CARLSON ENGINEERING, P.C.
• STRUCTURAL ENGINEERS • STRUCTURAL REPAIR

September 4, 2007

David L. Jenkins & Associates, P.C.
David Jenkins
109 North Main Street
Rockford, IL 61101

Re: Building Inspection
502 South Main
TAPCO Building
Rockford, IL

Mr. Jenkins,

On August 30, 2007 at your request, Theodore J. Carlson, a licensed Structural Engineer in the State of Illinois, inspected the multi story building located at the above referenced address. The inspection was visual and did not include any digging or testing. The purpose of the inspection was to give a professional opinion on the general condition of the building. The inspection was not intended to identify in detail all defects with the building structure and make repair recommendations. The opinions and recommendations given below are based on the conditions observed at the time of this inspection. No guarantee or warranty as to the future life, performance, or need for repair of any item inspected is intended or implied. Not all items discussed as a courtesy during the inspection will necessarily be included within the report.

OBSERVATIONS

The front of the building is assumed to face west along Main Street as shown in the attached photograph #1. Photograph #2 was taken from the northeast corner of the building. Photograph #3 was taken from an upper floor of the building located to the north. As can be seen in the photographs, the east or back side of the building has 6 full stories exposed above grade. The grade slopes from the back of the building up to the front of the building leaving 5-1/2 stories exposed at the front.

At the back of the building I noted that dates had been embedded into concrete blocks set into the building. At the bottom of the 4th floor level the date was 1907 and at the roof level the date was 1915. I also noted a transition in the type of construction between the 5th and 6th floor levels as can be seen in photograph #4. The first five floors were reinforced concrete construction with concrete block used to fill what must have at one time been window openings, and the 6th floor appeared to be a load bearing brick with steel lintels over window openings. Based on this it appears that the first 5 floors of the building were constructed in 1907 and the 6th floor was added in 1915.

P.O. BOX 507 SYCAMORE, IL 60178 (815) 899-2435 Fax (815) 899-8961

An inspection of the exterior of the building revealed that almost all of the perimeter concrete beams, or spandrel beams, had some level of deterioration in the form of spalling concrete and exposed reinforcing steel. I consider most of this deterioration to be severe as can be seen in photograph #5. Many areas of deterioration were not visible as they were concealed behind an aluminum cap as shown in photograph #6.

Deterioration of the concrete columns in the form of spalling concrete and exposed reinforcing steel was also noted at the exterior although this deterioration was not nearly as severe as it was with the spandrel beams. There were areas of deterioration that were not visible as they were concealed behind an aluminum cap, similar to the spandrel beams.

A visual inspection of the steel lintels over the windows at the 6th floor level was done from the ground using binoculars. I noted deterioration of the steel lintels in the form of corrosion and expansion of the steel. In some cases this expanding steel had forced the masonry apart resulting in cracks in the masonry piers between the window openings.

I then proceeded to the interior first floor level of the building where I noted that the 2nd floor above had been constructed using reinforced concrete joists spanning north-south between girders which ran east-west between column locations. The beams had been formed with clay tiles set between the beams which became permanently embedded in the floor system as can be seen in photograph #7. In general the floor slab appeared to be in good condition.

I noted several columns at the first floor level which had been damaged by impact. This damaged typically exposed the outer layer of reinforcing steel in the column and could be easily repaired.

I noted that sections of the exterior perimeter walls below grade were also constructed of reinforced concrete.

At the 2nd floor level I noted that the 3rd floor above had been constructed out of reinforced concrete similar to the 2nd floor.

From within the 2nd floor level I noted deteriorated spandrel beams, photograph #8, and deteriorated perimeter columns, photograph #9, in the form of spalling concrete and exposed reinforcing steel.

During my inspection of the second floor level I noted that all of the interior and exterior columns which I inspected were cracked at the north and south faces. A typical crack is shown in photograph #10.

At the 3rd floor level I noted that the 4th floor above had been constructed out of reinforced concrete similar to the 2nd floor.

The cracks noted in the columns at the 2nd floor below did not appear in the columns at the 3rd floor level above the slab. Cracks were noted in the north and south faces of the 3rd floor columns near the ceiling level, similar to those noted at the 2nd floor level.

Deterioration of the spandrel beams was noted in some areas at the perimeter of the 3rd floor. Numerous cracks were noted in the spandrel beam along the north side of the building and it appeared as though the spandrel beam had been capped with concrete.

At the 4th floor level I noted that the 5th floor above had been constructed as a one way slab without any concrete joists formed in the slab. There were some randomly placed pieces of tile which must have been thrown on top of the form work prior to pouring the slab. Photograph #11 was taken from the underside of the 5th floor slab.

The cracks noted in the columns at the 3rd floor below did not appear in the columns at the 4th floor level above the slab. Cracks were noted in the north and south faces of the 4th floor columns near the ceiling level, similar to those noted at the 2nd and 3rd floor levels. Some cracks ran very close to the face of the building columns as shown in photograph #12.

Deterioration of the spandrel beams was noted in some areas at the perimeter of the 4th floor.

A load sign on the 4th floor indicated the capacity of a 22' x 16'-6" bay to be 43,000 pounds. The equates to approximately 120 pounds per square foot.

At the 5th floor level I noted that the 6th floor above had been constructed as a one way slab, similar to the 5th floor construction.

The cracks noted in the columns at the 4th floor below did not appear in the columns at the 5th floor level above the slab. Cracks were noted in the north and south faces of the 5th floor columns near the ceiling level, similar to those noted at the floor levels below.

Deterioration of the spandrel beams was noted in some areas at the perimeter of the 5th floor.

The construction at the 6th floor level was different than the floor levels below. The exterior walls were brick with steel lintels over the window openings. The roof system utilized encased steel beams supported on concrete columns. The roof structure above the steel beams was not visible as it was concealed above wood decking. Photograph # 13 was taken at the 6th floor level.

The steel roof beams were exposed only in very limited areas making an inspection of the condition of the steel impossible. I noted that some of the supporting concrete columns were randomly cracked.

Deterioration of the masonry was noted at the interior of the 6th floor as shown in

photograph #14.

A load sign on the 6th floor indicated the capacity of a 18' x 16'-6" bay to be 36,000 pounds. The equates to approximately 120 pounds per square foot.

CONCLUSION

The severe level of deterioration noted in most of the spandrel beams may require that the spandrel beams be removed and replaced or reinforced with a steel beam installed underneath. If testing is done to determine the size, quantity, and location of reinforcing steel it may be possible that the undamaged section of some spandrel beams have adequate reinforcing steel remaining to safely support all required loading.

The visible deterioration of the columns at the exterior did not appear to be as severe as the spandrel beams. Cleaning and patching of the columns will most likely be an effective repair solution. This may not be true for columns which had deterioration concealed behind an aluminum cover.

From what I was able to observe from the ground, it appears as though all of the steel lintels over the window openings at the 6th floor level will require replacement.

The cracks located on the north and south faces of most of the building columns at floors 2 through 5 is of significant concern. These cracks appear to be the result of tension forces along the top of the beams not being properly resisted by reinforcing steel which should be continuous and pass over the column locations. It could be that the steel reinforcing is in place but it is inadequate, or it could be that the steel was never properly installed.

Tension forces are produced along the top of the beams at column locations under gravity and lateral loading of the building frame. Gravity loading includes the weight of the floor system and anything on the floor. Lateral loading refers to horizontal building loads caused by wind or a seismic event.

If the problem is related to gravity loading, and assuming that floors 1 through 4 were all constructed using the same details, I would expect to see similar cracks in the columns at the first floor level. What the first floor level has that the other floor levels do not is concrete walls at the perimeter which act as shear walls and are capable of resisting lateral loads.

The 6th floor was at one time the roof for the building and it was constructed as a flat one way slab, different from the lower floors. The 5th floor was also constructed as a one way slab, different from the lower floors. The date of 1907 was present at the exterior 4th floor level, not the 5th. I would expect this date to have been visible at the top floor of the building at the time it was constructed. These two things suggest that there is a strong possibility that the 5th and 6th floors were both added after the original construction of the first 4 floors. This would have significantly increased the lateral

loading on the building frame.

The technology behind concrete construction during the early part of the 1900's was not very advanced and details regarding size and placement of steel reinforcing was often left up to the building contractor. It is unlikely that there was any special consideration taken for lateral loading of the building frame.

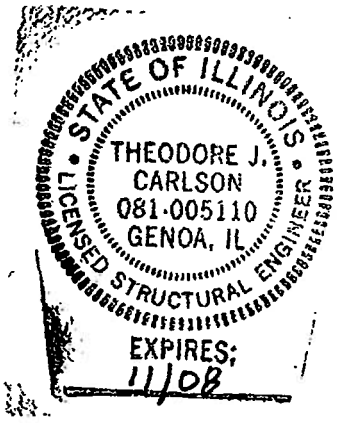
As the building currently exists, the concrete block which replaced the windows at the exterior perimeter of the building is providing for lateral resistance. It is my understanding that the block walls will be removed and replaced with widows.

I recommend that testing be done to determine the location and size of steel reinforcing within the building's columns and beams. Some of this testing will most likely be destructive. With this information the building can be analyzed for current code required lateral and gravity loading and recommendations for repair or reinforcement of the building frame can be made. Reinforcement of the building frame may include the installation of permanent shear walls at the corners of the building. Repair may include reinforcement of the cracked columns with steel strapping or carbon fiber.

If there are any questions with regard to this report, or if I can be of further assistance to you in any way, please do not hesitate to call.

Sincerely;

Theodore J. Carlson
Licensed Structural Engineer



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Re: Photographs Page 1
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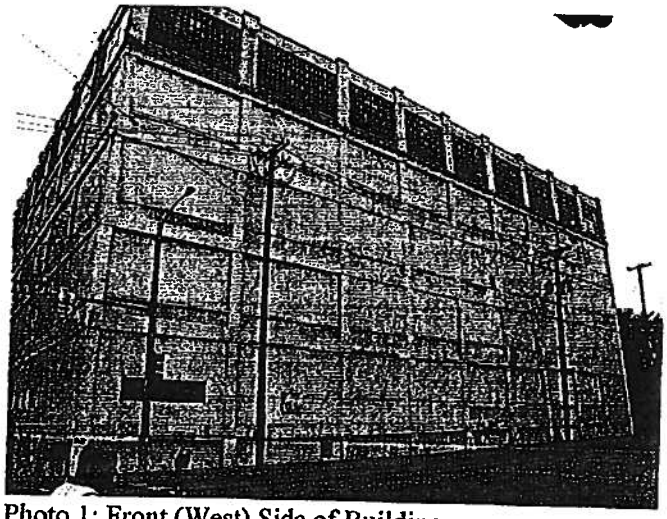

Photo 1: Front (West) Side of Building

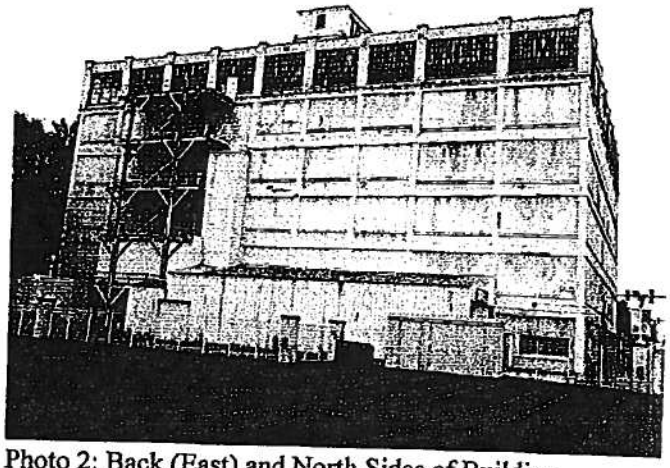

Photo 2: Back (East) and North Sides of Building

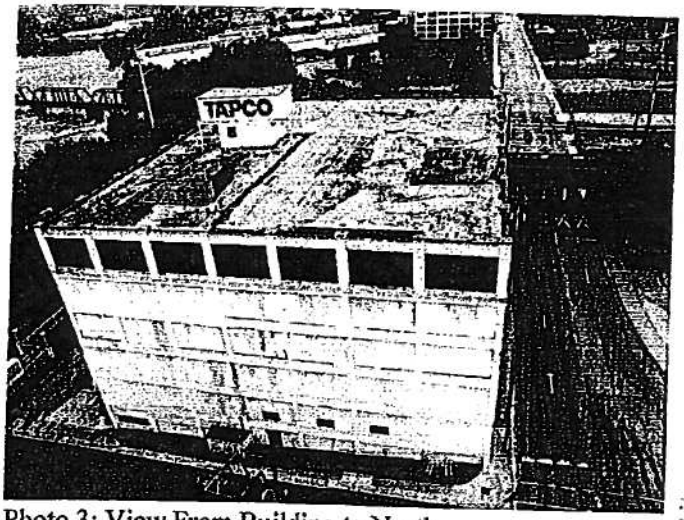

Photo 3: View From Building to North

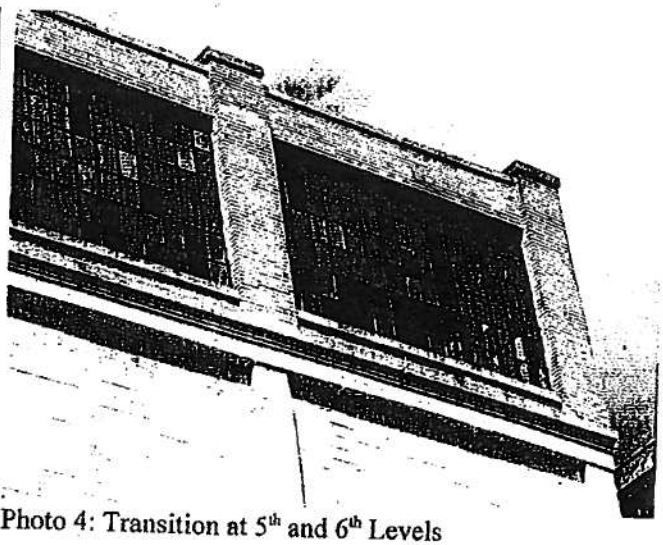

Photo 4: Transition at 5th and 6th Levels

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Photo 5: Deteriorated Spandrel Beam

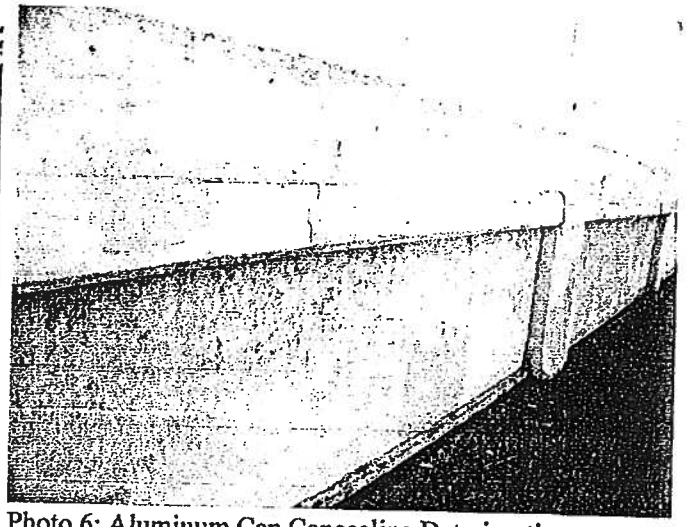

Photo 6: Aluminum Cap Concealing Deterioration

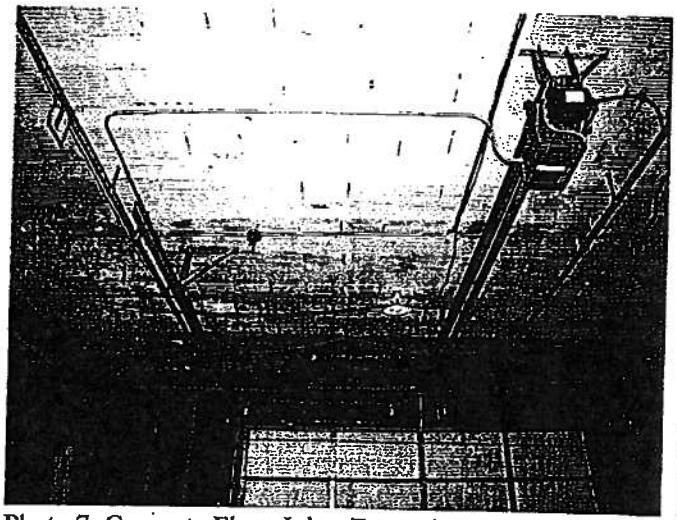

Photo 7: Concrete Floor Joists Formed With Tile

Photo 8: Spandrel Deterioration

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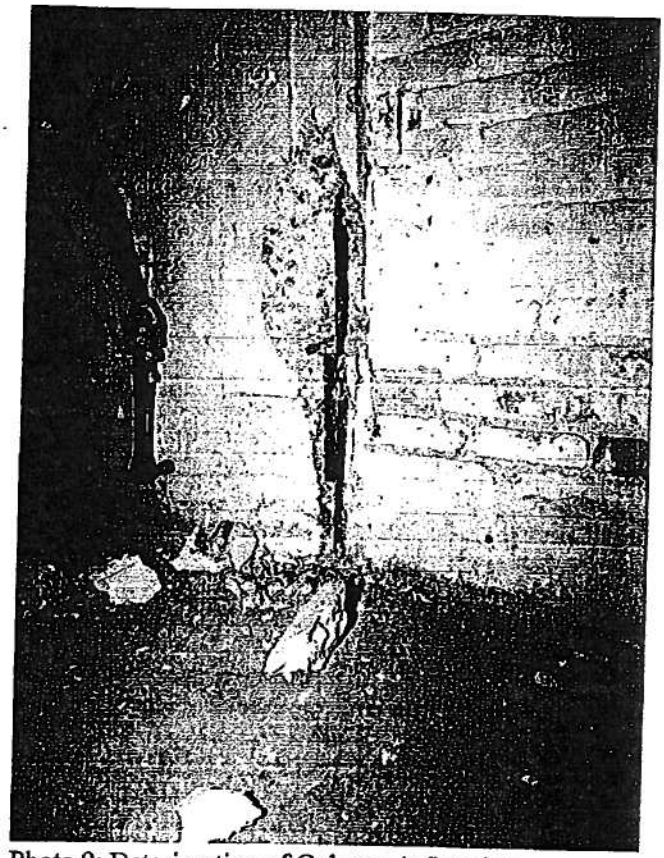

Photo 9: Deterioration of Column At Interior

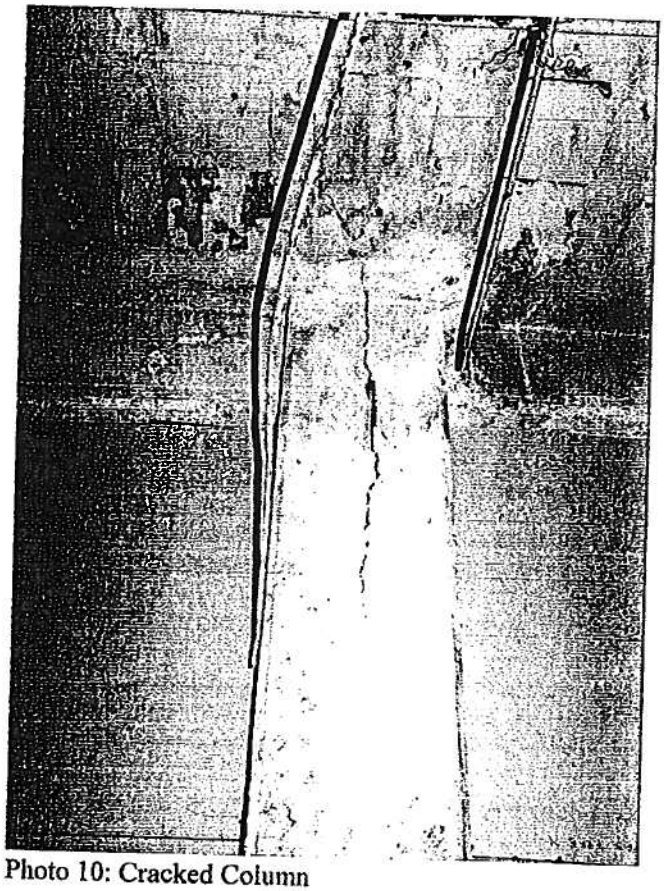

Photo 10: Cracked Column

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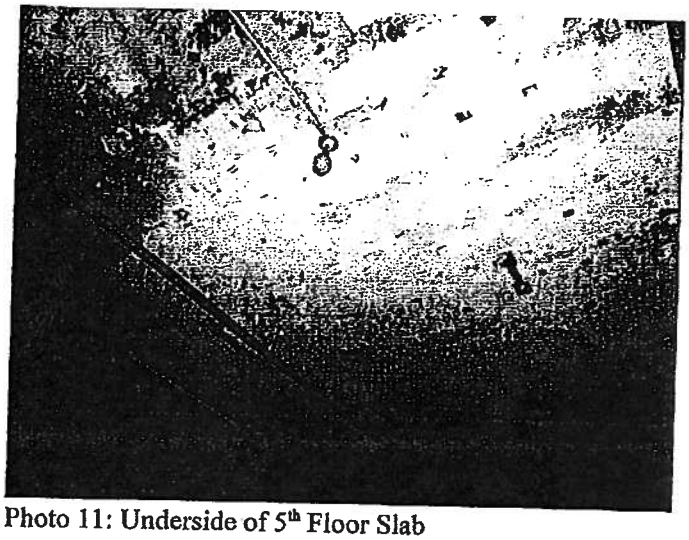

Photo 11: Underside of 5th Floor Slab

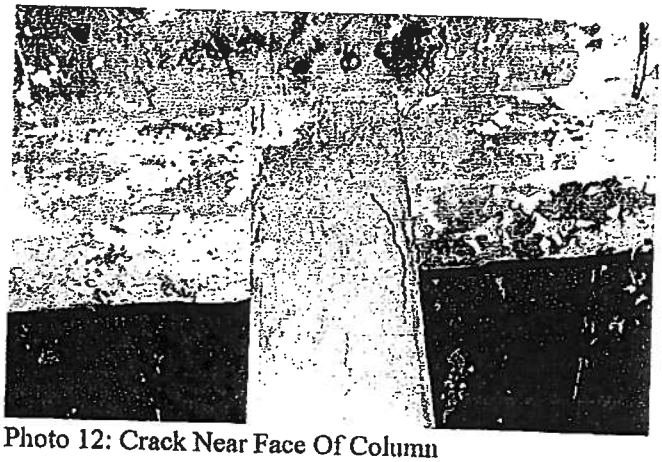

Photo 12: Crack Near Face Of Column

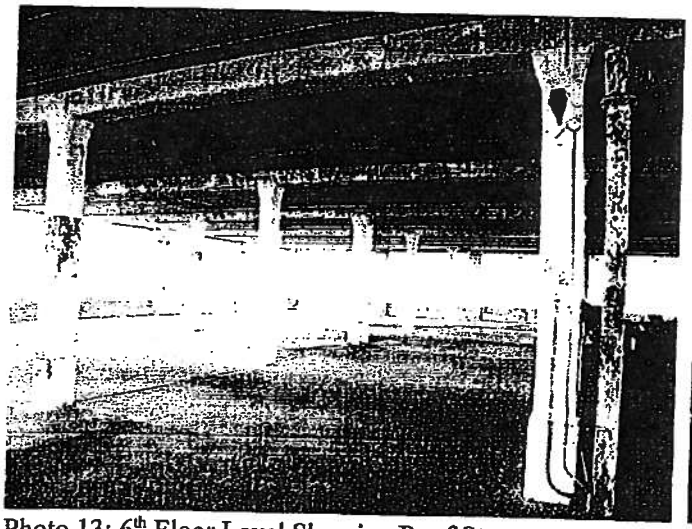

Photo 13: 6th Floor Level Showing Roof Structure

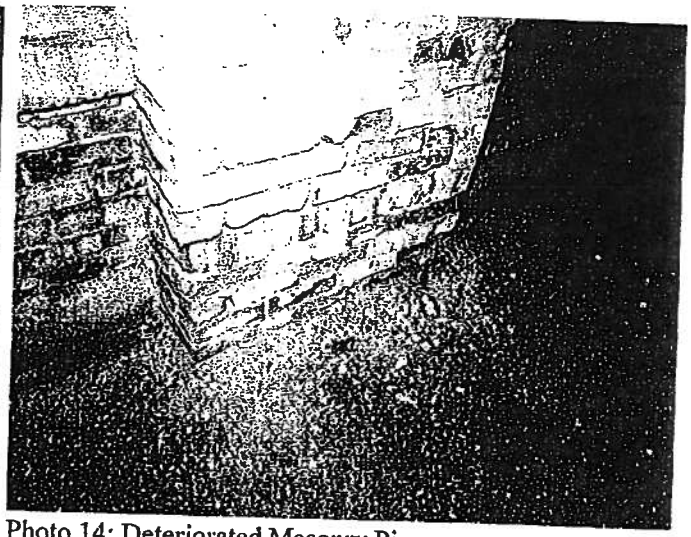

Photo 14: Deteriorated Masonry Pier