truly yours,

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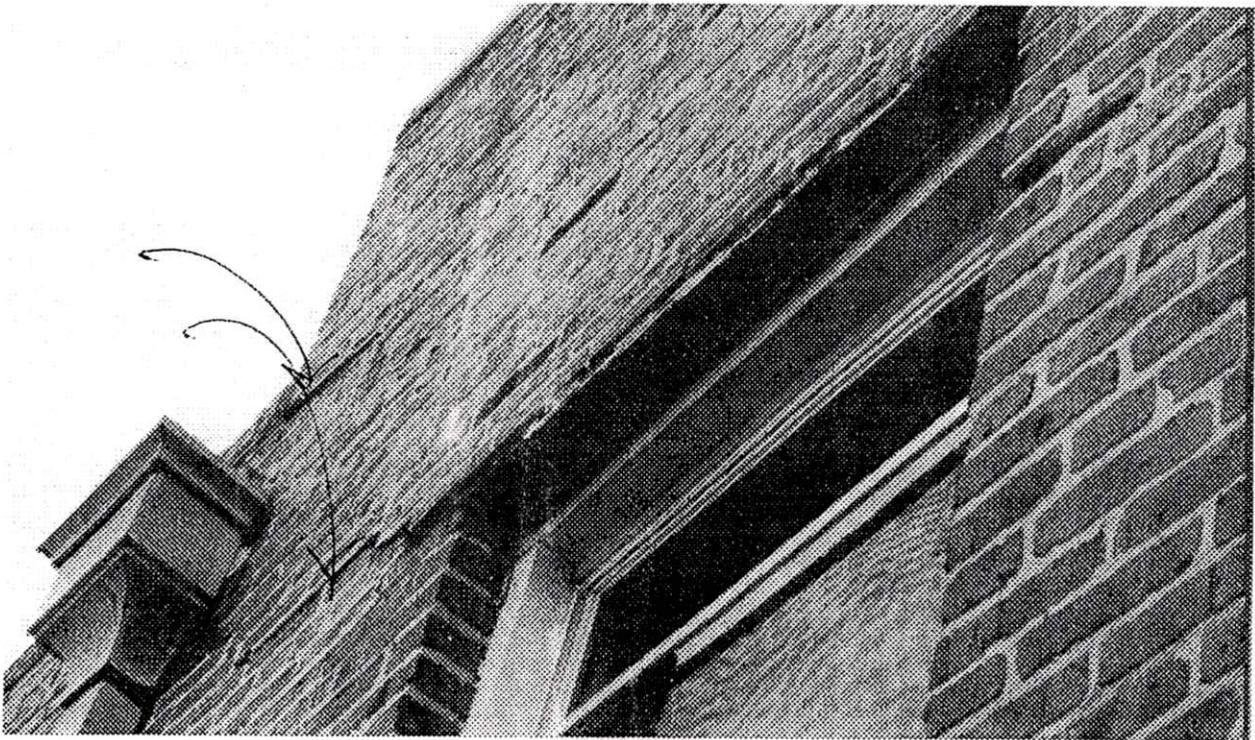


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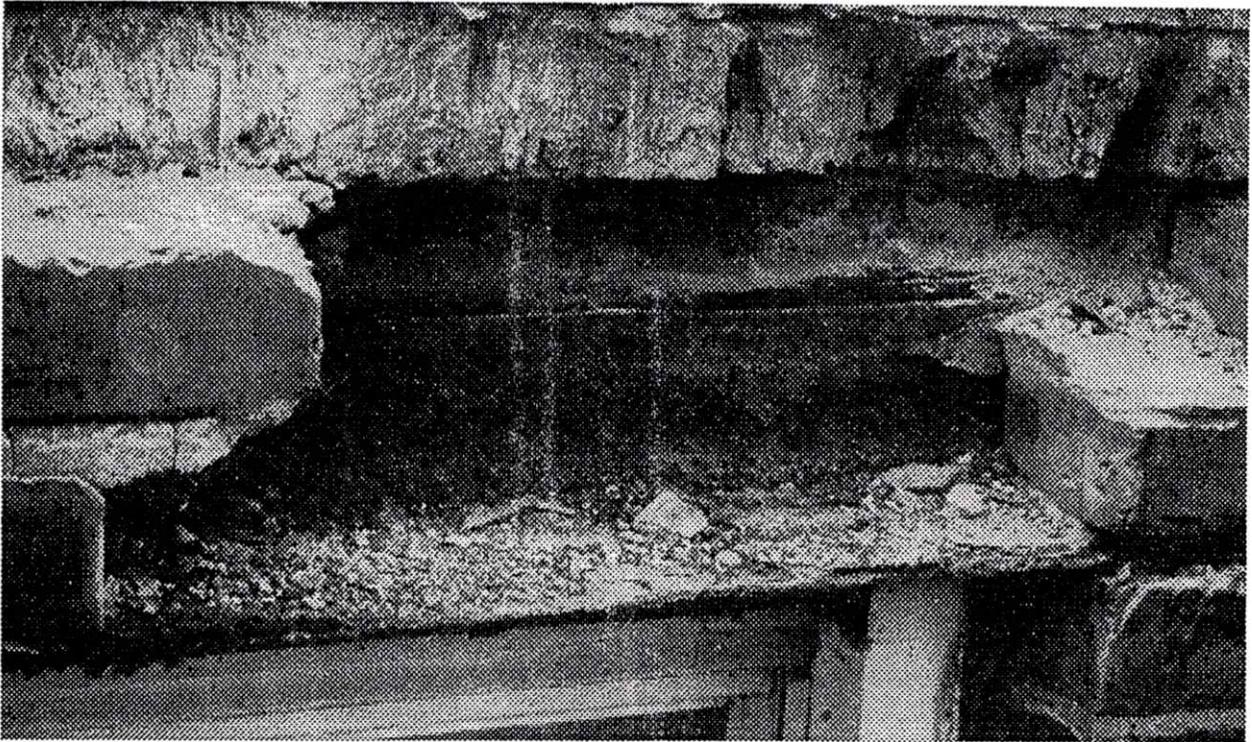
*Corner movement  
crack continues  
- should occur*



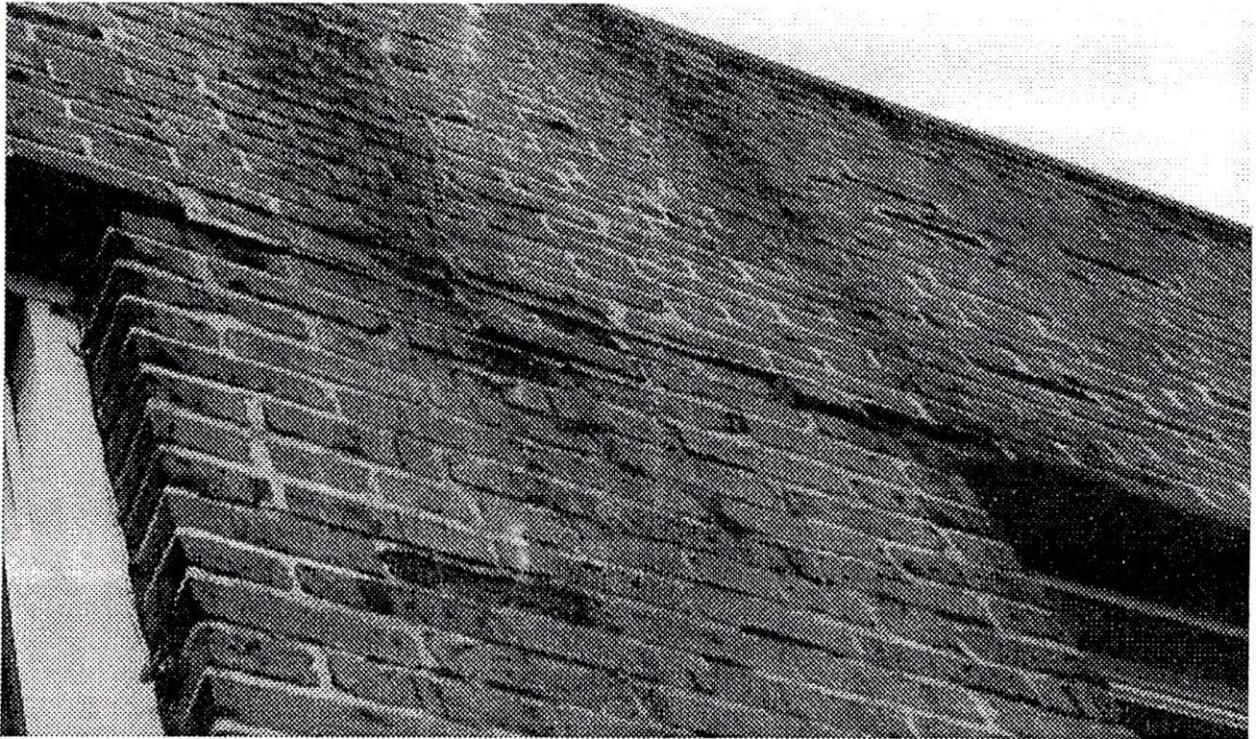
**Photo 1- Right rear of Building**



**Photo 2 - Cracked wall at scupper**



**Photo 3 –Severely Corroded steel angles**



**Photo 4 -Heavy water stains; brick face deterioration & separation**

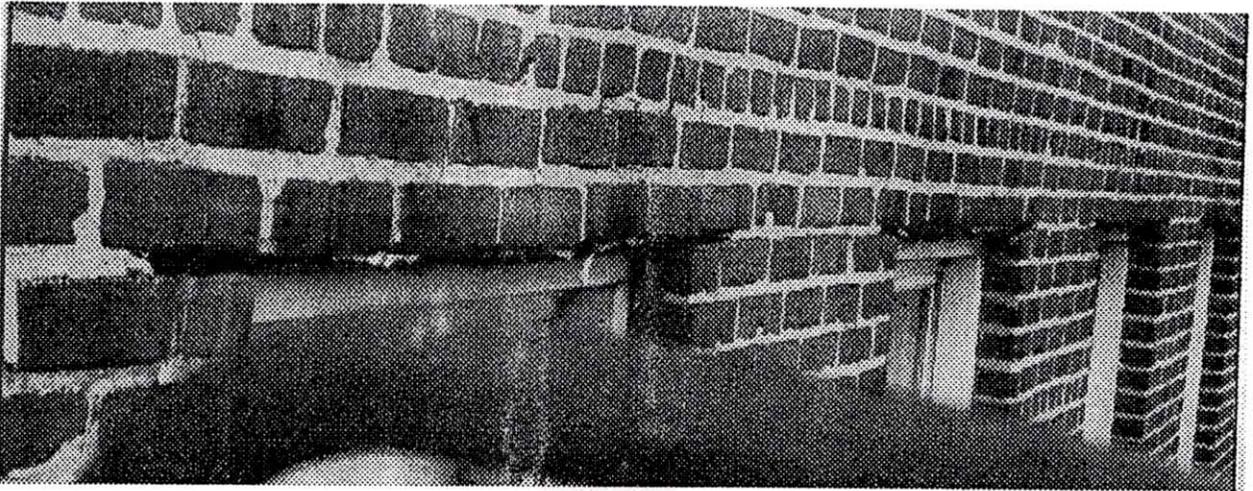


Photo 5- Excessive steel angle and masonry deflection

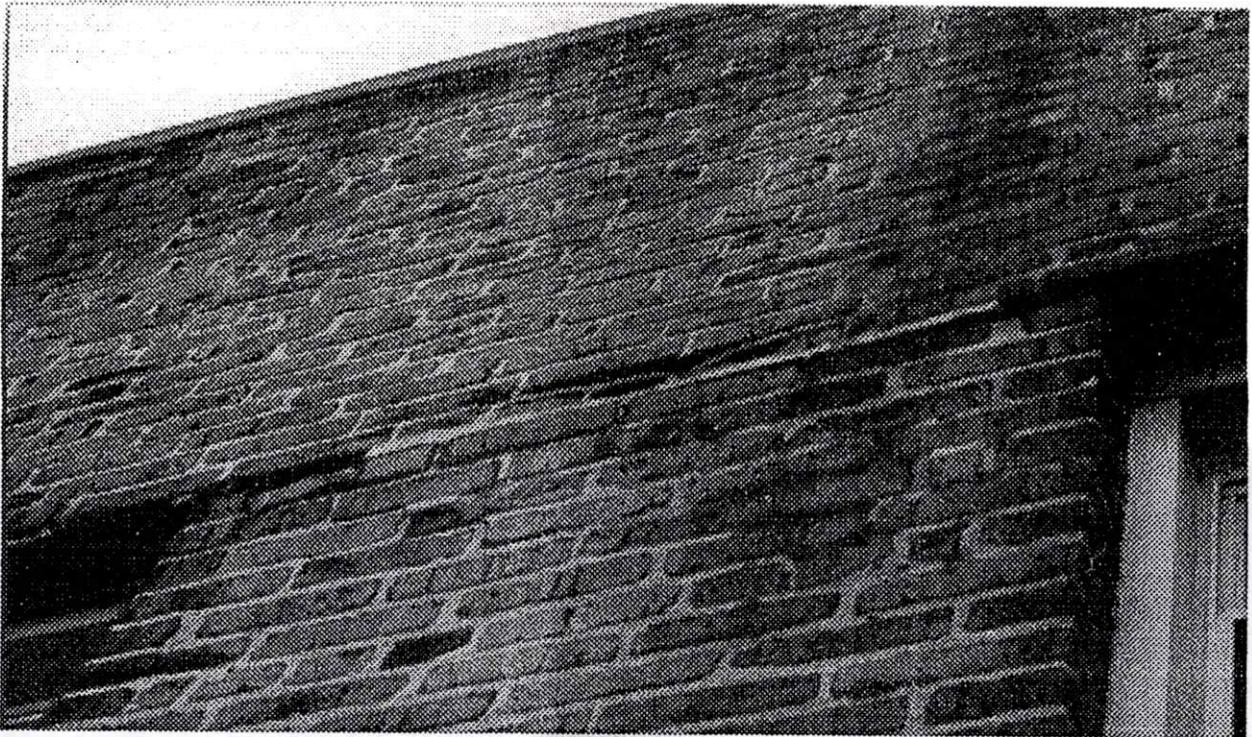
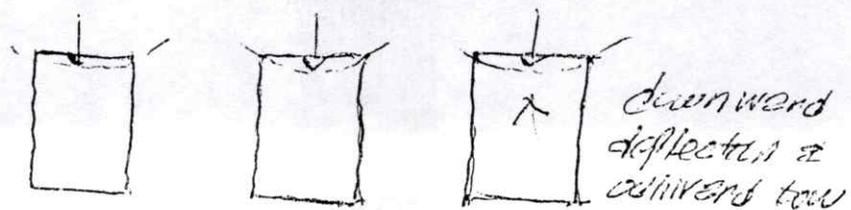


Photo 6- Heavy water staining, loose and failing brick and faces of brick. Wall separation



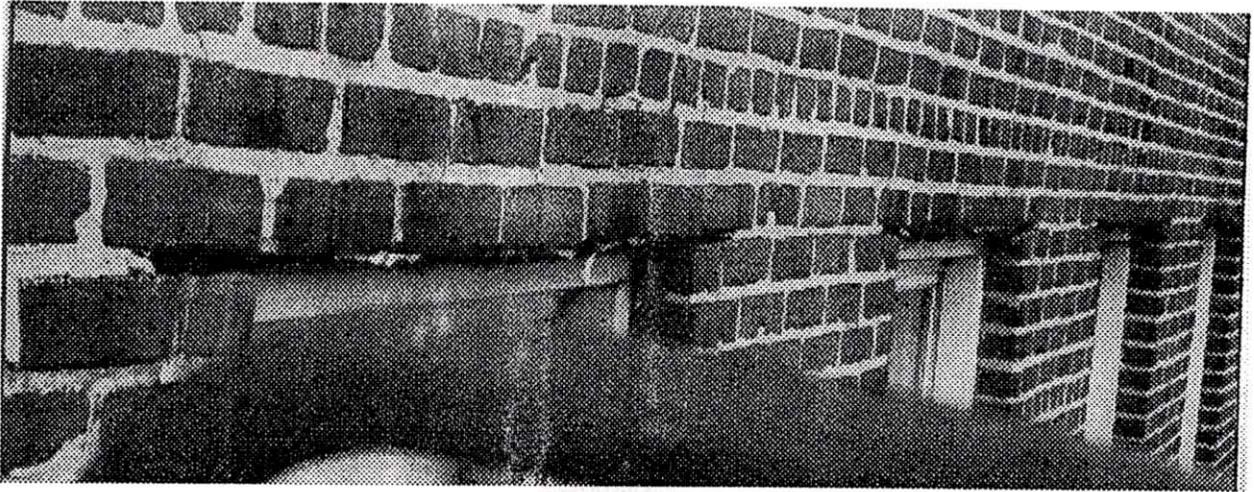


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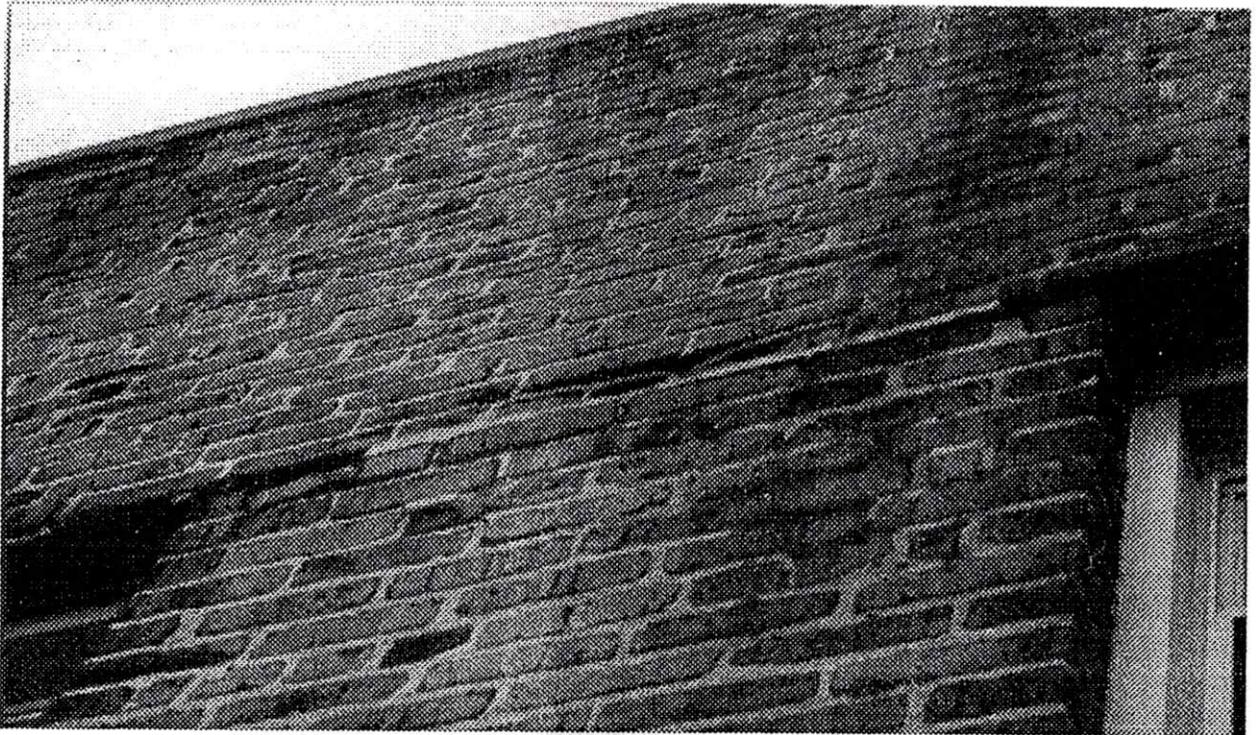


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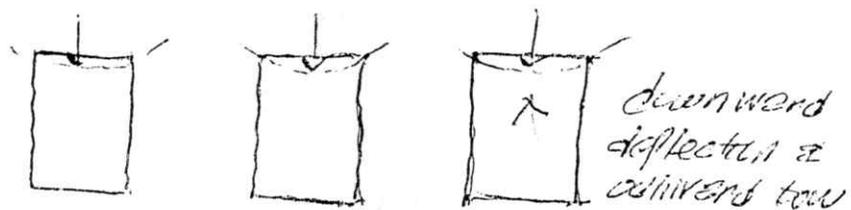
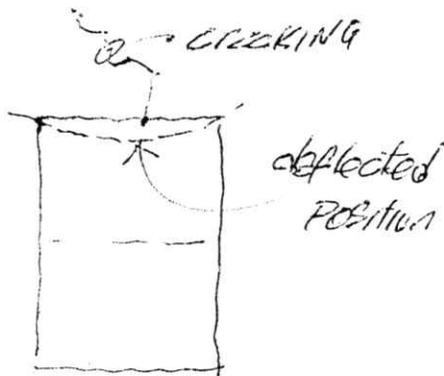
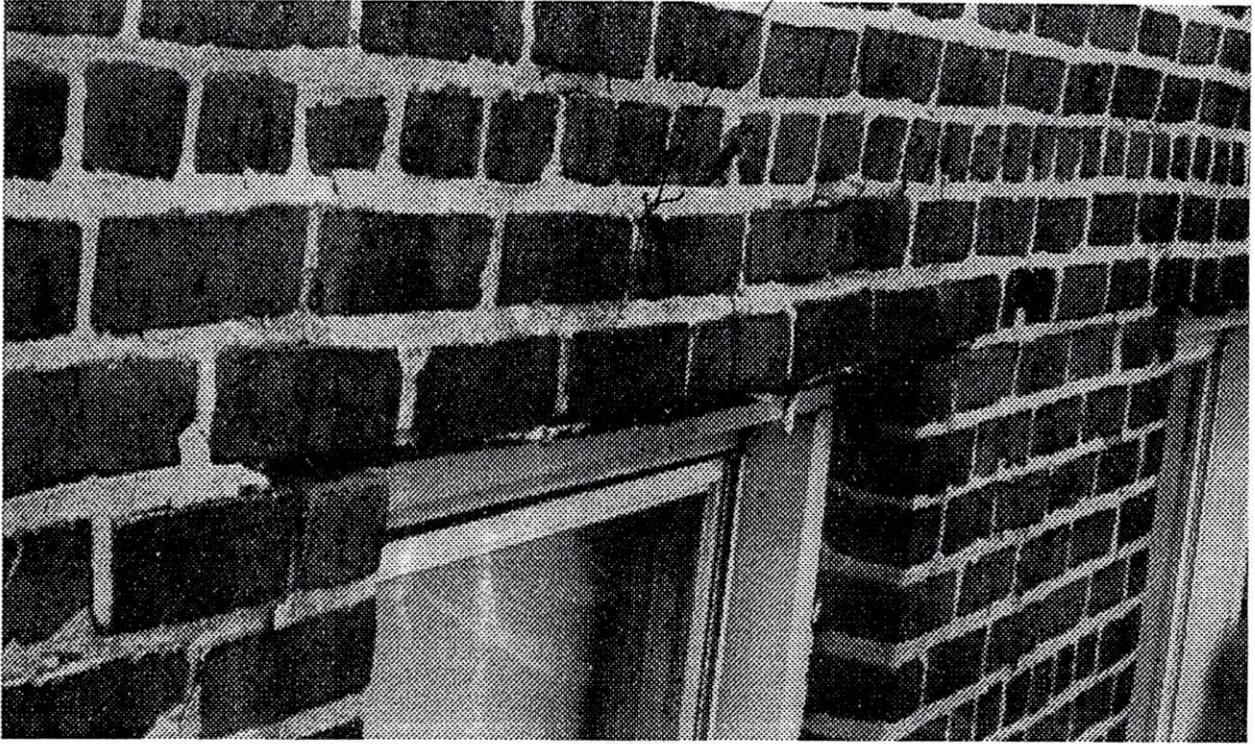


Photo 7-Severely deflected steel angle and masonry

cracks above  
in mortar line



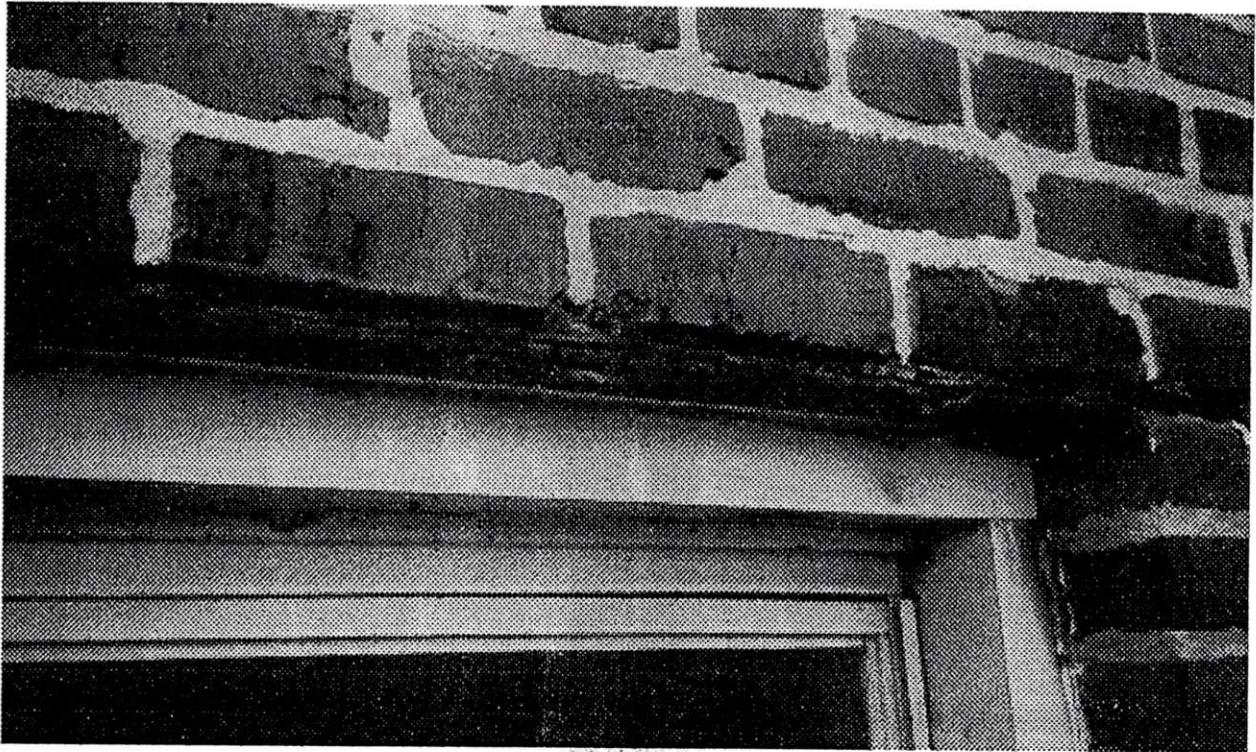
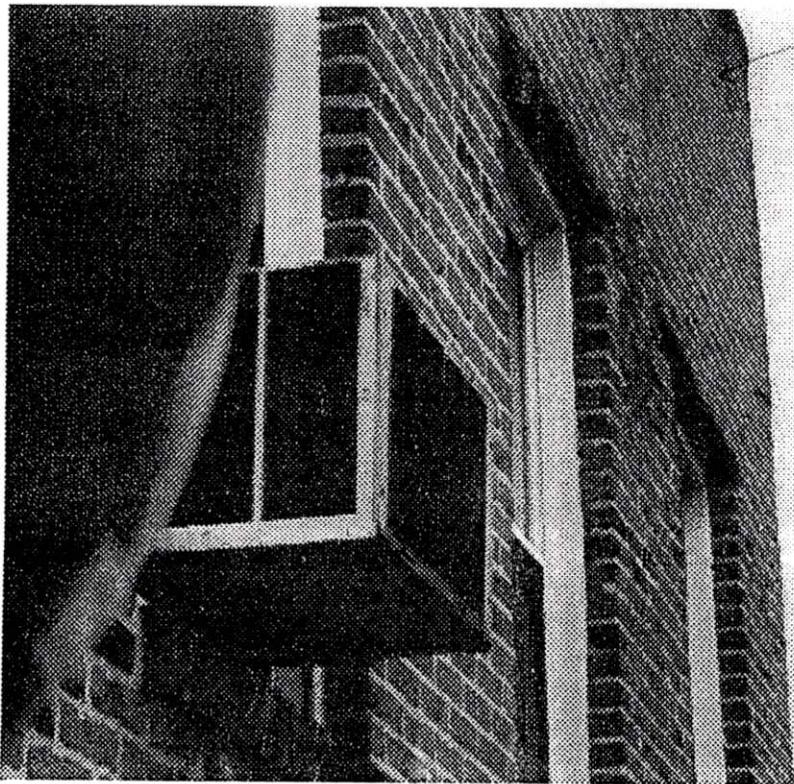


Photo 8- Severe steel lintel corrosion and mortar failure



OUTWARD  
MOVEMENT  
&  
CRACKING

Photo 9- Mortar cracking at upper corner of wall



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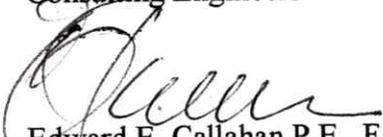
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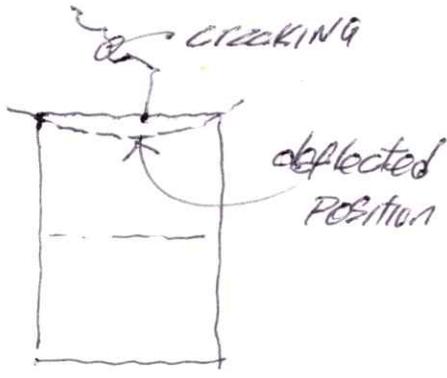
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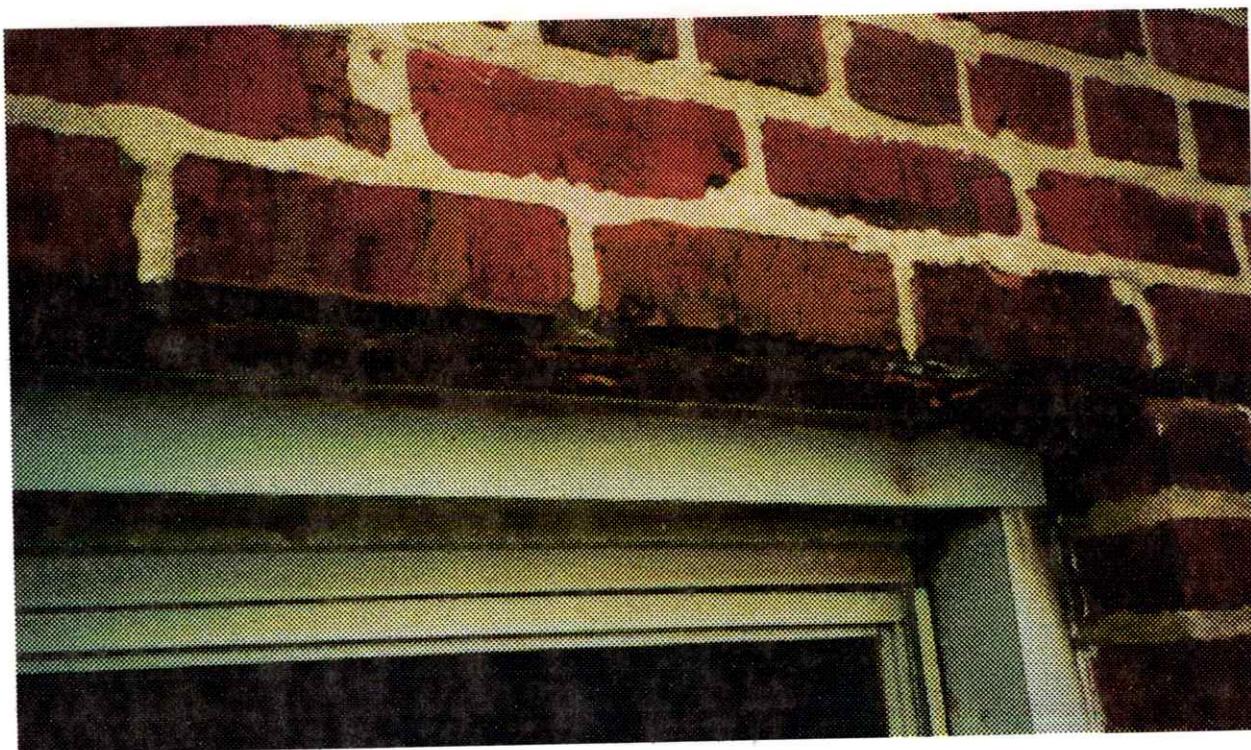


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Photo 7-Severely deflected steel angle and masonry

cracks above  
in mortar line





**Photo 8- Severe steel lintel corrosion and mortar failure**



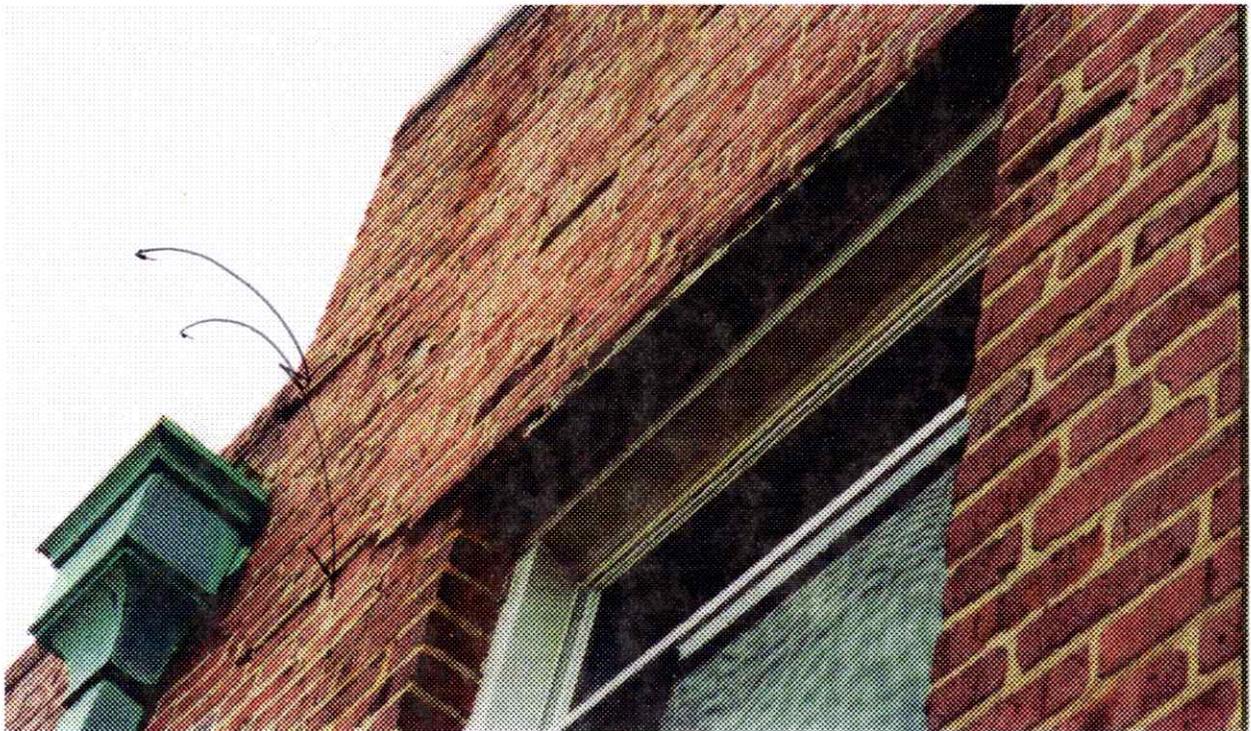
*OUTWARD  
movement  
&  
CRACKING*

**Photo 9- Mortar cracking at upper corner of wall**

corner movement  
crack continues  
around corner



**Photo 1- Right rear of Building**



**Photo 2 -Cracked wall at scupper**



**Photo 3 –Severely Corroded steel angles**



**Photo 4 -Heavy water stains; brick face deterioration & separation**



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