Appendix H
Exterior Condition Survey

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Exterior Condition Survey
for the
University of Wisconsin Field House

Madison, Wisconsin

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Exterior Condition Survey - University of Wisconsin Field House

The exterior of the Fieldhouse at the University of Wisconsin, Madison, was surveyed on July 26 - 27th, 2018 to determine needed repairs. The building was broken up by elevation and by bay, increasing in number from left to right.

Please note: much of the gable on the south elevation was not accessible as the man-lift could only reach to the bottom of the "W" Cartouche. Additionally, the north elevation could not be accessed by a man-lift as the stadium abuts the Fieldhouse.

Mortar

In general, the mortar for the sandstone and brick is in good condition. The mortar often covers the arises of the stone. Nearly all the mortar appears to be original and is generally sound. The mortar has exposed aggregate from weathering and it is difficult to determine how the mortar joints were originally finished. Large white nodules can be seen in the mortar and these are assumed to be lime nodules.

There has been some localized repointing in areas, especially at the cracks and at high weathering areas, including skyward facing joints, areas near grade at the water table and at the parapets. This investigation did not find evidence of a past large-scale repointing campaign.

Deteriorated mortar on the South elevation.

The terra cotta mortar is typically in a bad state, with open or deteriorated joints. Much of the mortar for the terra cotta has been replaced with caulking, which can trap moisture behind it and cause additional damage to the terra cotta. Caulking can be used for wash joints or skyward facing joints but should not be used for standard joints as it traps water behind it and can cause damage to the glaze as well as the terra cotta unit itself. Replacement of all of the mortar joints for the terra cotta is recommended.

The common mortar for this time period would be a cement/lime mortar. A lime/Portland cement-based mortar would be appropriate for the use on the building. A mortar mix by volume similar to a 1 part white Portland cement: 2-½ parts lime : 8 parts aggregate. To determine the amount of cement present in the mortar, further analysis should be considered. Calcimeter analysis is one method that can determine the amount of soluble salts present.

A base quantity/percentage of repointing should be carried out for each elevation, minimally say 5%. The mortar should be installed and allowed to cure until it's thumbprint hard, then tamped with a churn brush. The churn brush packs the mortar as well as exposing the aggregate giving it a weathered appearance, allowing it to visually blend with surrounding elements.

Caulk

Caulk has been used throughout the building for repairs, including at flashing, windows and on the terra cotta. Much of the caulk has failed or has nearly reached the end of its service life. Please note that we recommend all of the caulking be replaced.

Failed caulking at terra cotta/copper flashing joint and copper/stone joint.

Brick

The brick found at the window surrounds was generally found in good condition and it appears that no brick replacement is required. There is no evidence that the brickwork at the window surrounds was added later. The only notable concern with the brickwork is on the East elevation second bay from the north, where there is a large crack that extends through the brick arch. One course of brick has dropped approximately a half inch in the underside of the arch.

Crack at brick window arch. Note brick that has dropped.

Sandstone

A majority of the building is composed of a locally sourced tan Madison Sandstone, from the Steven's Quarry in Western Madison.

> "The upper beds of the Potsdam also furnish in the southern part of the State two layers – one of sandstone, underlaid by the other, an impure dolomitic limestone – which immediately underlie the Lower Magnesian limestone and occur everywhere just below the base of that formation wherever the latter is exposed in the half circle in which it comes to the surface. These beds have been given the name of Madison sandstone and Mendota limestone. "

> "The Madison beds, wherever they occur, are rarely less than 35 feet thick, often more, and furnish frequently a slightly calcareous sandstone, which is generally a very good building stone, although never occurring in layers of a thickness suited for large ornamental stone. It is of various shades, from yellow to a light dull brown, and has been much quarried wherever found, because of the ease with which it can be shaped into appropriate forms. It gradually hardens and changes upon exposure to a rather dull yellowish-brown, and has been quite extensively used at Madison and in the surrounding country, and in many villages in the region where it occurs." - *The Wisconsin Sandstones*, The Manufacturer and Builder, Vol. 17, Issue 12 December 1885, pg. 274

In general, the sandstone was found to be in good condition. Some deterioration was present, including sugaring and loss of stone. This deterioration is typically found near grade and at the parapet walls and was most likely caused by rising damp and salts near grade, as well as exposure/weathering at the parapets. Some of the stone has lost a considerable about of material at the face and should be considered for possible replacement. A good a source of available and appropriate replacement sandstone, however, will need to be located.

Deteriorated stone.

The most concerning issue with the Field House's sandstone is the amount of cracked or fractured stone that was found. Some of the stone units can be left in their current state, while others should be pinned or considered for possible replacement.

Cracks

A number of cracks were found on the building, usually one per bay, and typically extending from grade to the door surround, and through to the lancet windows (where present). These cracks also extended through the arched windows, and up through the cornice. Of concern, a majority of cracks appeared open despite having been previously filled or repointed. A previous structural report indicates the cracks have been monitored over a length of time with no observed movement but installing crack monitors for future observation is recommended. The regularity of the cracking suggests it may be design-related, making it a good candidate for closer examination by a Structural Engineer.

Crack(s) above window arch

Several bays on the East elevation have excessive movement, including the second bay from the north and the second bay from the south.

Terra Cotta

Much of the building's terra cotta shows some degree of fracturing, cracking and/or spalling. In previous repair campaigns, fissures were widened to make them easier to fill, thereby creating larger voids, eventually allowing more water into the terra cotta units. Crack repair typically consisted of infilling with mortar or caulk (photo 2557). Crack repairs should be carried out with a proprietary grout or mortar repair system and coated with a glaze. We recommend areas that have suffered full-blown loss be infilled with these same mortar repair materials, and then coated with the pre-matched, matte, glaze used elsewhere.

Additionally, glazing on the terracotta has spalled on many units. This is common especially near grade and at some of the high-weathering areas. (photo 2559)

Figure 1

Repair of the terra cotta units – Jahn M100; Edison Coatings Custom System 45.

Replacement – some of the terra cotta units should be considered for full replacement as they have experienced loss, extensive cracking, as well as loss of glazing, or are no longer structurally sound.

There are two prominent manufacturers of terra cotta - Boston Valley Terra Cotta (near Buffalo, N.Y.) and Gladding McBean (California). Another option for terra cotta replacement is pre-caste stone with a glazed finish. Pre-caste stone may be a more cost-effective alternative.

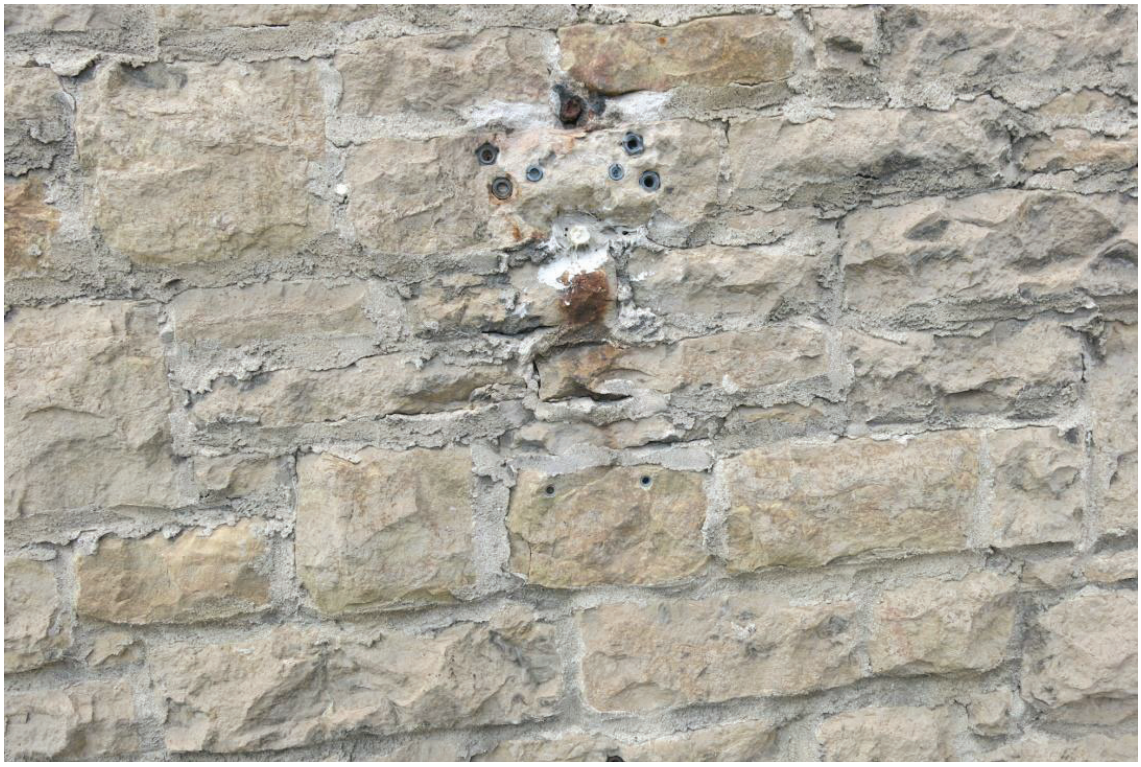
Glaze – Loss of the glazing on the terra cotta units is common and is found throughout the building. It occurs in both small quarter sized spalls to areas of loss greater than a square foot. Often the loss of the glaze is caused by water getting behind the glaze and popping off the glaze trying to escape. Water can get into the terra cotta units through the mortar joints or through other spalls. As opposed to the typically water impervious glazing, the body of the terra cotta is porous and readily absorbs water.

Please note that the introduction of water into the building's terra cotta units can cause deterioration of their anchoring system and could potentially lead to their catastrophic separation and fall from elevations.

Glazing repair - Cathedral Stone's MasonRE Terra Cotta Glaze; Edison Coatings: Aquathane UA210, AquaSpex 220, Elastomeric 350-Series.

Anchors

Metal anchors and attachments are found throughout the building. Although these once served a purpose, they are now superfluous. One location where attachments were found is on each pier, below the existing lighting, where earlier lighting was once located. Ferrous stains were found around most these anchors. These anchors should be removed, and the holes infilled with mortar or a stone repair material.



Anchors/attachments on East elevation.

Soiling/Staining

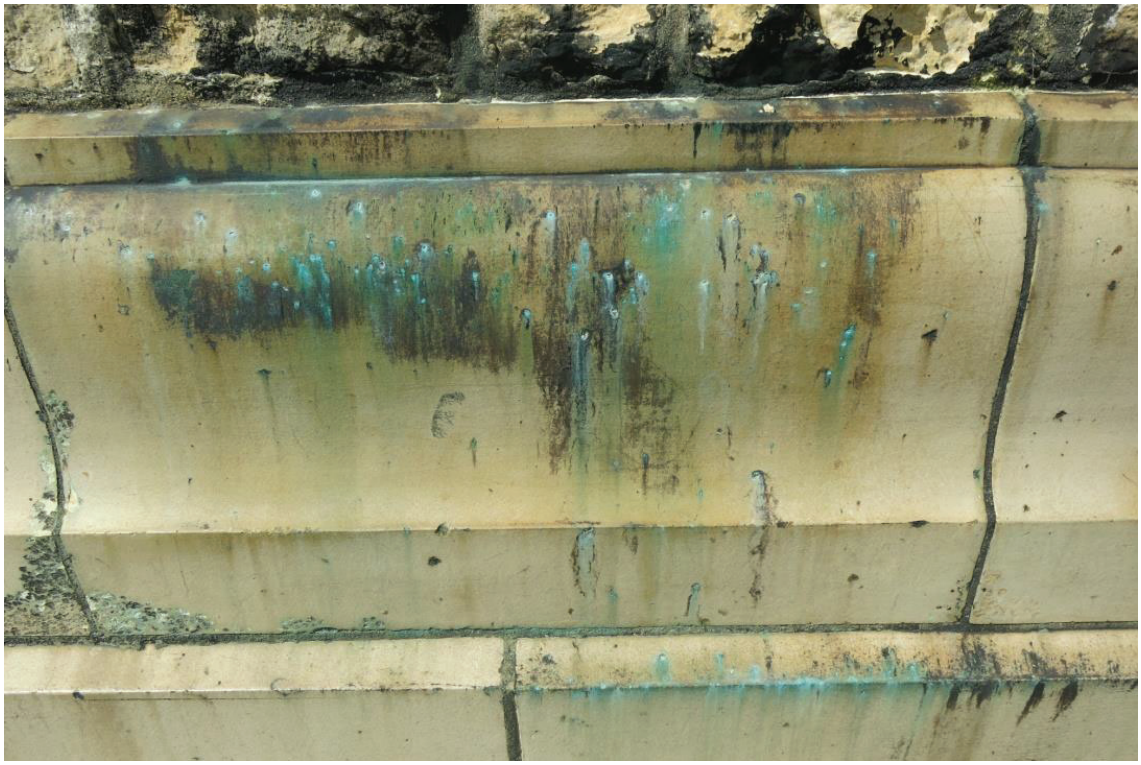
Various kinds of stains and soiling were found on the building. These included biological growth, ferrous staining, cuprous staining, and atmospheric soiling. Much of this staining and soiling was located near grade.

Various types of staining/soiling on the South elevation.

Ferrous staining is found on the building at multiple locations. Typically, it is found on lower sections of the building, ands was primarily caused by run-off from the metal flashing and metal anchors above. This staining can probably be removed with proprietary stain remover or poultice, such as ProSoCo Ferrous Stain Remover. Additionally, the problematic flashing should either be cleaned and painted, or replaced.

Ferrous staining on stone below metal flashing on South gable.

Cuprous and Ferrous staining – remove with proprietary stain removers or poultice

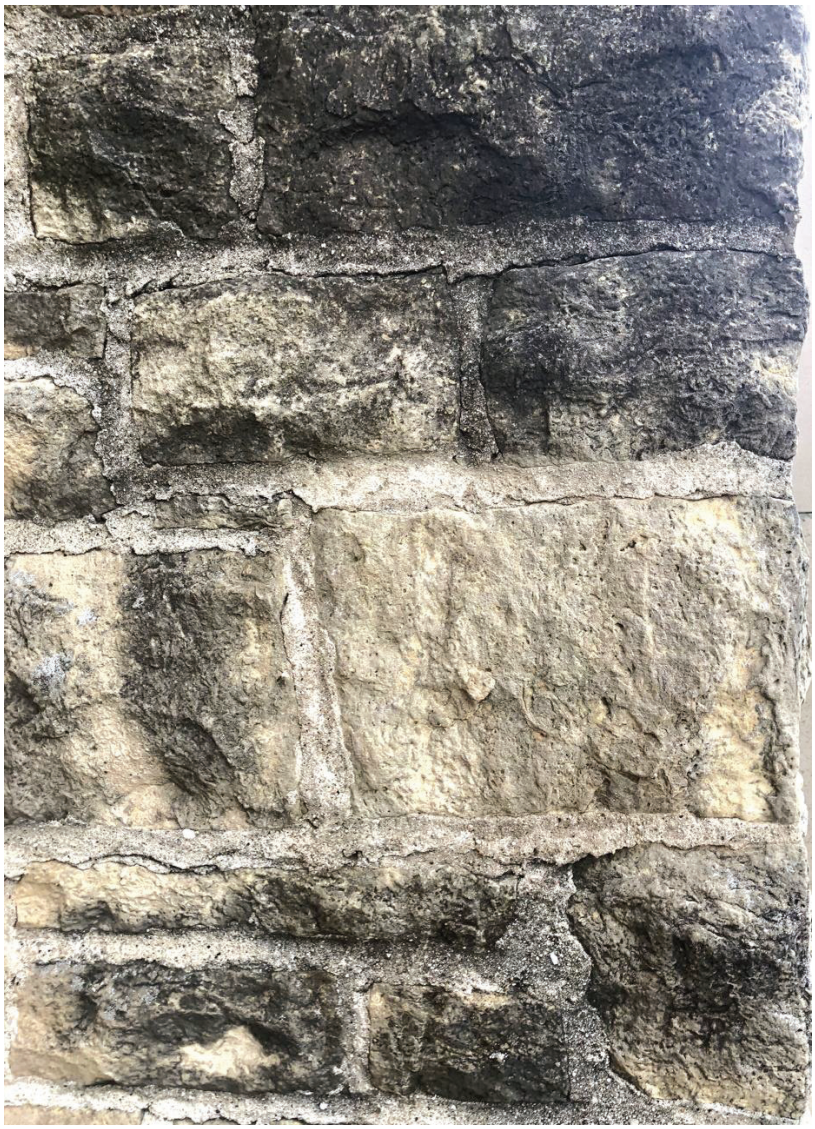


Terra cotta near grade: Note cuprous as well as ferrous staining.

Staining/Soiling/ Biological growth is found at various locations on the building but is more common on the lower section of the building below the lower belt course, and especially on the water table.

Cleaning tests were performed on Bay W7 near grade attempting to remove the black bio/soiling using a proprietary biocide (D/2) with promising results. Both sandstone and terrace cotta were test cleaned. The product was applied and allowed to dwell on the substrate for a period of five minutes and then was agitated with a bristle brush and reapplied and agitated again. Run-off was removed with towels to prevent biocide from running onto the stones below.

Cleaning test on dark biological staining on sandstone.



Detail of sandstone after cleaning with an antimicrobial

Further cleaning tests will need to be carried out prior to treatment to determine the efficacy of other potential methods and materials.

Conditions and Treatment Recommendations:

Prioritization Guideline

In summary of the narrative description of existing conditions above and the details presented in the Treatment Recommendations to follow, the recommended overall prioritization of repair/replacement work is:

1. Consider replacing all skyward facing/wash joints, especially at cornices
2. Cut-out all cracks and repoint; Repair or replace stone as needed and consider installing crack monitors.
3. Repoint any open joints
4. Clean all masonry
5. Repair and re-glaze terra cotta as needed; consider removal of a damaged terra cotta unit to further investigate construction and anchorage methods.

Please see the Elevation Key – Appendix 1

1) South Elevation

Bay No. S1 –Lower – Repair crack on door surround bottom left. Water table – loss of glazing, repair cracks. Cracked/deteriorated pointing between water table and lower band course - repoint. Heavy soiling @ 35sf, cuprous and ferrous staining on terra cotta. Large crack at left door surround at bottom – repair.

S1 Middle – Heavy glazing loss on balcony and mortar failure – repoint 100%.

S1 Upper – Deteriorated mortar above cornice at return – repoint 100%.

Bay No. S2 – Lower – Crack running from terra cotta doorway through to sill. Remove out of service electrical junction boxes. Heavy soiling 35sf, cuprous and ferrous staining on terra cotta staining

S2 Middle – Repair/replace left sill and band course below it as they have extensive cracks. Crack runs from door surround through sill. Balcony – heavy glaze loss, 100% repoint of joints.

Bay S3 - Upper – “W” cartouche – Bottom unit has crack. Middle – Repair/replace heavily cracked left sill and band course beneath it. Crack runs from doorway through to sill.

Bay No. S4 – Lower – crack runs through lancet window through sill and to grade. Repair crack in terra cotta at grade. Middle - Replace left sill, it has several cracks and very hollow sounding. Possibly replace band course below sill as it has several cracks.

Bay No. S5 – Lower – Repair crack in terra cotta at bottom right surround. Soiling at 20sf. Cupperous staining at 8sf. Ferrous staining at 10sf. Loss of glazing at water table at 40%.

S5 – Middle - Balcony – repair two cap stones, 1 baluster, 1 band course with loss. Approximately 45% loss of glazing.

2) East Elevation:

E1 Lower – Consider replacing SE corner bottom unit on water table as it has several cracks, loss of material and glaze. Cracks from either end of window sill to doorway surround. Ferrous attachments above doorway.

E1 Upper – Large crack from window arch to cornice.

E2 Lower – Consider replacing top right-hand corner at door surround. Consider replacing unit below as it has three patches and loss of glaze. Stones above water table are deteriorating – sugaring and loss of surface. Upper – open joints on coping wash course.

E2 Upper – Joints on coping skyward joints are open.

E3 Lower – Consider replacing top right door corner unit at door surround. Consider replacing unit just below it and the top left corner.

E3 Middle - Consider replacing right terra cotta sill - cracked and hollow. Left sill is cracked as well.

E4 Lower – Heavy staining on pilaster at bottom. Re-attach piece at bottom left door surround.

E5 Lower – Consider replacing top right corner of door surround and consider replacing unit below it. Also consider replacing top left unit of door surround.

E6 – Door surround – Spalling of glazing. Replace top left corner door surround (severely cracked) and strongly consider the unit below it (25% loss), or patch.

E6 - Upper/Middle - Large crack, movement, loose mortar in crack. ¼" – ½" out of plane. One brick dropped ½" in arch.

E7 – Caulk joint between Fieldhouse and adjacent building has failed. Review cornice piece in greater detail.

3) North Elevation

Ferrous flashing below cornice facia, causing staining below.

Bay N1 – Upper has staining/bio/dirt at 10sf. Repointing at 5-10% above decorative band to bottom of cornice facia.

N2 – Middle – Anchors on window surround. Crack runs from peak of arch to cornice.

N3 – Upper – Dirt/staining/bio at 10sf. Cartouche has cracking. Middle- Anchors – 38 at window surround. Two cracks in sill.

N4 – Anchors – 32 at window surround. Crack from window arch to cornice facia.

N5 – No anchors or cracking. Bad gray pointing at arch and west of window.

4) West Elevation

W1 – Crack(s) extend from door surround to cornice. Lower – Loss of glazing on water table. Some previous repairs on door surround – two cracked units. Top of door surrounds are capped with copper flashing. Some cupperous staining below. Crack between door surround and window.

W1 - Upper – Some black soiling/bio on parapet wall and terra cotta cornice.

W2 – Crack(s) extend from door surround to cornice. Lower – Consider replacing top right corner unit of right door surround.

W2 Middle – Crack runs from below lancet window and extends up through cornice.

W3 – Crack(s) extend from door surround to cornice. Lower – Replace top right corner and adjacent unit. Bio growth found on sandstone adjacent to terra cotta.

W4 – Lower – Crack extends from below left lancet window to above it.
Upper – Crack extends from window arch and through upper band course.

W5 – Middle – Joints on sill course are caulked.

W6 – Lower – Consider replacing two corner nits on door surround. W6 Middle – Sill is cracked and hollow sounding – replace.

W7 – Lower – Consider replacing bottom left unit.

Building Arts & Conservation specializes in cleaning, analyzing and stabilizing historic materials. Utilizing archival sources, material evidence, and a working knowledge of past skilled trades, we assist clients in the interpretion of historic building materials. We carry out the investigation, analysis and interpretation of buildings, as well as the oversee and execute the hands-on restoration and conservation. With over 25 years experience in the field of architectural conservation and preservation, our skilled staff and craftsmen are experienced in meticulously conserving and reinstating historic plaster, wood, paint, gold leaf, glazes, stencils, metal finishes, masonry and metalwork. Following the tenets of the American Institute for Conservation, our goal is to help our clients preserve their places and retain the patina and significance embedded in our architectural traditions.

APPENDIX 1


Coping
Parapet
Cornice
Cornice Frieze (on N & S)
Upper Band Course (on E & W)
Decorative Band Course (on S & N)
Return
Sill
Lower Band
Water Table
GATE B
TICKET - HOLDERS ENTER HERE
PUBLIC WILL CALL LOCATED AT McGINNIS FAMILY TICKET OFFICE
TICKET SALES AT McGINNIS FAMILY TICKET OFFICE
FIRE ZONE NO PARKING