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HELEN C. WHITE LIBRARY FAÇADE EVALUATION UW Madison, Wisconsin

Submitted to:
Division of State Facilities
101 East Wilson Street, 7th Floor
Madison, WI 53702

Date: May 1, 2009

DSF Project Number: 07K3W
A&O Project Number: 080362

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INTRODUCTION

Arnold & O'Sheridan, Inc. was retained by The State of Wisconsin, Division of State Facilities to conduct a façade condition evaluation of the Helen C. White Library and Office Facility at 600 N. Park Street, Madison, WI.

The investigation was prompted by observations of cracked brick and displaced precast concrete panels. This report is intended to cover the entire perimeter of the building including those items originally pointed out to us. The exterior of the building is found to be in good condition considering all the exposed surface area and detail. Repairs noted are detail oriented and are generally maintenance items.

Appendix A consists of photographs representing some of the visual observations of the current deterioration.

FACILITY BACKGROUND

Description of Structure

The Helen C. White Facility was designed by Fitzhugh Scott in 1968. Arnold and O'Sheridan was provided copies of portions of the original design drawings and found other information at the University Physical Plant Engineering Group at 118 N Mills Street, Madison. Shop drawings for the precast façade elements and their connections were never located. The existing building drawings had some indications of the intended precast to structure connections but were general in nature and did not contain the type of detail that would be desirable for the purposes of this report.

The building consists of a seven story tower (measured from south side entry grade) on the west side and a four story library school wing on the east side adjacent to Park Street.

The building is of concrete frame construction. The facade consists of brick and precast concrete panels built into the brick. Precast concrete sunscreens are set around the perimeter of the building.

SUMMARY OF FIELD OBSERVATIONS

General Observations on the Facade

The precast spandrels panels, in many cases, are spaced out from the surface of the building. This can be observed in the elevation photos 1-14 in Appendix A. The panels are thus subject to thermal variation across their full dimension and will expand/contract with the seasons. The panel/panel caulk joints are thus subject to forces beyond that of a normal structure. The author understands the caulking for this building was repaired 10-15 years ago. It appears the re-caulking was not a complete removal but instead done in sections. We do not generally recommend a patchwork of differing caulking ages and types in a given joint and thus find the present installation lacking in general integrity.

The newer caulk is a polyurethane product and thus does not contain asbestos. The author has retained a section of the newer caulk if asbestos testing is desired. The older caulk was judged by B+B Restoration as containing asbestos. The exact locations for the newer and older caulks were not identified.

The elevation photos show precast panels placed within the brick wythe. There are no weeps or flashing at the base of the precast panels or above the precast panels and thus no method of exit for water entering the cavity. At the one point where a lift was used to provide higher access, it was noted that bricks directly above the precast band were being pushed outboard from their original position. This is believed to be the result of water trapped in the cavity and freezing. This was documented in one location only. Verification of the extent of this situation would require a lift to cover the entire perimeter of the building. Review of this extent was outside the scope of this report.

General observation of the wall system: The upper walls were observed with binoculars from the ground. Walls at the lower level were directly observed and the conditions noted presumed to exist higher on in the structure as well.

Condition of the precast panels: The panels themselves appear in good condition. No exposed rebar was observed. The grouting done on the tops of the spandrel panels to conceal the lewis hooks appears to be holding well. Some of the panels had minor defects as outlined under the listing of specific conditions.

Condition of the brick: The bricks themselves and the mortar joints appear in generally good condition. There is no general recommendation for re-pointing of the mortar joints at this time.

Condition of the Caulk: The quantity of precast panels requires extensive use of caulk. We understand that the building was re-caulked 10-15 years ago. We have no records of the extent of re-caulking. Our observations were again made with binoculars from the ground making it difficult to precisely judge the overall caulk condition. We did walk all the roofs and the perimeter of the building at grade level to observe the caulk and panel condition. The re-caulking of 10-15 years ago was done as patches and not as a complete replacement. We conclude it desirable, considering the age of the re-caulk and the probable age of the previous caulk, that the entire perimeter be considered for re-caulk. This would include brick control joints, precast wall panel/panel joints and precast panel to brick joints. Costs noted in later text are for a silyl-terminated polyether sealant with primer.

Listing of Specific Problem Areas

1. Photos 15-17 show the location of a precast parapet panel misalignment. This occurs at the library school east wing at the south wall. A similar condition exists along the north wall at the companion

position. This area was subject to an evaluation using a boom truck for closer observation. The caulk at the head joints of the panels was removed to observe the building connection condition which the original design drawings showed to exist between panels. There was no connection found between the panels and the concrete beam as the original drawings had shown. The support for the panel is thus considered to occur where noted in photo 17 where the upper and thicker portion of the panel overlaps the concrete roof slab. There was no attempt to expose the condition since it was in early February and removal of the roofing membrane was not desirable with the temperatures present at the time.

Using a level, the corner panel was found to be plumb and square with the wall. The first interior panel was then judged to be the panel which was out of alignment. This panel had been field modified as shown on photo #18. The east end of the panel had been cutoff in the field as evidenced by the rough cut of the head joint surface and the lack of the caulk recess cast into the panel. The panel as supplied to the job site was apparently too long. Using a level and a straight edge the panel was found to have a warped outer surface. The panel corners reasonably flushed out with adjacent construction at the two bottom corners and the top corner at the west end. The top corner at the east end was inset about 1" relative to the corner panel thus indicating the warped condition. The top elevation of all the precast panels were consistent along the parapet indicating there was no loss of vertical support Evidence from the caulk indicated this misalignment existed at the point 10-15 years ago when the re-caulk was done. Based on the counterflash (photo#17) the panel misalignment existed at least when the building was re-roofed. Thus it is concluded that the best evidence is that the first interior panel was probably placed in this position originally. The support for the panel could be exposed by removing the roofing for final verification of this opinion, if desired.

The same condition occurs on the north wall, south of the signal tower and the same opinions hold there.

There is no repair anticipated or cost estimate made for this condition.

2. Along the juncture of high and low roof at the library school (grid 9 in original building drawings) there are four intermediate masonry covered piers as shown in photo #20. The first and second interior piers from the south end have vertical cracks in the brick as shown in the photo. There is also some cracking on the east exposed face of

the pier although they are hairline. The north two piers do not have this type of cracking. The piers consist of brick built around the concrete columns. The east face of the pier bears the weight of the precast spandrel. The brick returns to the interior side of the column and is exposed within the room. It is the writer's opinion that the brick has been cracked by the shrinkage and thermal movement of the precast spandrel panels. This is evidenced by the vertical hairline cracks on the east face of the pier and by the horizontal offsets in cracks in the north and south faces of the piers.
The repair proposed is complicated by the fact that the brick is partially exterior and partially interior and any repair would involve removal of the windows on either side of the pier. The desirable solution would be to remove and replace the cracked bricks. It is probable that no extra original bricks are available but that a possible match could be achieved as was done at the signal tower. The precast spandrel panel would be shored and eventually set on a hard plastic bearing pad on the brick. This would allow some movement in the panel without distress to the brick.

The easy solution is to simply caulk the cracks to avoid water entry to the pier and avoid the potential of freeze damage at the base of the pier.

3. The north elevation of the building adjacent to office #4232 (fourth level east end of the library school building) has a crack as shown on photo #9. The crack extends from the end of the intersecting precast panel horizontally toward the window and into the exposed brick inside office #4232. This is most likely a result of initial shrinkage in the precast panel and exacerbated by thermal movement. There are no other instances where this occurs in the building leading to the idea that the repair would be simply re-pointing of the joint with matching mortar. There does not appear, from the ground, to be any broken bricks thus making the repair fairly straight forward.

4. The walkway at the third library level. The walkway rings the courtyard on west thru the east side and extends to the southeast stair tower. Please refer to photos #2 thru 5. The west side and central portion of the walkway is constructed of precast planks running with the long direction of the walkway. The east side is poured in place concrete. Except for the panel shown in photo #30, the plank portion of the walkway is in good condition, especially considering the salts being used for de-icing. The caulking between precast panels has delaminated in certain portions and is in need of replacement. The water stains from the leaking caulk can be seen in the underside of the slabs.

The poured in place walkway on the east side is in much worse condition than the precast portions. Modern day techniques of significant slope, epoxy coated rebar and higher density concrete were not used in the original construction and thus more effort must be expended in continuing repairs. Shrinkage cracks in the floor panels have been caulked but are in need of re-caulking. There are delaminations in the slabs. We have not done a chain drag survey for this slab as it was outside the scope of this report. Delamination and caulk repairs followed by a urethane coating would be desirable to extend the life of this slab.

5. The accent wall at the northwest corner of the building has evidence of a leaking coping. This wall forms the west end of the north walkway. This condition is shown on photo #22. Water stains at the concrete beam over the walkway are indicative of a leaking coping. There is no visible drip edge under the coping and thus it is assumed there is no flashing under the coping. It is felt the coping leaks along essentially the full length of the wall even though the evidence of leakage only occurs where the beam exists. Because of the difficulty in removing the cast in place coping, we are proposing the wall be coated with a silane sealer to slow down the deterioration. Ultimately there is nothing to do with this wall other than to reconstruct it to modern water resistance standards. We are not proposing this to be done at this time as the wall still has integrity. At some point in the future this section of wall system will need to be replaced.

6. The concrete stair at the west side of the entry plaza is shown on photo #2. The stair has been most likely heavily salted and relatively recently been covered with a urethane membrane. Rebar corrosion is evident on the underside of the stair slab. This has probably occurred due to water infiltration before the coating was applied. It does not appear to require further attention at this time. Other problems noted for this slab
    a. Cracks lengthwise in the stair treads: The cracks have penetrated the new coating. The solution would be to rout and caulk the crack and repair the urethane over the top.
    b. Drainage pattern at the intermediate landing seems marginal but is not suggested for revision since the urethane is relatively new.
    c. A spall at the intermediate landing level at the top surface of the concrete slab. The spall has damaged the urethane coating.

7. Photo 24 shows a crack in the foundation wall at the southeast stair. This should be repaired by routing and caulking.

8. Photo 25. Rusted spandrel connectors on the underside of the east walkway. The steel connectors have rusted due to the corrosion proceeding on the walk way slab above. At this point they do not appear to have lost significant cross section but this observation is made from the ground only, not from a close up view. This is further evidence of the desirability of resolving the water issues at the walkway. The spandrels tended to block the escape of surface water, causing damage to the spandrels and the slab itself.

9. Photo #26 shows a typical condition of a precast panel built within the brick wythe. The backup for the wall is typically concrete block. The precast panels share the brick width. There is no drip edge evident and the belief is there is no flashing at the precast panels and back to the CMU wythe. Weep holes were not observed to be present in the brick as a means of water exit from the cavity. Thus any infiltration will collect at the base of the wall and potentially cause damage to the wall. The cost to cut in weep vents has been included in the estimate. The costs provided assume weeps are cut into the bottom of each brick wall at the elevation of the top of the foundation wall.

10. Photo #27 shows the typical outrigger condition at the tower roof level. The wash slabs have in some cases cracked on their upper surface which can admit water to the concrete outrigger beam below. It is believed the wash conceals the panel connection below and any leakage would endanger that connection. We are recommending the washes be routed and caulked where the cracks occur.

11. Photo #28 shows the north walkway scupper. The scupper was a concrete extension off the precast panel. This extension was not watertight and water was able to enter the brick wall below. This has caused the staining evident in the photo. The drain configuration was revised presumably when the walkway was repaired. This appears to be working successfully. We have reviewed the condition of the brick under the drain area and find it in reasonable condition with no repair indicated other than cleaning.

12. Photo #29 shows the condition of the scupper at the east walkway. This scupper was constructed in a similar manner to the north walkway. There are two drains thus along this side. The north scupper is placed over a lower stairs and has a metal extension to keep the water from entering the stairs below. The south scupper has deteriorated over time and been repaired with grout over the top.

This is viewed as a short term solution with the desired repair being that as was done at the north walkway.

13. Photo #31 shows a cementitious patch in the precast panel which has become delaminated and occurs in several locations. We would propose the patch be removed and the area filled with caulk.

14. Photo #32 shows a mortar crack in the vicinity of a small cast-in-place concrete beam. The beam is not believed to bear on the brick. The crack does not go thru any of the bricks. The repair proposed would be to re-point the joint with a matching mortar.

15. Photo #33 shows a vertical crack in the toothed-in re-entrant corner brick joint in the southwest corner of the office tower. The precast/precast panel re-entrant corner joints also have a heavy caulking to indicate this joint there has probably also opened. We would propose the brick joint be routed and a heavy bead of caulk be applied to seal the joint.

16. Photo #34 shows the precast panels below the windows along the west side walkway. These panels will need to be re-caulked in this and the similar circumstances around the west, north and east sides. The cost of doing this caulking is carried in that for the building in general.

RECOMMENDATIONS

Overview

Arnold & O'Sheridan, Inc. has completed a condition evaluation of the facade to evaluate its current condition. It is recommended that the observed deficiencies mentioned in this report be repaired in the near future to help to help reduce continued deterioration and more costly repairs. Cost estimates for the repair of items identified from our survey are discussed in later text.

The exterior of the building is found to be in good condition considering all the exposed surface area and detail. Repairs noted are detail oriented and are generally maintenance items.

COST

Overview

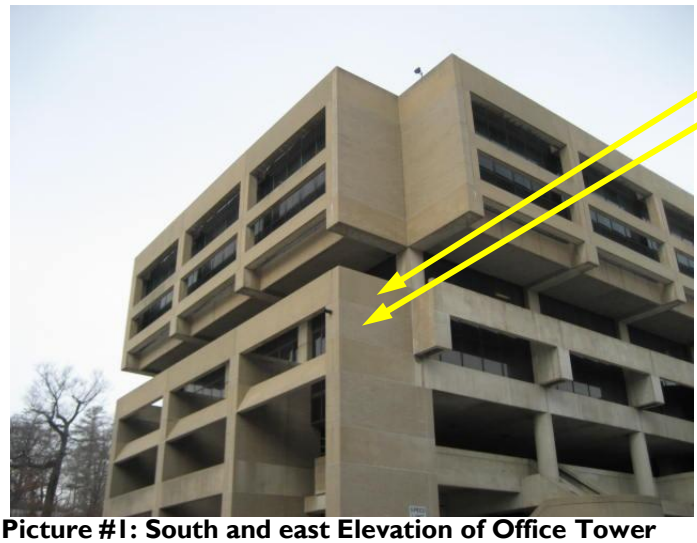
The Survey Results and Cost Analysis summarize our findings of the current condition of the facade. The table provides our estimates of probable construction costs for repair of the items noted in this report. The cost estimate for these tables are based on 2009, current costs. No attempt has been made to adjust the cost for future years. The estimated costs are for construction and do not include any fees for architectural or engineering services. The estimated costs do not reflect multiple work phases. Cost can increase when work areas or items are restricted, thus creating multiple work phases.

Opinions of Probable Construction Costs

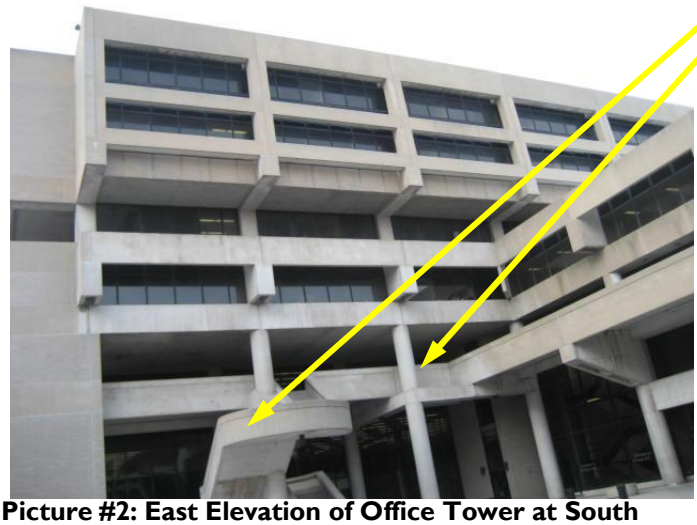
Opinions or estimates of probable construction costs presented within the context of this report are prepared on the basis of Arnold & O'Sheridan, Inc. (A&O) experience and qualifications and represent A&O's judgment as a professional generally familiar with the industry. However, since A&O has no control over the cost of labor, materials, equipment, or services furnished by others, over contractor's methods of determining prices, or over competitive bidding or market conditions, A&O cannot and does not guarantee that proposals, bids, or actual construction cost will not vary from A&O's opinions or estimates of probable construction cost.

Estimate of Construction Costs

General Conditions (~5%)	$14,000
Re-caulk perimeter of exterior walls/precast panels. Estimate 14,000 lineal feet of caulk. $12/ft average cost	$168,000
Scaffolding/ bucket truck access for caulking	$25,000
Costs for the specific repairs as noted in items 1-16.	$83,000
Sub Total	**$290,000**
Contingency (10%)	$29,000
Total	**$319,000**



Picture #1: South and east Elevation of Office Tower



Picture #2: East Elevation of Office Tower at South Entry

Picture #3: South Elevation Main Entry to Library School

Walkway at third library level
Concrete supports for walkway The stains noted are from leakage in the joints of the precast walkway slabs.

Picture #4: South Elevation- South Entry

Walkway at third library level
Southeast corner stair box

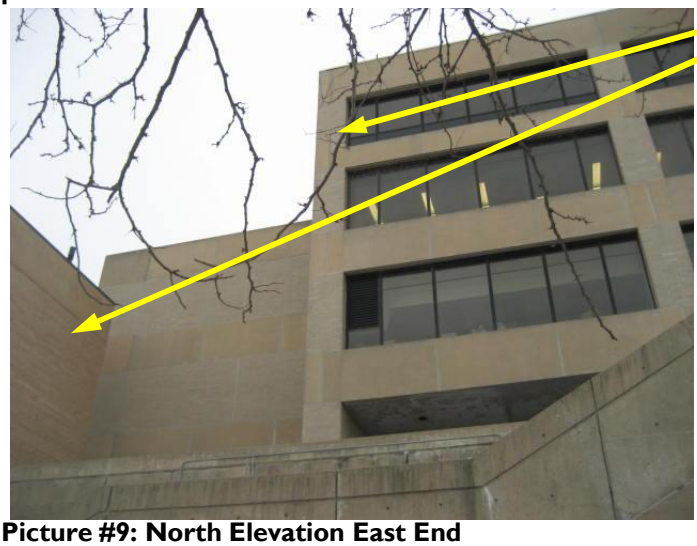
Picture #5: West Elevation of East Wing Near Main Entry

Southeast corner stair box

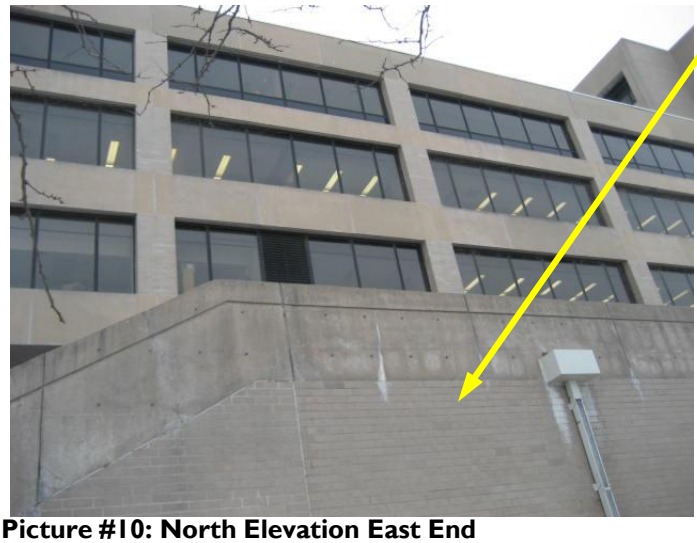
Picture #6: West Elevation of east wing Looking Toward Park Street

Picture #7: East Elevation of Library School looking north and abutting Park Street

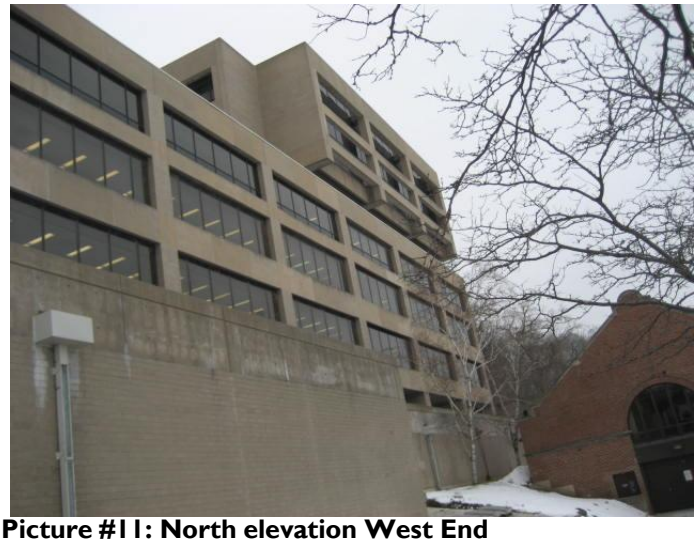
Picture #8: east elevation of library School viewed from park Street



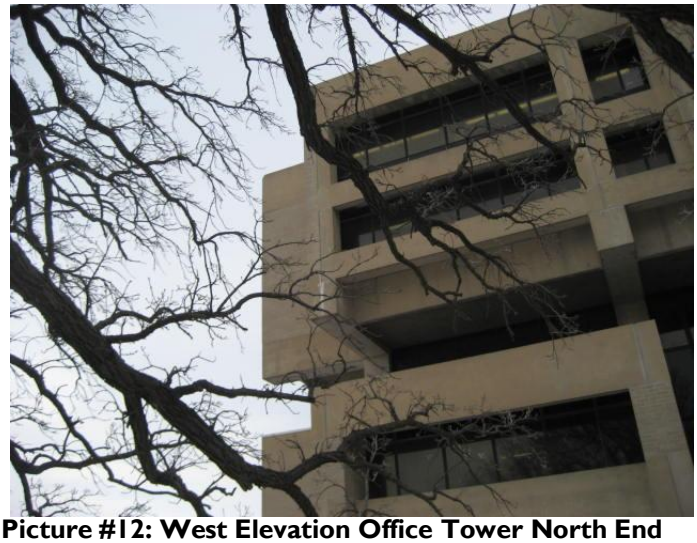
Picture #9: North Elevation East End



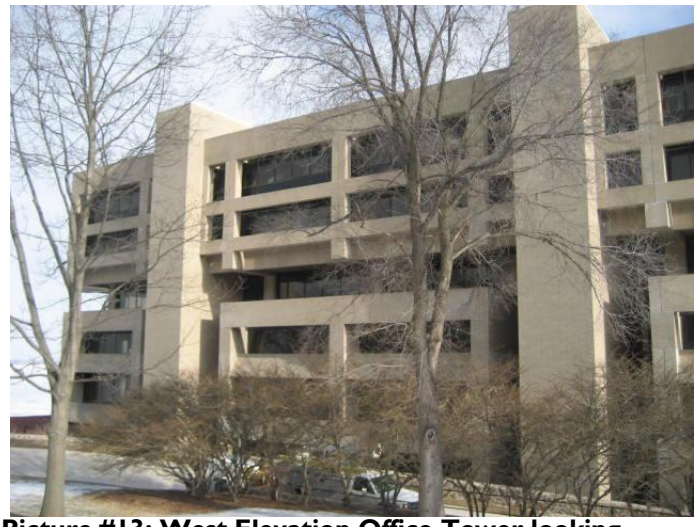
Picture #10: North Elevation East End



Picture #11: North elevation West End

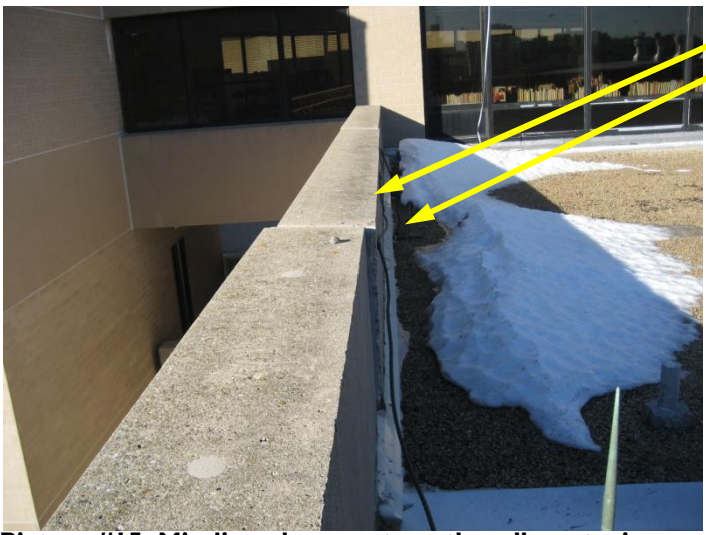


Picture #12: West Elevation Office Tower North End



Picture #13: West Elevation Office Tower looking Northeast

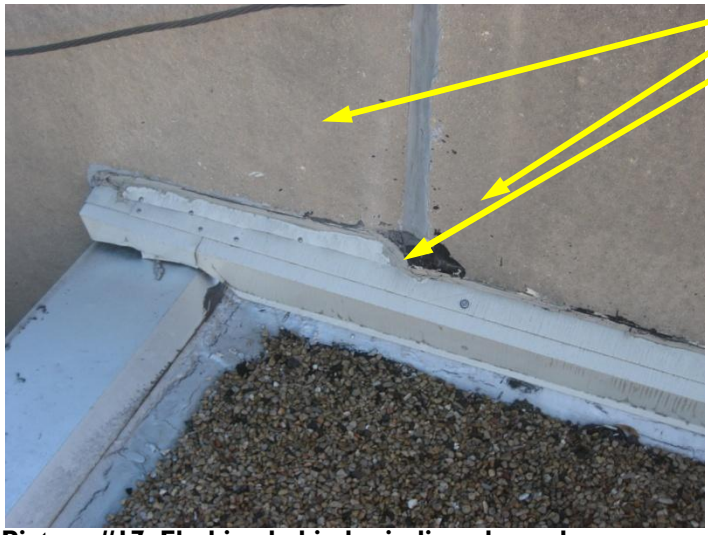
Picture #14: West Elevation South End



Picture #15: Misaligned parapet-south wall, east wing

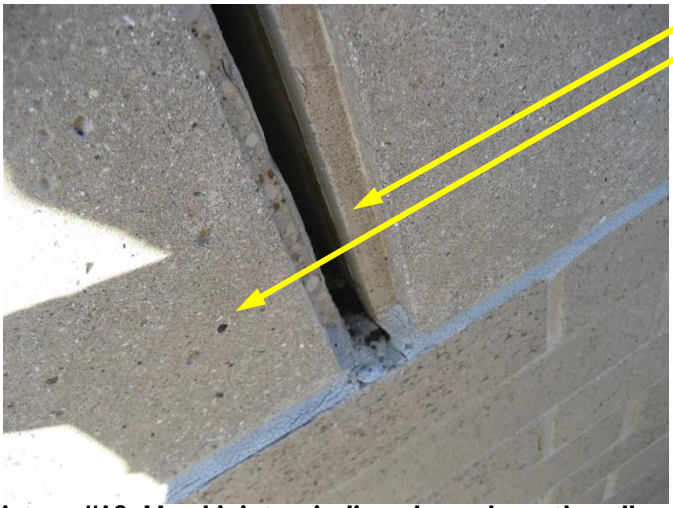
Corner panel
Misaligned panel joint

Picture #16: Top view misaligned parapet-south wall



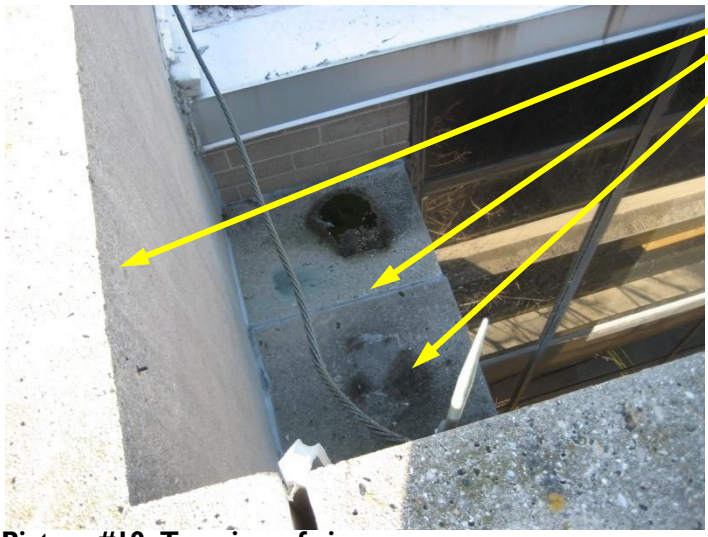
Corner panel
First Interior panel
Misaligned counter flashing. The support for the precast panel probably occurs behind the counterflashing where the panel overlaps the concrete roof slab.

Picture #17: Flashing behind misaligned panel



Corner panel
First interwork panel off the corner

Picture #18: Head joint, misaligned panel, south wall



Corner parapet panel
Concrete cap over pier
Probable area of connection for spandrel panel

Picture #19: Top view of pier

Cracked brick pier at the junction of the high and low roof at the east side of the building. Referring to the existing building drawings this would be along grid 9.

Picture #20: Low Roof at Library School

West walkway with precast panels. Arrow points toward the caulk joint

Picture #21: West Side Walkway

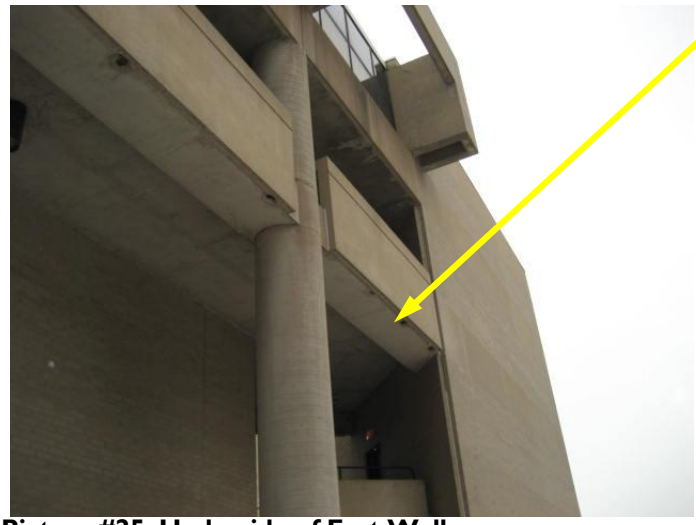
Section of wall with leaking coping. The stains on the lower poured concrete beam indicate the passage of water thru the wall.

Picture #22: Entry wall at Northwest Corner

Picture #23: Concrete Stair at Main Entry Plaza

Crack in foundation wall

Picture #24: South end of Southeast Stair



Rusted concrete spandrel connectors

Picture #25: Underside of East Walkway

This photo shows the precast concrete bands built into the brick wall. This is typical wall construction around the library school

Picture #26: South Wall at the Library School

Spandrel Panel-caulking in vertical joint is in need of replacement

Concrete outrigger wash slab. The cracks in the wash slab will need to be routed and caulked

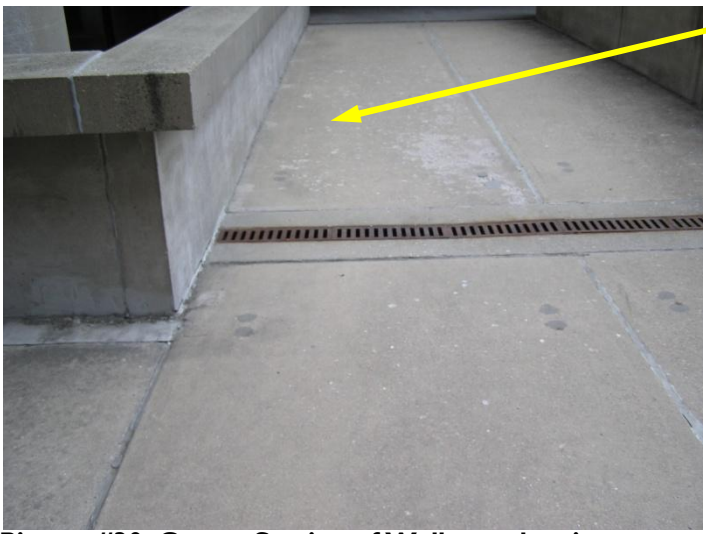
Picture #27: East Side roof level –outrigger support of concrete spandrel

Walkway drain. This has been re-piped from original construction.
Walkway surface beyond

Picture #28: North Wall at the walkway

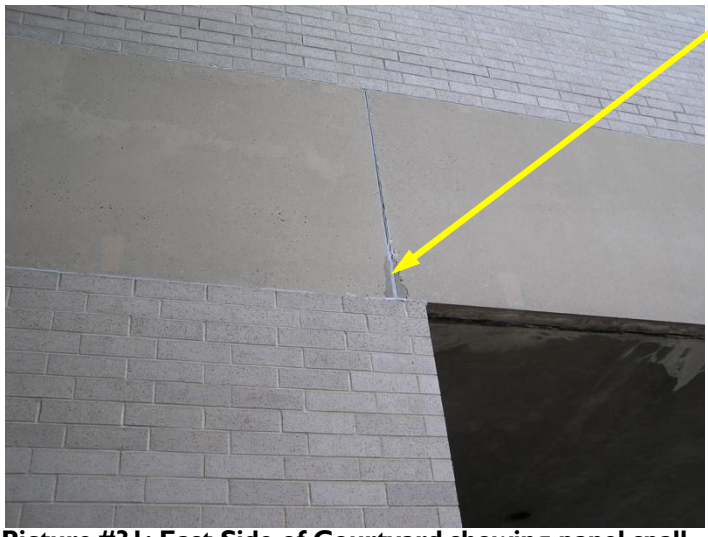
Deteriorated scupper with grout repair on the upper surface.

Picture #29: East side walkway-paralleling Park Street



Spalling is evident on this precast walkway panel. The remainder do not have similar problems

Picture #30: Center Section of Walkway showing spalled panel

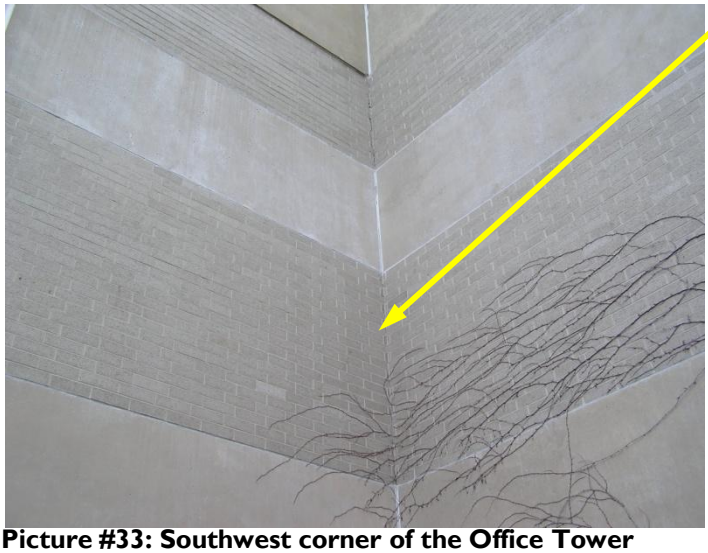


Corner of the panel has spalled. The repair has been pulled out by the caulking.

Picture #31: East Side of Courtyard showing panel spall

Step crack in brick at the poured in place beam bearing.

Picture #32: South side of building at the entry to the elevators which service the tower



Cracked brick full height between precast panels

Picture #33: Southwest corner of the Office Tower

Precast panel joints require re-caulk. This is typical along the west, north and east walkway.

Picture #34: West side of Office Tower at the base