



CERTIFICATE OF APPROPRIATENESS APPLICATION FORM

Incomplete applications will not be processed for Commission review.
Please print legibly.

1. HISTORIC NAME OF PROPERTY OR HISTORIC DISTRICT: (if known)

Concordia Historic District

ADDRESS OF PROPERTY:

Albrecht Hall / Rincker Library, 3136 West Kilbourn Avenue, Milwaukee, WI 53203

2. NAME AND ADDRESS OF OWNER:

Name(s): Forest County Potawatomi Community

Address: 313 North 13th Street

City: Milwaukee

State: WI

ZIP 53233

Email: rzeller@GreenFireLLC.net

Telephone number (area code & number) Daytime: (414) 727-6110

Evening:

3. APPLICANT, AGENT OR CONTRACTOR: (if different from owner)

Name(s): The Kubala Washatko Architects, Inc

Address: W61 N617 Mequon Avenue

City: Cedarburg

State: WI

ZIP Code: 53012

Email: thansmann@tkwa.com

Telephone number (area code & number) Daytime: (262) 377-6039

Evening:

4. ATTACHMENTS

A. REQUIRED FOR ALL PROJECTS:

- X Photographs of affected areas & all sides of the building (annotated photos recommended)
- X Sketches and Elevation Drawings (1 full size and 2 reduced to 11" x 17" or 8 1/2" x 11")
- X Material and Design Specifications (see next page)

B. NEW CONSTRUCTION/DEMOLITION ALSO REQUIRES:

Floor Plans (1 full size and 1 reduced to 11" x 17")

Site Plan showing location of project and adjoining structures and fences

Other (explain):

PLEASE NOTE: YOUR APPLICATION CANNOT BE PROCESSED UNLESS BOTH PAGES OF THIS FORM ARE PROPERLY COMPLETED.

5. DESCRIPTION OF PROJECT:

Describe all existing features that will be affected by proposed work. Please specify the condition of materials, design, and dimensions of each feature (additional pages may be attached)

The intent of the proposed work is to restore the exterior of the building and to fix interior structural issues in order to stabilize the building for future adaptive office reuse. This project is utilizing Historic Tax Credits, and as such all proposed work would conform to the standards outlined by the National Park Service. All existing historic/original elements are to remain and be restored. Key character-defining features that remain are the masonry elements. The masonry on Albrecht Hall consists of a tan iron spot face brick with Indiana limestone base, trim and accents; a carved "CONCORDIA COLLEGE 1900" inscription is at the top band of the south central facade. The front entry projection includes limestone columns and cornice features. The masonry is deteriorated and spalling in places, with heavily decomposed mortar butter joints and corroded steel lintels found throughout the building. Rincker Library is a red-toned face brick with Indiana limestone trim. Masonry has decomposed mortar and spalling at the parapets. Roof: Roofing on both sections of the building is non-original. Doors/Windows: Several original windows remain on Albrecht on the east and west ends, and exterior doors with transoms are original. Windows at Library are original.

Photo No. See attached

Drawing No. See attached

B. Describe all proposed work, materials, design, dimensions and construction technique to be employed (additional pages may be attached)

Please refer to the attached Drawing Set for full building material descriptions/design features/specifications. In general, the proposed scope of work for the exterior includes:

1. Masonry: All masonry is to be restored. The masonry butter joints on Albrecht Hall are severely decomposed and will be repointed. Masonry joints on the Library portion will also be repointed, and parapets rebuilt as needed. Indiana limestone trim will be repaired. Corroded lintels will be replaced.
2. Roofing: Roofing and insulation underlay on the Library portion will be replaced with an adhered roofing system.
3. Doors/Windows: Original wood units and transoms over entry doors will be restored. 1955 stainless steel replacement units on Albrecht Hall will be cleaned and reglazed as needed.
4. Building Accessories: For any lighting attached to the building, period reproduction lighting would be utilized.

Photo No. See attached

Drawing No. See attached

6. SIGNATURE OF APPLICANT:


Signature

Harold Frank 3-14-12
Print or type name Date

This form and all supporting documentation **MUST** arrive by 12:00 noon on the deadline date established to be considered at the next Historic Preservation Commission Meeting. Any information not provided to staff in advance of the meeting will not be considered by the Commission during their deliberation. Please call if you have any questions and staff will assist you.

Hand Deliver or Mail Form to:
Historic Preservation Commission
City Clerk's Office
200 E. Wells St. Room B-4
Milwaukee, WI

PHONE: (414) 286-5722

FAX: (414) 286-3004

www.milwaukee.gov/hpc



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**ALBRECHT HALL / RINCKER LIBRARY STABILIZATION: CONCORDIA HISTORIC DISTRICT
CERTIFICATE OF APPROPRIATENESS APPLICATION SUBMISSION
MARCH 15, 2012**

Project Overview: Synopsis of Key Items

Albrecht Hall Construction 1900, Rincker Library Construction 1941



Albrecht Hall (Recitation Hall) undated image pre 1940.



Rincker Library, 1942

Item 1: Masonry Restoration – Albrecht Hall

See Attached Exterior Elevations – Sheets D3.0 and D3.1 and the U.S. Heritage Group (USHG) Custom Mortar Matching Report and Sample Comparison for Albrecht Hall.

The exterior walls are comprised of a tan “iron spot” brick, fairly homogenous in range, laid in a common bond pattern with butter joints. Base, horizontal banding, areas of coping, sills, miscellaneous trim and ornament are of Indiana limestone. Brick units are predominately in good condition with the noted exception of spot areas, in particular near basement windows. Mortar is severely decomposed or missing in many areas. Indiana limestone features are predominately intact with noted exceptions of spalls, especially near the South entry and fractures at window sill belt courses.

INTENT:

- March 2012: Mortar samples have been analyzed; refer to the USHG Custom Mortar Matching Report for details. New mortar and render will match the historic in composition, gradation and appearance for the brick and stone segments individually; compositions and tooling profiles are different at these materials.
- Cut and repoint mortar joints 80-100% on all wall faces. An effort will be to located intact original mortar segments to retain, however, extensive moisture infiltration will limit this effort. Butter joints at the brick must be hand removed as saw cutting would widen the joints and damage the brick units.



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- Stone base, columns, entry portico, horizontal banding, sills, coping, trim, etc. will be restored and all stone reused where possible. Natural, custom matched stone restoration mortars will be utilized to repair spalled units.
- Replace severely corroded steel lintels with galvanized steel (alternate: stainless steel). Refurbish exposed surfaces on mildly corroded lintels.
- Moss, algae growth, tar, graffiti, and other defects will be cleaned from masonry surfaces utilizing the gentlest means possible; on-site testing in small areas will validate product selection. Efflorescence will be neutralized. Any extraneous metal attachments to the building will be removed and sympathetically patched.

Refer to the attached Images for further details on existing conditions.

Item 2: Masonry Restoration – Rincker Library

See Attached Exterior Elevations – Sheets D3.0 and D3.1 and the U.S. Heritage Group (USHG) Custom Mortar Matching Report]and Sample Comparison Report for Rincker Library [PENDING].

The exterior walls are comprised of a red face brick, wide color range, laid in a common bond pattern with standard size lightly raked joints. Horizontal banding, West entry cornice, columns, coping, sills, miscellaneous trim and ornament are of Indiana limestone. Brick units are predominately in good condition with the noted exception of spot areas and the parapets, where spalling, cracked stone, deteriorated mortar, and instability is evident. Mortar is severely decomposed or missing in many areas. Indiana limestone features are predominately intact with noted exceptions of spalls and damaged coping.

INTENT:

- March 2012: Mortar samples have been analyzed; refer to the USHG Custom Mortar Matching Report for details [*PENDING final report*]. New mortar will match the historic in composition, gradation, and appearance.
- Rebuild parapets as indicated on drawings, from the coping down to the horizontal stone belt course reusing all salvaged material possible. New material will consist of matching units.
- Spot cut and repoint mortar joints on all wall faces, estimated 40% of the surface area at this time.
- Stone base, columns, entry feature, horizontal banding, sills, coping, trim, etc. will be restored and all stone reused where possible. Custom matched stone restoration mortars will be utilized to repair spalled units. Spot replacement of stone will be necessary at coping that is spalled and fractured beyond repair.
- Replace severely corroded steel lintels with galvanized (alternate for stainless steel). Refurbish exposed surfaces on mildly corroded lintels.
- Moss, algae growth, tar, graffiti and other defects will be cleaned from masonry surfaces utilizing the gentlest means possible; on-site testing in small areas will validate product selection. Efflorescence will be neutralized. Any extraneous metal attachments to the building will be removed and patched.
- Modifications to the Connector to Albrecht Hall and the associated Greenhouse are pending design. It is expected that when the next phase of this project occurs, in order to occupy the buildings this Connector will need to be modified with an elevator to create accessibility to the buildings. The Greenhouse, currently in a state of severe deterioration in masonry, glazing, and wood frame, presents the least intrusive place to create an at-grade accessible entry point serving both buildings. Design drawings will be submitted for review (plans, exterior elevations, and sections) once solutions are designed and detailed for review.)

Refer to the attached Images for further details on existing conditions.



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Item 3: Roofing and Drainage – Rincker Library

See Attached Roof Plan and Exterior Elevations – Sheets D1.4, D3.0 and D3.1

The roofing is a flat roof obscured behind parapets and, as such, is not visible from the public right-of-way. Spay-on existing roofing is not original. Roofing extends up the entire height of the parapet and over the coping stone, trapping moisture; this has caused severe parapet deterioration. Roofing should terminate below the coping. A minimum of three brick courses on the roof side should be exposed to allow moisture to transmit through the parapet. Skyward facing joints in the coping are open, allowing moisture to further penetrate the parapet. As a result, parapets lean inward (towards the roof) and coping stones are loose; bedding mortar is completely decomposed and missing in many areas. Areas of the roofing are pitted and wavy, creating areas of standing water. Four roof drains are visibly clogged. Where roofing is pitted, the damp insulation layer below could be observed.

INTENT:

- Execute a complete tear-off of the roofing and insulation down to the decking.
- Install tan or white TPO (thermoplastic polyolefin) Single Ply Roofing System (TPO mechanically attached membrane over mechanically attached roof board, lap heat welded, Polyisocyanurate roof insulation, mechanically attached to existing structural roof deck), sloped for positive drainage to internal leader drains. Overflow drains to be added as needed.
- Install appropriate galvanized flashing and counter flashing bent and set with a reglet into parapet wall below coping.

Refer to the attached Images for further details on existing conditions.

Item 4: Windows and Doors – Albrecht Hall

See Attached Exterior Elevations – Sheets D3.0 and D3.1

The majority of windows are modern (1955) stainless steel replacement units in good condition. A number of original wood windows can be found at the East and West ends of the building, as well as the transoms over the entry doors. These windows are peeling and missing glazing. Existing entry doors are original.

INTENT:

- **EXISTING HISTORIC WOOD WINDOWS/ENTRY DOOR TRANSOMS:** Refurbish existing windows. Retain glass in good condition and replace broken glass, add new hardware inserts at weights and pulleys, add zinc weather stripping, new putty and glazing sealants, new hardware. Scrape peeling paint, prime and paint. Replace protective glazing at south second floor sanctuary leaded glass windows. Restore leaded glass.
- **NON-ORIGINAL STAINLESS STEEL/GLASS BLOCK WINDOWS:** Refurbish windows in place. Refurbish hardware, replace broken glass, add weather stripping, add storms/screens as warranted.
- **TRANSOM INFILL:** Window transoms that have been infilled with masonry to remain as masonry.
- **DOORS:** Refinish existing wood and glass components. Refurbish hardware and add ADA and code compliant panic bars. New hardware for locksets and handles. Refurbish existing hinges. Add weather stripping.

Refer to the attached Images for further details on existing conditions.



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Item 5: Windows and Doors – Rincker Library

See Attached Exterior Elevations – Sheets D3.0 and D3.1

Windows and doors are original to the building. Paint is peeling and areas of glazing are missing.

INTENT:

- **WOOD WINDOWS:** Refurbish existing windows. Retain glass in good condition and replace broken glass, add new hardware inserts at weights and pulleys, add zinc weather stripping, new putty and glazing sealants, new hardware. Scrape peeling paint, prime and paint.
- **DOORS:** Refinish existing wood and glass components. Refurbish hardware and add ADA and code compliant panic bars. New hardware for locksets and handles. Refurbish existing hinges. Add weather stripping.

Refer to the attached Images for further details on existing conditions.



FIGURE 1: South facade and main entry. Chapel windows above main entry are wood, all others on this elevation are stainless steel frame.



FIGURE 2: South facade. Windows other than the chapel windows above main entry are stainless steel frame and historic arch top at upper level has been filled in with a smooth brick.

South Elevation - Albrecht Hall

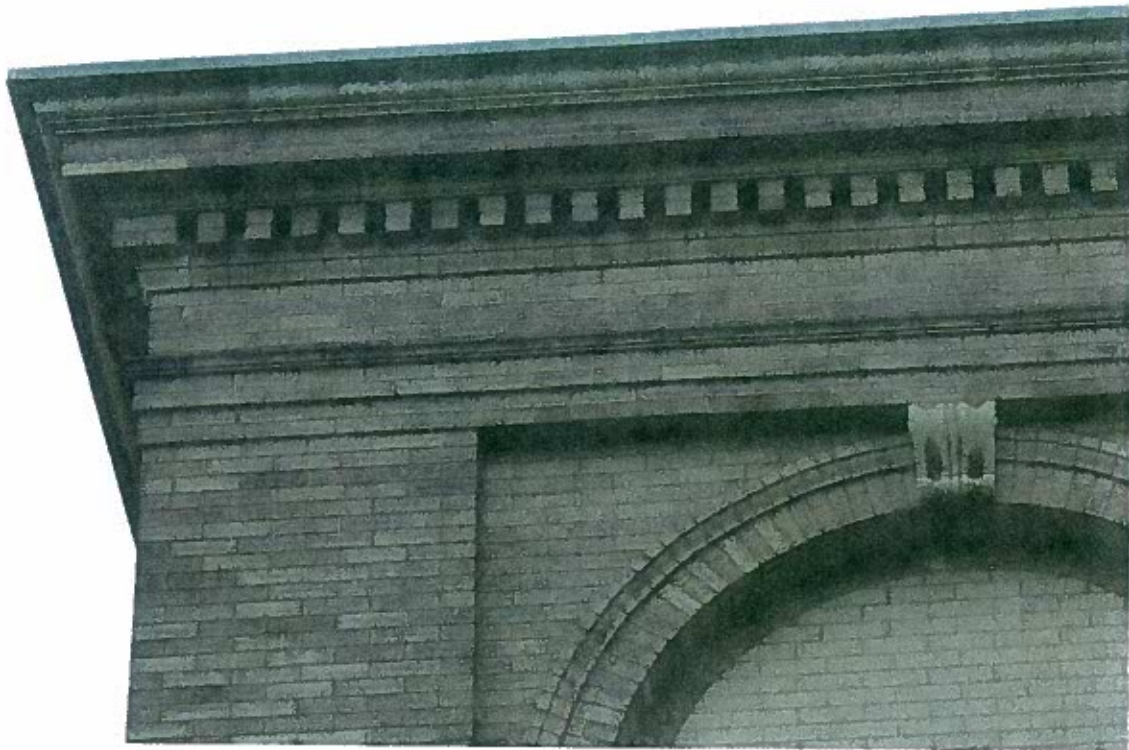


FIGURE 3: Brick details and dentils at top of wall, with limestone detail at top of window arch.



FIGURE 4: Brick infill at upper arch top windows, undated.



FIGURE 5: Indiana limestone at south entry exhibits moisture damage with spalling of details.



FIGURE 6: Wall area east of entry showing corrosion of lintels and spalling of concrete at steps.

South Elevation - Albrecht Hall



FIGURE 7: Spalling of limestone at main entry and water damage to main entry door. Efflorescence from use of deicing salts and prolonged exposure to moisture.



FIGURE 8: Pockets of deteriorated mortar in butter joints and drifting of brick under sill.



FIGURE 9: Water damage and peeling at wood window frame of chapel above main entry. Wood rot is evident.



FIGURE 10: Water damage and peeling at wood window frame of chapel above main entry.

South Elevation - Rincker Library

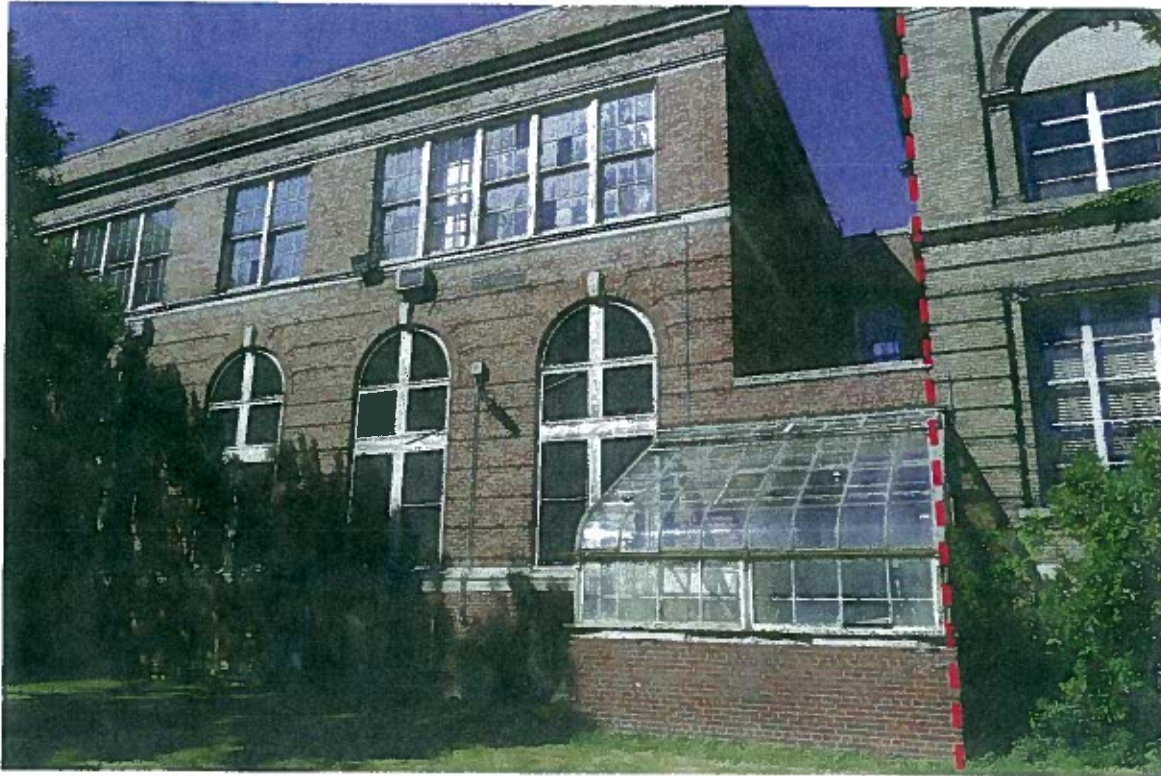


FIGURE 11: View looking southwest. Albrecht Hall on right and Rincker Library on left. Greenhouse addition is in very poor condition. As all building faces are “primary” facades, this location is the only one that does not have significant visual impact on the historic facades and a new accessible entry would fit.

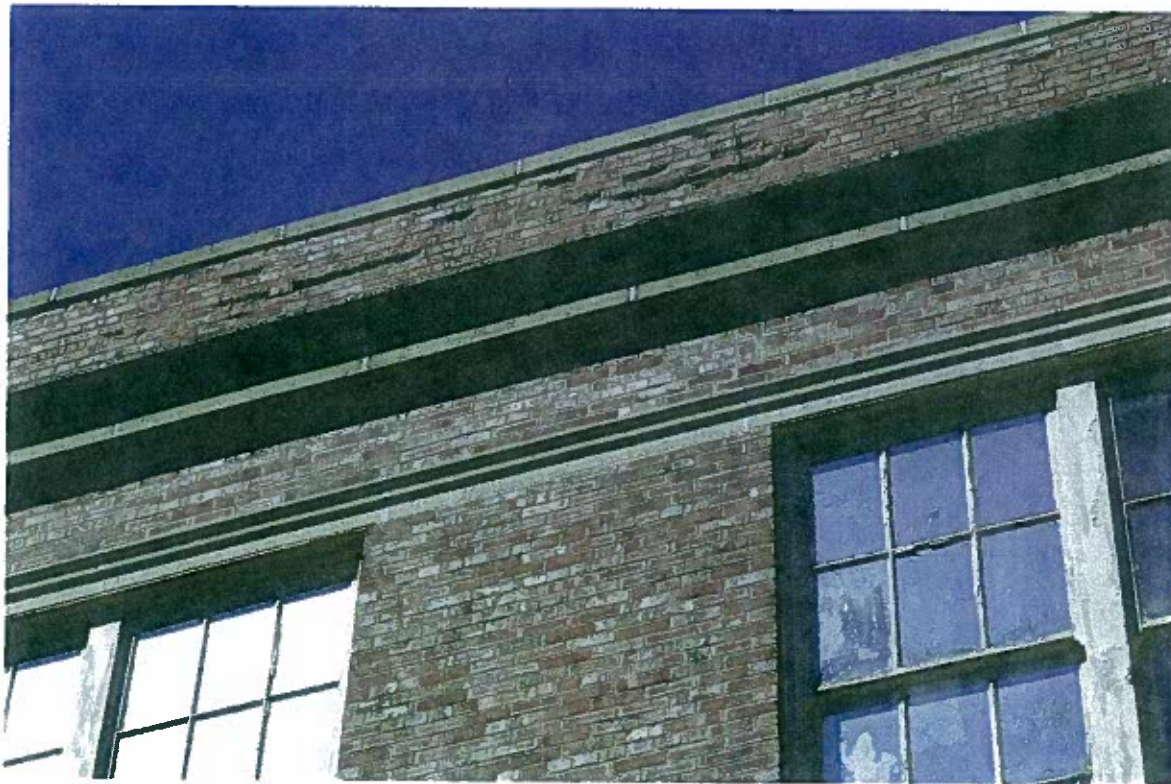


FIGURE 12: Parapet of Rincker Library is deteriorated with large areas of missing and decomposed/loose mortar, spalling shifted brick. The only remedy for these conditions is to rebuild the parapet.

South Elevation - Rincker Library



FIGURE 13: Severe deterioration to all aspects of the greenhouse addition. This greenhouse is proposed to be removed to allow for an accessible entry that would serve both buildings. The limestone sill is spalling, brick is loose (cracks are evident), and mortar is decomposed. There is no modern use for this educational greenhouse within the proposed reuse plans.



FIGURE 14: Patching evident at meandering crack from the corroded lintel uplift near a south elevation basement window.

South Elevation - Rincker Library



FIGURE 15: Cracking, spalling, and patches at existing Indiana limestone water table.



FIGURE 16: Wood windows are severely peeling. Air conditioner unit patched through wall will remain until study for future HVAC system is complete.



FIGURE 17: Mortar is completely decomposed in many areas of the Indiana limestone base at the south-east corner. Rising damp from the water saturated foundation has caused mortar deterioration.



FIGURE 18: East facade showing brick details. Ironspot brick with butter joint. Projecting details courses, Flemish cross design at east and west elevations.

East Elevation - Albrecht Hall



FIGURE 19: View looking north along east side showing corrosion of protective window grates.



FIGURE 20: View looking up at east elevation interior corner efflorescence from prolonged exposure to moisture.



FIGURE 21: Original wood window shows water damage and peeling paint. Proposed to be stripped, primed, and painted. New glazing sealants will be installed, reputtied. Hardware is missing and will be recreated.



FIGURE 22: Top of jack arch at basement windows. The deterioration of mortar and spalling of brick is typical above all the basement windows on the east and north sides. Small pitting to the corners and top edges of the brick is from prolonged exposure to moisture, inappropriate pointing mortars.

East Elevation - Albrecht Hall



FIGURE 23: View of northeast corner.



FIGURE 24: Deterioration of mortar and efflorescence below Indiana limestone sill.

North Elevation - Albrecht Hall



FIGURE 25: View looking southeast. Connection to Rincker Library appears at right. Discoloration at the building base due to rising damp from severe water infiltration.



FIGURE 26: Severe deterioration of brick and mortar at northeast corner from rising damp caused by the moisture saturated and flooded basement/foundation conditions. Algae growth is also typical in this area.

North Elevation - Albrecht Hall



FIGURE 27: Deterioration of mortar and efflorescence below sill at northeast corner. Building was left for many years with a leaking roof that allowed moisture to saturate the walls.



FIGURE 28: Corrosion of existing continuous steel lintel.



FIGURE 29: Missing section of Indiana limestone sill at a stress crack.



FIGURE 30: Deterioration of mortar at jack arch over basement window. Brick is slipping out of place.

North Elevation - Albrecht Hall



FIGURE 31: Basement windows have been bricked in. Corrosion of continuous steel lintel. Exterior door and transom to be refurbished, reglazed, paint stripped, wood primed and painted.



FIGURE 32: Deterioration of mortar around basement exterior entry. Water penetrates boards and collects at bottom of steps leading down to this door, then enters the building below door.

North Elevation - Albrecht Hall

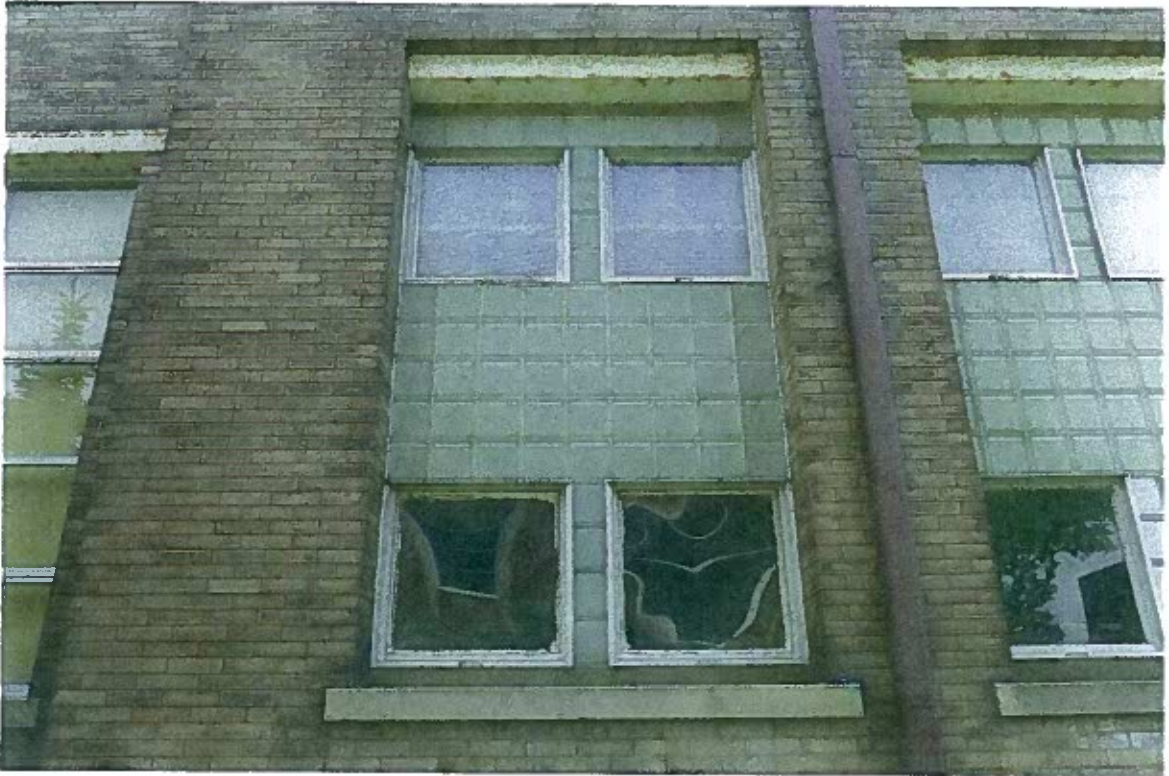


FIGURE 33: Replacement windows at north middle section include glass block and very sloppy glazing. Corrosion of steel lintel.



FIGURE 34: Acid etching of brick and mortar from severe moisture infiltration at window west of basement entry. Brick in this area will need to be replaced.

West Elevation - Albrecht Hall & East Elevation - Rincker Library

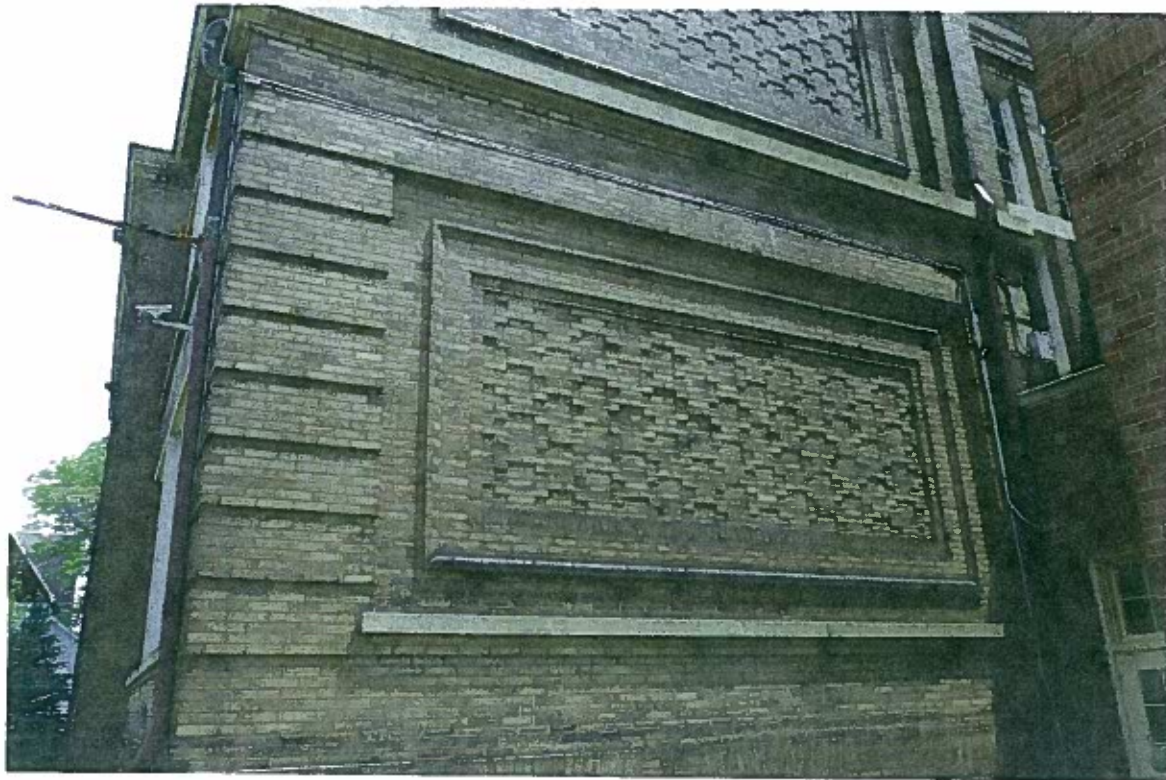


FIGURE 35: Brick details at west elevation connection with Library building.



FIGURE 36: Rincker Library east elevation and connector to Albrecht Hall. Access ladder is loose at top due to masonry deterioration at parapet.

North Elevation - Rincker Library



FIGURE 37: North elevation of Library with Albrecht Hall at left.



FIGURE 38: Patching at northeast corner base. Caulk at horizontal joint under water table band to be removed. Lintels at basement windows to be replaced due to corrosion and uplift causing brick damage.

North Elevation - Rincker Library



FIGURE 39: Corrosion at continuous steel lintel. Corrosion at ventilation grille and metal sleeve for missing air conditioner. Long continuous lintels can be refurbished in place.

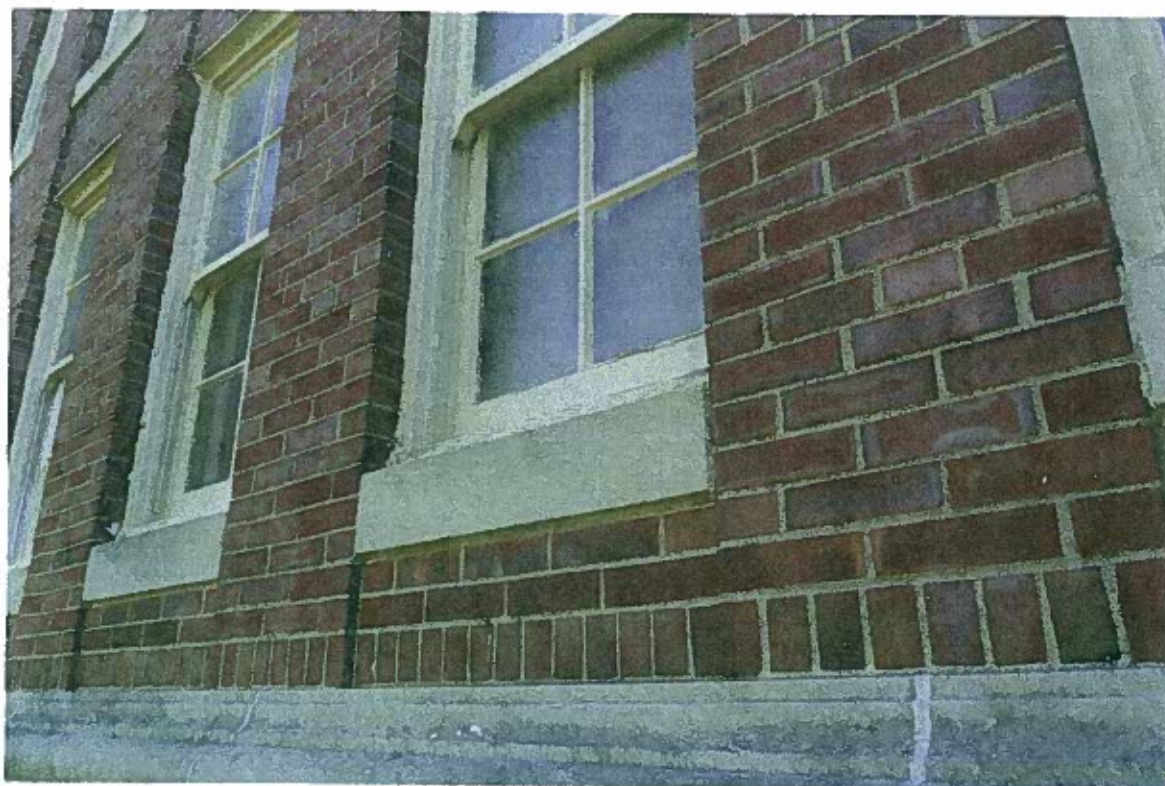


FIGURE 40: Peeling paint at original wood windows. Windows to be stripped, primed, and painted.

West Elevation - Rincker Library



FIGURE 41: View from roof of Gymnasium/Rec Center. Wood door to be refurbished. Spalling at entry steps and crack at base of right column. Moisture infiltration through the parapet has caused spalling of the limestone details at the pediment and balustrade as well as mortar decomposition.



FIGURE 42: Indiana limestone canopy and inscription at main entry to Library. Indiana limestone to be cleaned.

West Elevation - Rincker Library

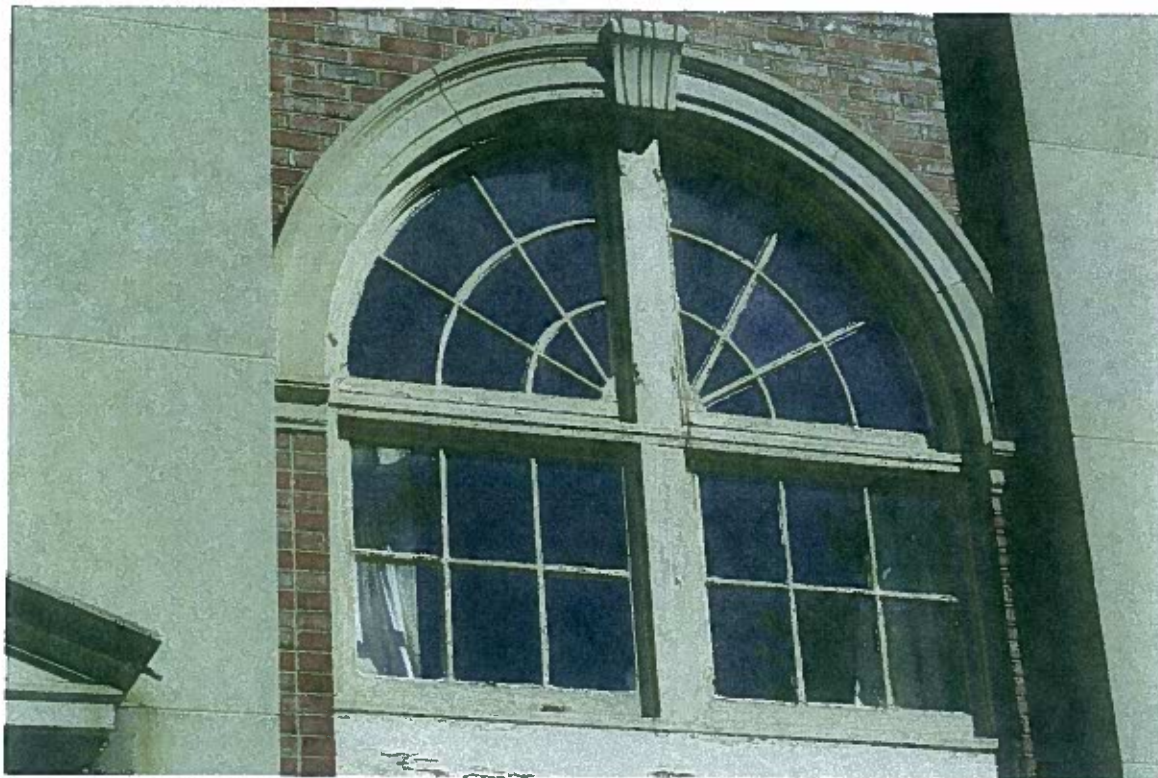


FIGURE 43: Water damage and peeling paint at original wood windows.



FIGURE 44: Severe spalling at Indiana limestone parapet coping and damage to brick below.

Roof and Parapet - Albrecht Hall



FIGURE 45: Flat roof looking due West, ventilation chimney at background. Current rubber membrane and asphalt shingle roofing is in good condition.



FIGURE 46: Corroded frame of skylight to attic area.

Roof and Parapet - Albrecht Hall



FIGURE 47: Shingle roof is in good condition. Copper flashing and counter flashing is not properly installed with a reglet and does not reach above the snowline. Tar from previous step flashing remains on the brick.



FIGURE 48: Failure at corbelled brick. Cracks evident in the limestone cornice bracket. Inappropriate flashing detail.

Roof and Parapet - Albrecht Hall

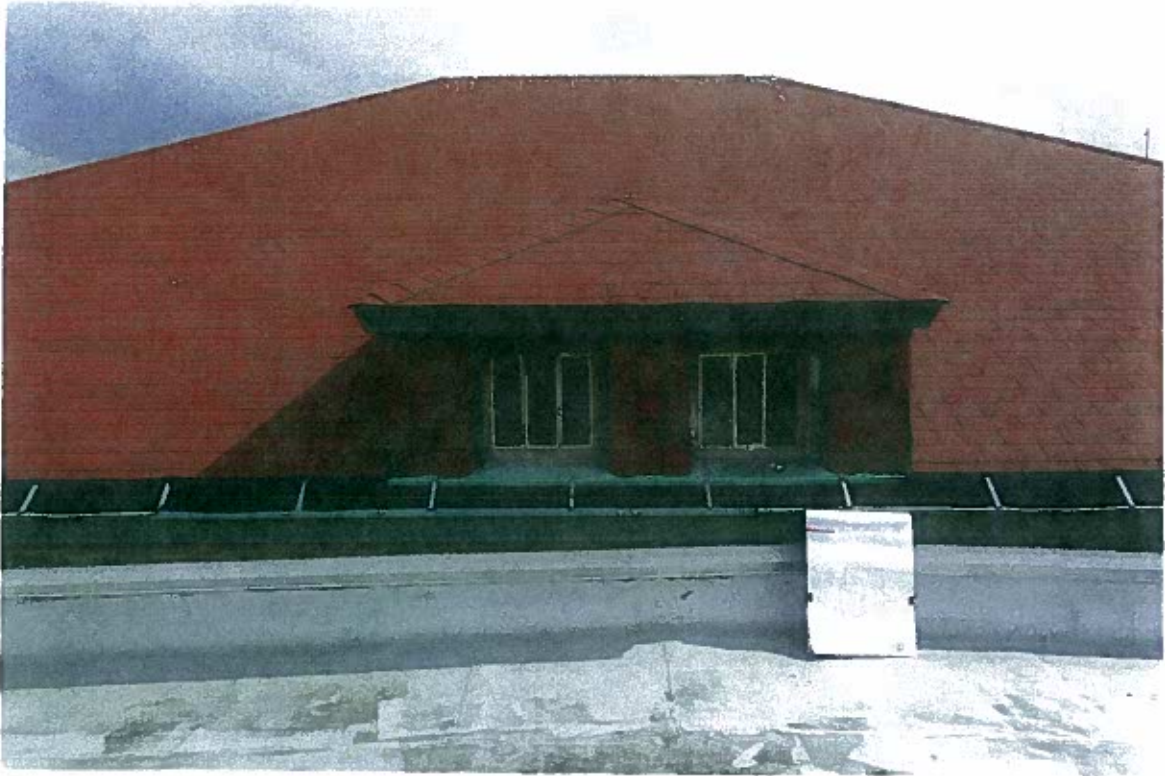


FIGURE 49: Windows at the center dormer are missing glass, allowing rain, birds and other animals to enter the building.



FIGURE 50: Corner shingle capping has come off, allowing water infiltration. Poor glazing and missing glass at dormer window.

Roof and Parapet - Albrecht Hall



FIGURE 51: Chimney/roof top ventilators are severely corroded. Require patch replacing and removal of corrosion from entire element, then prime and paint.

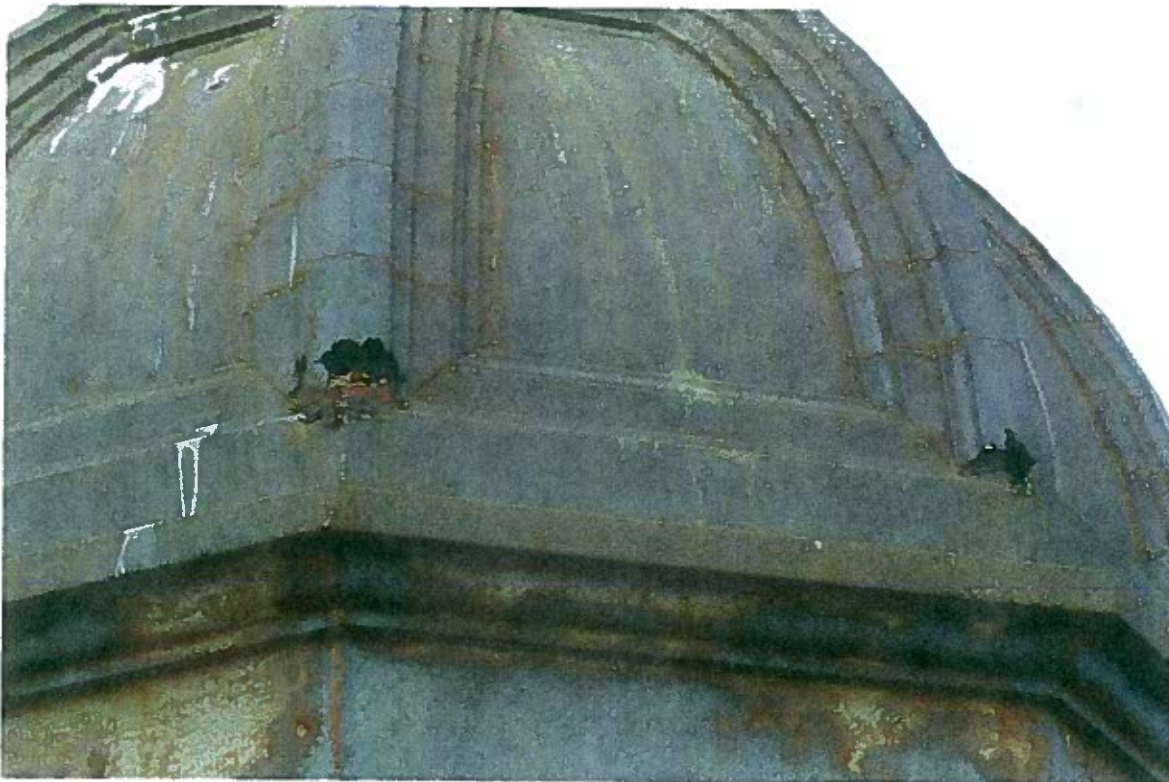


FIGURE 52: Detail of corrosion at chimney/roof top ventilator cap.

Roof and Parapet - Rincker Library



FIGURE 53: Roof looking West. Spray-on roof coating has an undulating surface and areas of ponding are visible. Beneath the spray-on roofing is spray-on foam insulation that is actively damp in all areas tested.



FIGURE 54: Roof looking East, with Albrecht Hall roof and chimney/roof top ventilators visible beyond.

Roof and Parapet - Rincker Library

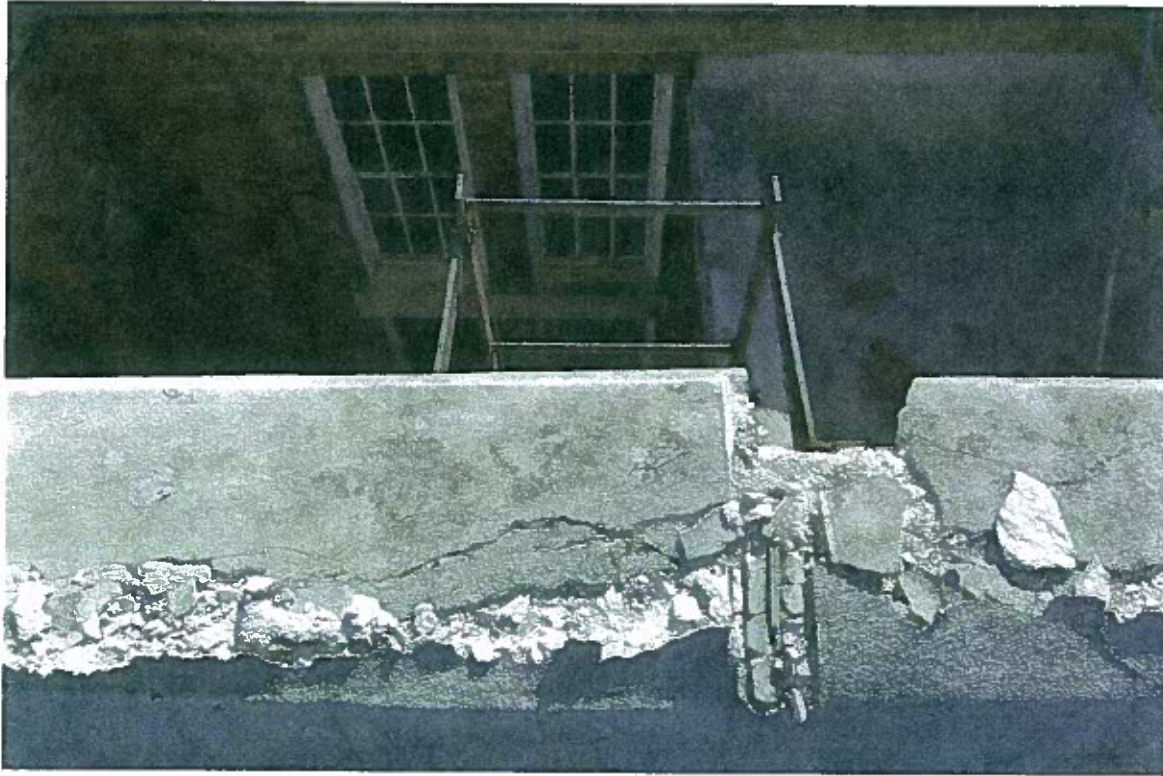


FIGURE 55: Spalling and cracking of Indiana limestone parapet from moisture trapped by the roofing membrane running up and over the coping.



FIGURE 56: Parapet at north side. Spar-on roofing and insulation run up the entire rood side of the parapet and half way up the coping. This has trapped moisture within the parapets, causing advanced mortar and stone decomposition.



FIGURE 57: Holes in roofing expose insulation below. Insulation is actively very damp with moisture meter reading upwards of 35% WME (wood moisture equivalent).



FIGURE 58: Deterioration of mortar at brick chimney and efflorescence from water infiltration. The spray-in roofing was applied up the chimney face.

Roof and Parapet - Rincker Library



FIGURE 59: Roof ventilator and corner drain. All drains show signs of clogging. The roofing extends up to top of parapet and feathers out on top of coping. Historic roof was flashed just below coping stone and roofing applied over the flashing.



FIGURE 60: Parapet is mostly straight, but will require rebuilding due to water damage and failure of brick below. This view highlights feathering out of roofing material on top of the coping.



Custom Mortar Matching Report

USHG Project: #12-006

Analysis Date: 2/23/2012 thru 2/28/2012

Client: Donna Weiss, Kubala Washatko Architects
W61 N617 Mequon Ave, Cedarburg, WI 53217

Phone: 262-377-6039

Client Requirements: Match Mortar / Package B

Mortar Dated: 1901

INTRODUCTION

The findings and recommendations presented in this report are premised on the results of tests performed on three mortar samples delivered to our laboratory on February 21, 2012.

The scope of testing was limited to the determination of the physical mix proportions of the major ingredients used in the mortar samples. The testing included visual examination, both with and without magnification, as well as analysis of the aggregate color, particle shape and grain size distribution.

The sample's physical characteristics, original date of construction, and guidelines from the U.S. Department of the Interior National Park Service were used to determine the proposed mortar component recommendations as well as the aggregate ratios for the replacement mix.

U.S. Heritage Group interpreted and adjusted the proposed mortar formulation based on the information provided to us regarding: current site conditions; present conditions; type of masonry; the function of the replacement mortar; and the degree of weather exposure. Assuming the samples provided are representative of the original mortar, the analysis and mortar-matching diagnosis detailed in this report will give a reliable indication of the original ingredients and allow U.S. Heritage Group to recommend historically correct replacement mortars for the Olney Friends School exterior masonry restoration project.

SAMPLES

Three individually packaged mortar samples were received for analysis. Each bag contained mortar pieces extracted from different locations on the building.

The samples were identified in our laboratory as:



USHG 12-006A
Exterior Iron Spot Face Brick mortar,
Butterjoint



USHG 12-006B Interior Limestone Foundation



USHG 12-006C Exterior Limestone Foundation

PRELIMINARY TESTING

Following preliminary cleaning U.S. Heritage Group technicians visually examined received mortar pieces. Both samples from limestone foundation were similar in texture and color. Sample from face brick appeared to be made with finer aggregate and addition of red pigment. Next we broke each mortar piece in half to see if lime inclusions are formulated within mortar mass and to check possible contamination from previous repair. Cross sections of each sample were consistent in color and texture showing no presence of different material. Different size lime inclusions were discovered in all three mortar samples.

Next we compared each sample against other mortars of a similar age and appearance by measuring their relative compression resistance. Direct pressure testing revealed that the compression resistance of all three samples is around low to medium strength. This suggests they may contain a hydraulic component.

AGGREGATE ANALYSIS

Technicians next crushed each sample and chemically removed the binder from the aggregate using a dilute acid solution. After drying the aggregate, it was viewed under 40X magnification to determine the characteristics of the particles. A sieve separation process established the distribution of aggregate particles by a percent of total weight. We prepared gradation charts for each sample to graphically display the color, shape and size of the aggregate particles. The aggregate sieve sizes requisite in ASTM C144 meet ASTM E11 specification requirements. The sand weight retained on each testing sieve was as follows:

Samples:	12-006A	12-006B	12-006C
Testing Sieve Size	% of sand retained		
4.75mm, No. 4	0.0	0.0	0
2.36mm, No. 8	0.0	1.3	0
1.18mm, No. 16	2.3	2.7	1.8
600micro, No. 30	3.5	9.4	5.4
300micro, No. 50	11.6	31.3	26.3
150micro, No. 100	54.7	41.8	50.4
75micro, No. 200	27.9	13.5	16.1
Total sand weight	100%	100%	100%

Sand grain distribution charts illustrating the sands isolated from each sample are attached.

Based on the particle color and shape similarities it appears that the sand extracted from all three mortar samples was originally obtained from the same source. The material is classified as fine to medium sized aggregate. The aggregate appears to be round and sub-round in shape. Under magnification, the majority of the aggregate is transparent buff with gray particles scattered throughout the material. Binder in brick mortar sample appears to be pigmented into red color and has small in size white lime inclusions. The binder in both mortar samples from limestone foundation has light buff/gray color with white medium size lime inclusions.

BINDER TO AGGREGATE RATIO

Amount of binder in each mortar sample was established using wet chemical process.

All samples indicated high binder content in a range above 50% of the total weight. This mix design would be considered a binder-rich formulation. The results of this calculation can be affected by the presence of calcium carbonate in the aggregate which would have been dissolved out during the chemical wet process. This factor was considered in the evaluation of the proposed replacement formulation.

Sample	12-006A	12-006B	12-006C
Binder	65%	53%	53%
Aggregate	35%	47%	47%

SUMMARY OF TEST RESULTS

Direct pressure testing indicates low to medium compressive strength for all mortar samples. The material reaction noted during the wet chemistry process suggests presence of a hydraulic binder only in two samples representing "limestone foundation mortar". Brick mortar sample did not indicate presence of cement in their mix composition.

These results, coupled with the samples' appearance, suggest that mortar used in brick wall masonry was originally mixed using a non-hydraulic slaked lime putty, and sand with no cement.

Mortar used for limestone foundation masonry appears to similar to Type O mortar formulation made with portland cement, slaked lime putty and sand. Mortars mixed with lime putty typically leave traces of lime inclusions that were identified in these samples and hydrated lime in bags was not available on the market until 1930.

PROPOSED REPLACEMENT MIX

In light of these findings and the intended use of the replacement material, U.S. Heritage Group recommends the following mortar formulations:

Brick wall Masonry: (1:2.5)

1 part lime putty and 2.5 parts sand selected from the USHG sand library. Mineral-based color pigments were used to match the original color.

Note: Masonry work using this formulation must be completed 45 days prior to freeze thaw cycles occurring. Do not perform any masonry work unless air temperatures are between 40 degrees Fahrenheit (10 degrees Celsius) and 95 degrees Fahrenheit (32 degrees Celsius) and will remain so for at least 5 weeks after the completion of the work.

Limestone Foundation Masonry: (1:2:8)

1 part portland cement, 2 parts slaked lime putty and 8 parts sand selected from the USHG sand library. Mineral-based color pigments were used to match the original color.

This mix design would fall under the classification "Type O" in ASTM C270. The portland cement should be white in color and meet ASTM C150; the non-hydraulic slaked lime putty should meet ASTM C1489. Type O formulation made with lime putty is suggested for its flexibility, adequate compressive strength and compatibility to the substrate.

Note: Masonry work using this formulation must be completed 21 days prior to freeze thaw cycles occurring. Do not perform any masonry work unless air temperatures are between 40 degrees Fahrenheit (10 degrees Celsius) and 95 degrees Fahrenheit (32 degrees Celsius) and will remain so for at least 3 weeks after the completion of the work.

Above recommendations were made in accordance with Preservation Brief 2:

"The new mortar must be as vapor permeable and as soft or softer (measured in compressive strength) than the historic mortar."

JOBSITE MOCK-UP SAMPLE

U.S. Heritage Group will prepare 10-pound site-ready replacement mortar samples to be field-tested through a jobsite mock-up. The mock-up sample should be installed by a qualified craftsman who understands the curing and application details of traditional lime mortars. Once the mock-up sample is installed, appropriate precautions should be taken to ensure that the mortar is protected from wind, sun, rain and frost to enable slow curing to take place.

Thank you for seeking our advice and entrusting these important details to U.S. Heritage Group. We are always available to discuss these findings with you in detail. Please contact me directly at 773-286-2100 x307 if you have any questions.

We look forward to providing you with a custom, ready-to-use, historically correct mortar for your project.

Respectfully,

U.S. Heritage Group, Inc.



Tom Glab
Laboratory Manager

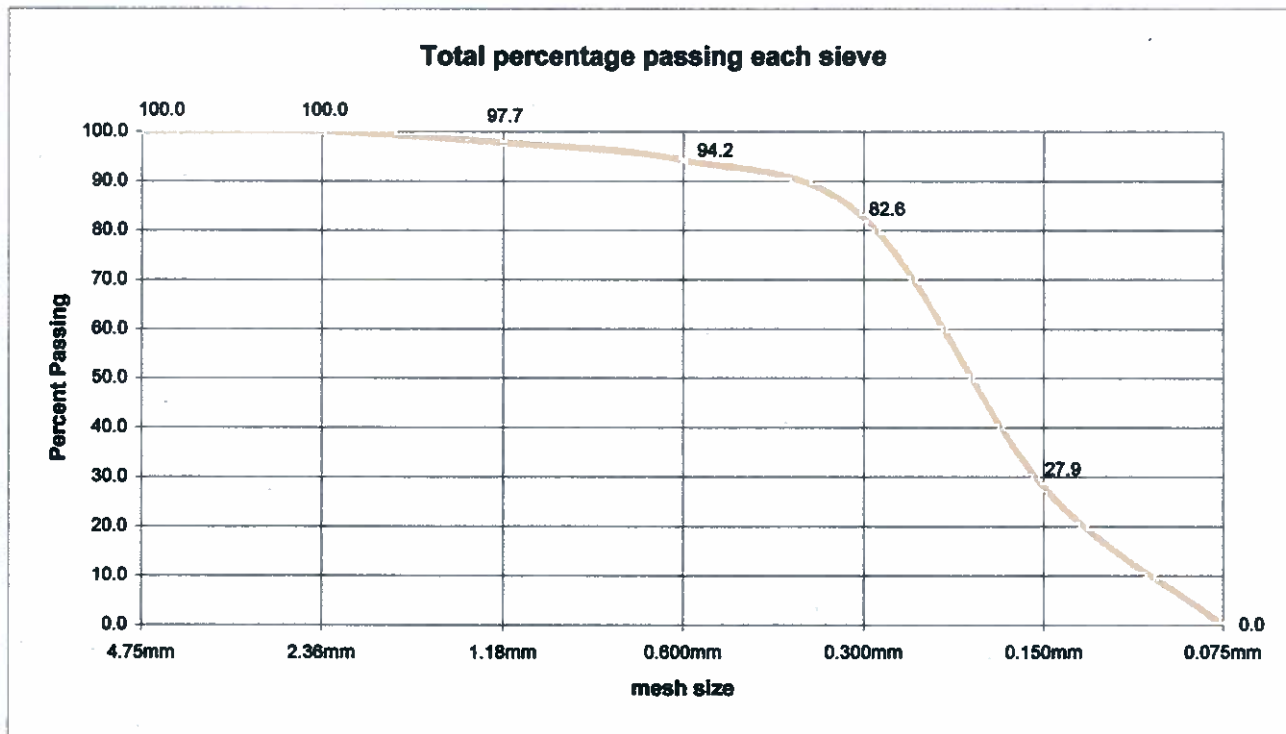
Note: This information is held in confidence and becomes a permanent record at the U.S. Heritage Group laboratories located at 3516 North Kostner Ave., Chicago, IL 60641. It can be referenced at any time in the future by the property owner named above or by an authorized mason contractor involved with the restoration work. When inquiring about this match please use the project number USHG #12-006

USHG # 12-006A Albrecht Hall - Exterior Iron Spot Face Brick, Butterjoint

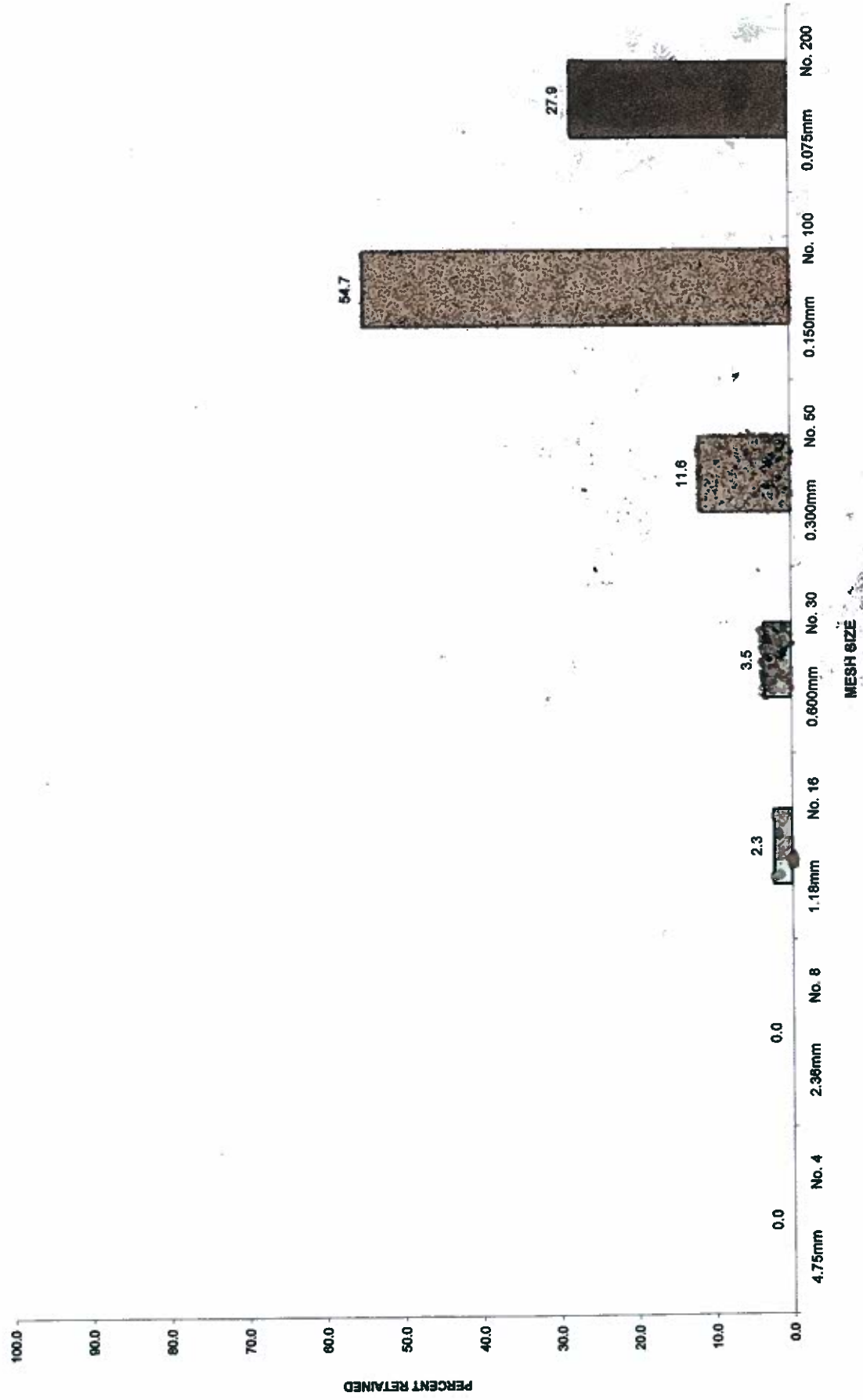
SIEVE ANALYSIS REPORT

Sieve size	percent retained on each sieve [%]	Total percentage passing each sieve	Cumulative Percent Retained [%]
4.75mm	0.0	100.0	0.0
2.36mm	0.0	100.0	0.0
1.18mm	2.3	97.7	2.3
0.600mm	3.5	94.2	5.8
0.300mm	11.6	82.6	17.4
0.150mm	54.7	27.9	72.1
0.075mm	27.9	0.0	100.0

Fineness Modulus **0.98**



USHG # 12-006A Albrecht Hall - Exterior Iron Spot Face Brick, Butterjoint

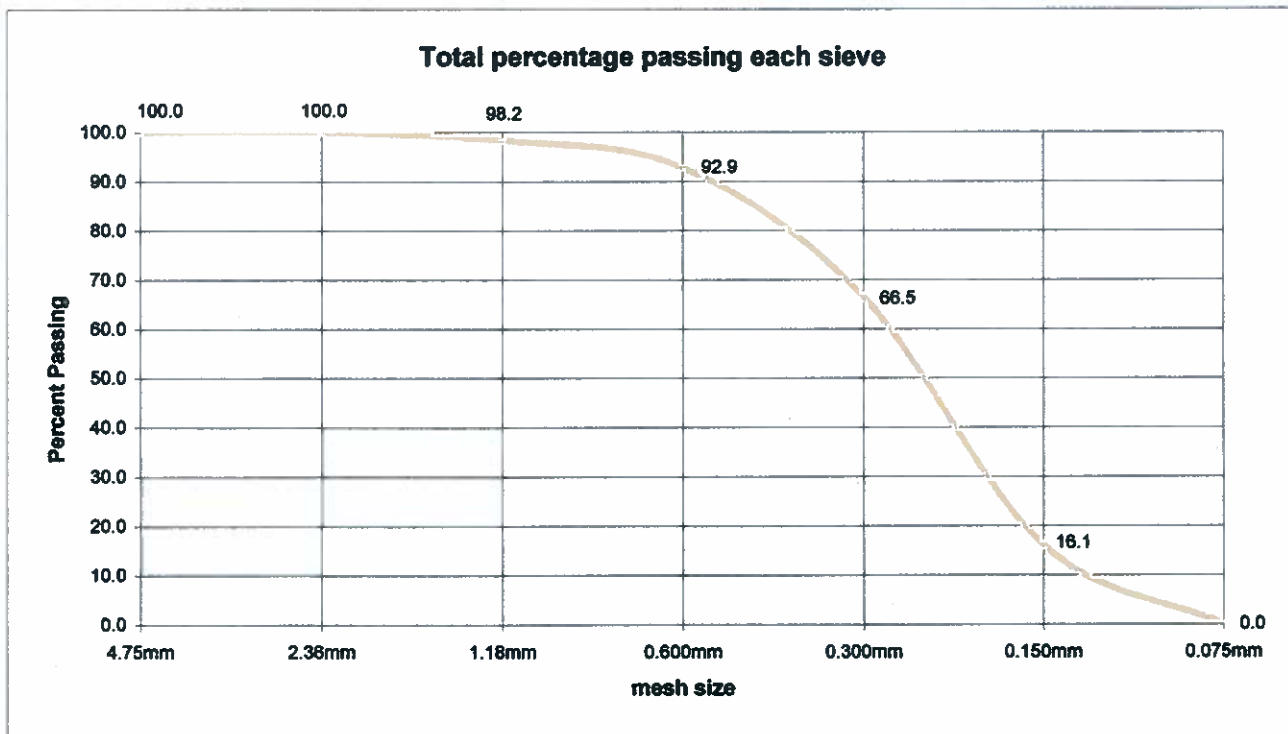


USHG # 12-006C Albrecht Hall - Exterior Limestone Foundation Mortar

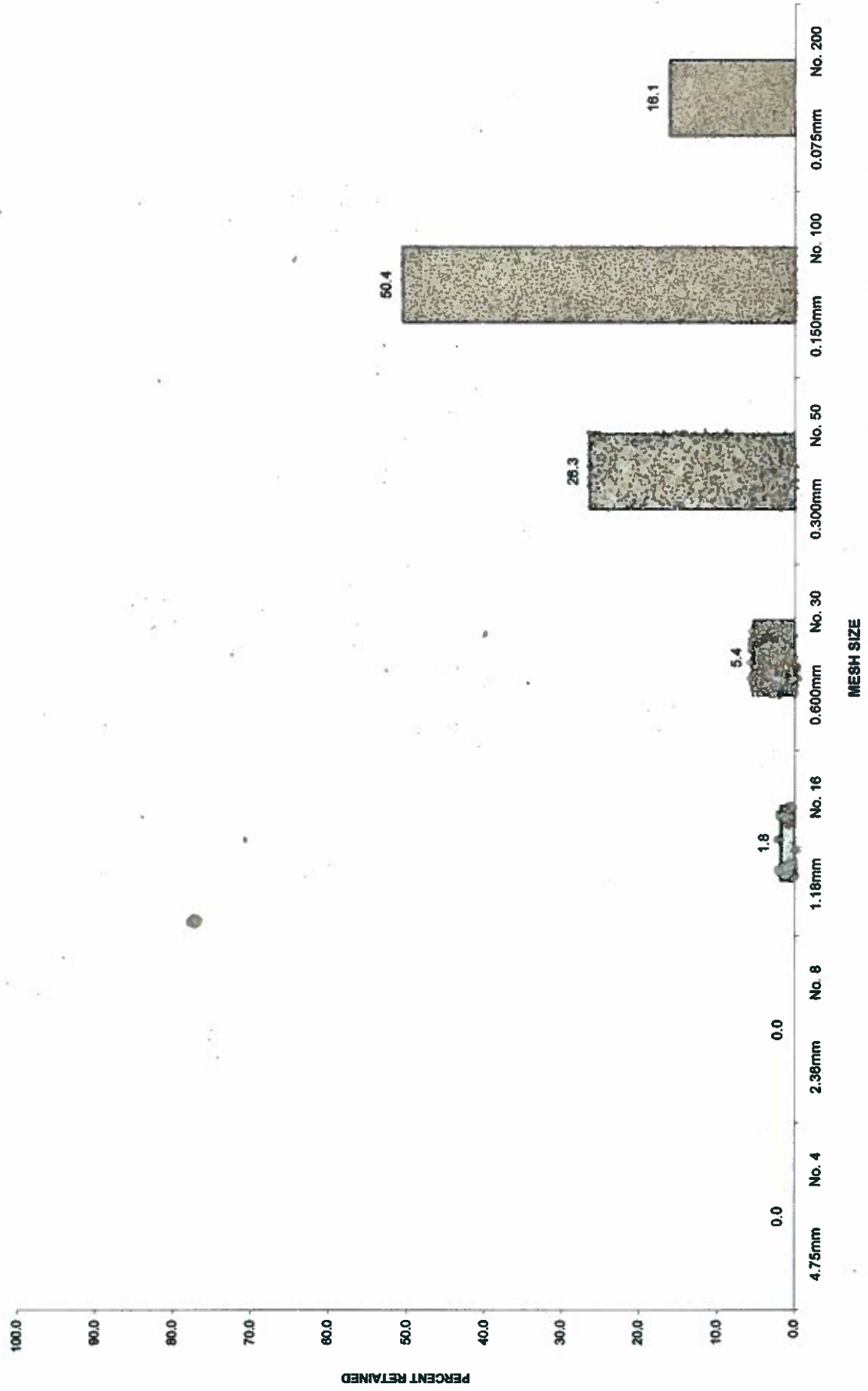
SIEVE ANALYSIS REPORT

Sieve size	percent retained on each sieve [%]	Total percentage passing each sieve	Cumulative Percent Retained [%]
4.75mm	0.0	100.0	0.0
2.36mm	0.0	100.0	0.0
1.18mm	1.8	98.2	1.8
0.600mm	5.4	92.9	7.1
0.300mm	26.3	66.5	33.5
0.150mm	50.4	16.1	83.9
0.075mm	16.1	0.0	100.0

Fineness Modulus **1.26**



USHG # 12-006C Albrecht Hall - Exterior Limestone Foundation Mortar

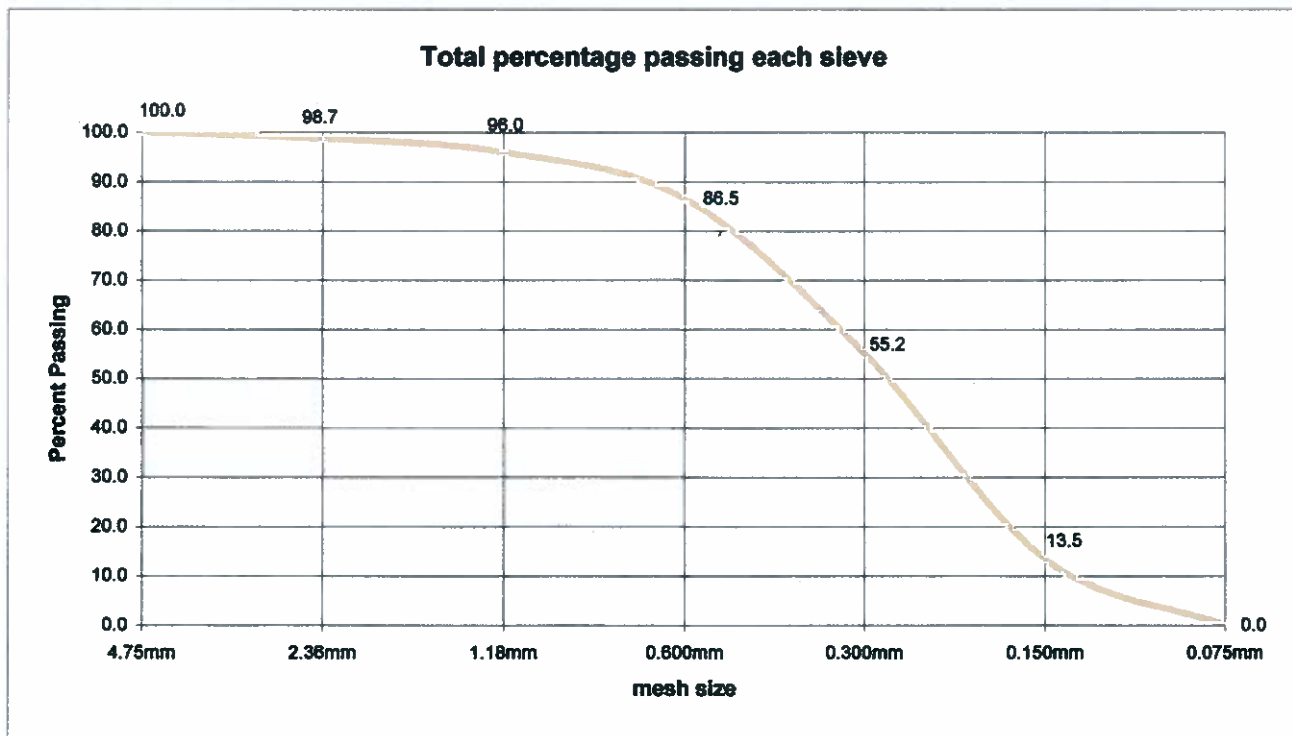


USHG # 12-006B Albrecht Hall - Interior Limestone Foundation Mortar

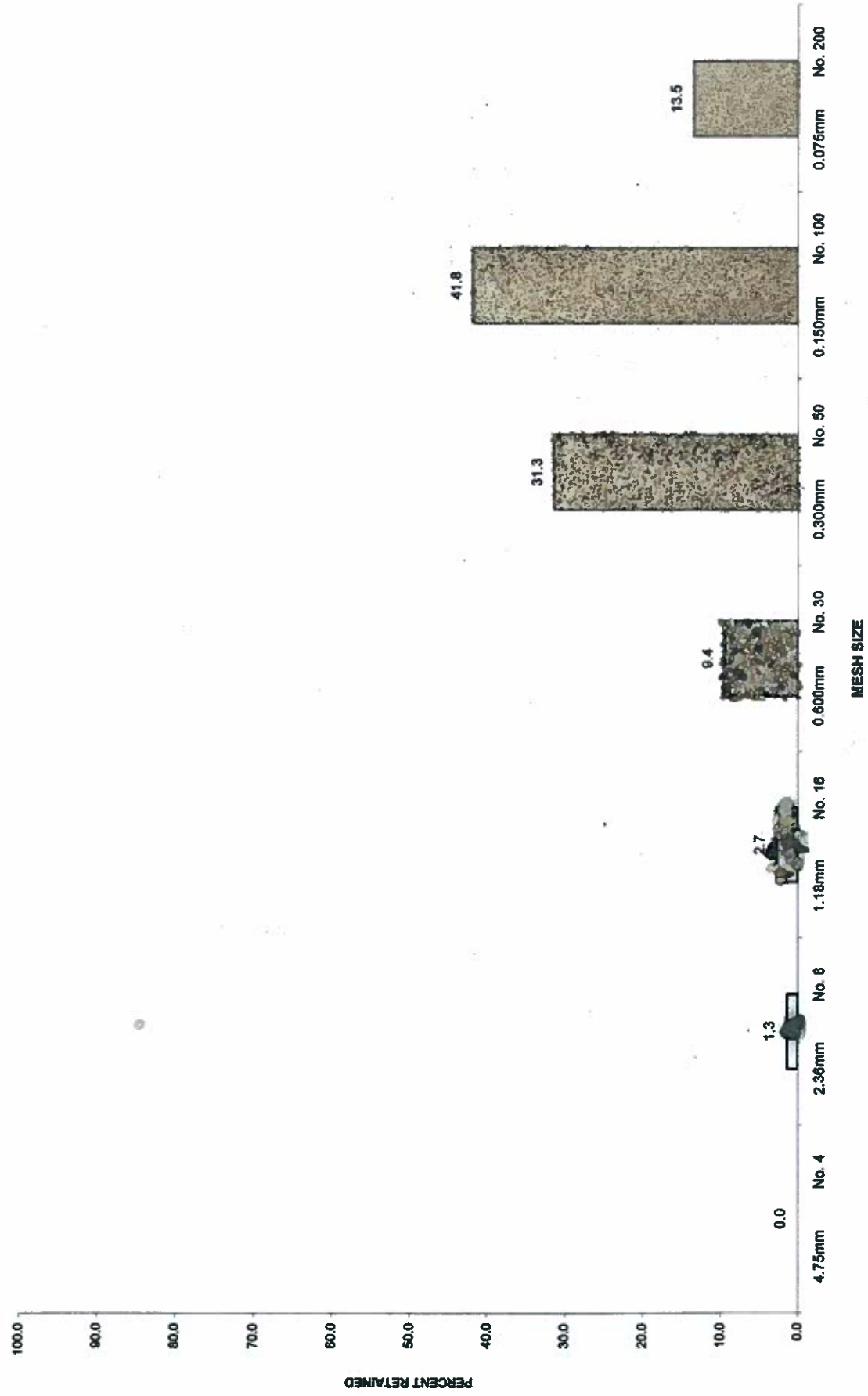
SIEVE ANALYSIS REPORT

Sieve size	percent retained on each sieve [%]	Total percentage passing each sieve	Cumulative Percent Retained [%]
4.75mm	0.0	100.0	0.0
2.36mm	1.3	98.7	1.3
1.18mm	2.7	96.0	4.0
0.600mm	9.4	86.5	13.5
0.300mm	31.3	55.2	44.8
0.150mm	41.8	13.5	86.5
0.075mm	13.5	0.0	100.0

Fineness Modulus **1.50**



USHG # 12-006B Albrecht Hall - Interior Limestone Foundation Mortar



SECTION 01 43 23

PRE-QUALIFICATIONS FOR MASONRY RESTORATION SERVICES

PROJECT ADDRESS:

Albrecht Hall (historic)
3136 West Kilbourn Avenue
Milwaukee, WI

Introduction:

Any contractor that wishes to be considered for this scope-of-work shall meet pre-qualifications. Bids by contractors who have not demonstrated meeting these specified pre-qualifications would be disregarded.

Project Description:

The major goals of the Albrecht Hall Masonry Restoration are:

- Return the appearance of the masonry to a "restored" condition without completely removing the patina of age or altering the brick/stone natural coloration.
- Repair damaged and deteriorated areas utilizing the techniques specified by the Project Architect and working with them to troubleshoot unforeseen conditions.
- Restore the masonry utilizing traditional masonry techniques including materials sympathetic; appropriate, and compatible to the original historic building components and materials. Modern treatments and repairs will be concealed such as the use of modern sealants, flashing, etc.

The Building:

Albrecht Hall, 1900, is listed on the National Register of Historic Places and is a designated building within a City of Milwaukee Landmark District. As such, the project will be utilizing Federal Historic Tax Credits making the appropriate execution of this work critical. The building is comprised of a tan iron spot face brick with Indiana limestone base, trim and accents.

Existing mortar is decomposed from high moisture levels, and large voids are present. Cut and repoint will be close to 100% due to mortar loss. Mortar joints are approximately 3/16".

Services to be Performed by the Masonry Contractor:

We are seeking qualified masonry restoration professionals. This would include preconstruction services (such as staging, scaffold erection, scheduling, pedestrian protection, building protection measures, etc.) transitioning into the Construction Phase of the project. This would include attending bi-weekly job site meetings with the Project Architect and Owner. *Note: All work shall be executed from scaffold.*

Proposed Project Schedule:

Please submit a Proposed Construction Schedule for the Masonry Restoration.

Masonry Contractor Selection Criteria and Pre-Qualifications:

Please respond to the following points. This will help in our understanding your experience, strengths, client satisfaction, and competitiveness. Sub-contractors included in your bid shall meet all pre-qualification requirements named herein with the exception of "materials," (see specs and drawings) and "mock-up."

1. **EXPERIENCE:** Provide a list of similar building types with restoration components, that your firm has completed within the last five years that are similar to this project. Include name of the building, address, and client contact with phone number, project architect's name with phone number. List your experience with Historic Structures in terms of restoration/renovation. In particular, provide detailed information on projects listed on the National Register of Historic

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1 Places, State Register of Historic Places, other buildings with local designations, Historic Tax
2 Credit projects, etc.

3
4 Provide a current under-construction project name and address that is being executed by your
5 firm that the owners could tour with a representative from your firm if they so desire.
6

7 **Mentoring:** It is acceptable for an approved masonry restoration contractor to act as a mentor
8 to a masonry subcontractor that lacks the background described in these pre-qualifications. This
9 would be for the purposes of allowing MBE firms to bid the work and increases the field for
10 potential bidders. As the City of Milwaukee Landmarks and the National Park Service mandate
11 the quality standards for this work, this bidding concession does not change the execution
12 requirements for this project. Contractors and sub-contractors will still be required to meet the
13 project specifications.
14

- 15 2. **MATERIALS:** Mortar analysis has been executed, or is currently in process. A matching
16 historically appropriate mortar will be the standard for all mortars for this scope of work.
17 Demonstrate past project experience with traditional lime-based mortars. Demonstrate
18 experience with varied mortar tooling capabilities beyond the standard raked or flush joint.
19

20 *Note: All repointing work shall be performed by a craftsman that is familiar with historic*
21 *lime mortar formulations, curing conditions, and performance characteristics. Work shall be*
22 *performed by a firm having not less than five years successful experience in comparable*
23 *masonry restoration projects and employing personnel skilled in the restoration process and*
24 *operations indicated. Only skilled journeyman masons who are familiar and experienced with*
25 *the materials and methods specified and are familiar with the design requirements shall be used*
26 *for masonry restoration. One skilled journeyman mason, trained extensively in like-type*
27 *projects, shall be present at all times during the mock-up and all subsequent masonry*
28 *restoration and shall personally direct the work.*
29

- 30 3. **MOCK-UP:** As part of the pre-qualification process, a mock-up shall be required on the actual
31 Albrecht Hall masonry. Complete a 3' X 3' masonry restoration mock-up to demonstrate your
32 interpretation of the Construction Documents and Specifications (mortar, tooling profile,
33 quality, cleaning etc...). Two mock-ups are required. **Mock-Up One:** Joint preparation /
34 mortar removal. **Mock-Up Two:** Mortar installation and tooling. Mock-ups will be executed at
35 locations to be specified by the Owner, but must be in close proximity to a cleaned portion of
36 the existing masonry. The mock-up shall act as a representation of the quality of the
37 contractor's finished work. The approved mock-up shall establish the standard of quality for the
38 project and will be a factor in final contractor selection.
39

40 Upon mock-up completion, appropriate precautions shall be taken to protect the mortar from
41 exposure to sun, wind, rain, and frost to enable slow curing (i.e. carbonation) to take place.
42

43 *The "approved" sample can only be used for color matching after curing in the wall for a*
44 *minimum of seven (but preferably fourteen) days.*
45

46 Please contact the General Contractor, or in absence of a General Contractor contact the Owner's
47 Representative, Robert Zeller to schedule the mock-up at:

48 Greenfire Management Services, LLC.
49 Robert Zeller
50 Phone: (414) 727-6110
51 FAX: (414) 727-6111
52 e-mail: rzeller@greenfirellc.net
53

1 *All mock-ups shall be completed on or by the date specified by Greenfire Management Services.*
2 *Mock-ups will be evaluated by the Owner's Representative and Architect, and City of*
3 *Milwaukee Historic Preservation Commission Representative.*

- 4 4. **PERSONNEL:** Indicate the name of key personnel that would be assigned to this project, act as
5 the main day-to-day contact, and follow the job through to completion.
6
7 5. **COSTS:** Describe your method of project cost estimating. Provide the hourly rate of the
8 reimbursable personnel. Provide an outline of what the Owner could expect under the heading
9 of General Conditions with a preliminary estimate of those costs.
10
11 6. **SERVICES:** List out-of- house trades you could potentially utilize on this project (such as
12 scaffold). The Architect and Owner will review the cost of this work for competitiveness. All
13 out-of-house subcontractors will bid directly to the Masonry Contractor with bid review by the
14 Owner and Project Architect (contracted through the Masonry Contractor).
15
16 7. Complete the "Contractor Qualification Statement" AIA document A305 1986 Edition.
17

18
19 **Proposal Due Date:**

20 Four copies of your proposal and qualifications are due to the General Contractor, or in absence of a
21 General Contractor to the Owner's Representative, on the date specified in the Bidding Documents.
22

23 For questions regarding the actual restoration specifications contact:

24 Tim Hansmann
25 Project Manager
26 The Kubala Washatko Architects, Inc.
27 Phone: 262/ 377.6039
28 Email: thansmann@tkwa.com
29

30 **Mandatory Pre-Bid Meeting and Tour:**

31 The pre-bid meeting and tour date for all firms will be established by the Owner's Representative.
32 Please r.s.v.p. via e-mail to confirm your attendance at the tour.
33

34 **Pre-Qualification Notification:**

35 Contractors will be contacted to indicate if they have met all pre-qualification requirements.
36
37

SECTION 04 01 00

MAINTENANCE OF MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes spot cleaning (water and/or chemical); replacement/repair of stone and brick units; repointing mortar joints; and repair of damaged masonry. For repointing, resetting, relaying of historic masonry as shown on the Drawings and as specified in the construction documents and Preservation Briefs 1, 2-revised, and 6, U.S. Department of the Interior, National Park Service, Technical Preservation Services.

1.2 REFERENCES

- A. American Concrete Institute:
1. ACI 530 - Building Code Requirements for Masonry Structures.
 2. ACI 530.1 - Specifications for Masonry Structures.
- B. Preservation Briefs:
1. No. 1 - The Cleaning and Waterproof Coating of Historic Buildings, Robert C. Mack, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Technical Preservation Services.
 2. No. 2 - Repointing Mortar Joints in Historic Brick Buildings, Robert C. Mack, John P. Speweik, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Technical Preservation Services.
 3. No. 6 - Dangers of Abrasive Cleaning to Historic Buildings, Anne E. Grimmer, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Technical Preservation Services.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate special supports for the work. Detail shoring, bracing, scaffolding, and temporary or permanent support. Contractor to supply all scaffolding drawings for permit.
- C. Submit the following items in time to prevent delay of work and to allow adequate time for review of submittals, if needed. Do not order materials or start the execution of the work before receiving the written approval:
1. Written certificates from mortar manufacturer should be submitted stating that all installers of the repointing mortars have successfully completed the training workshop for the installation of the mortar, or have met alternative workmanship qualifications acceptable to the manufacture, or provide written certification from the manufacture that site training services have been contracted. In lieu of training, documented experience executing successful lime mortar installations may be acceptable. Two day Lime Mortar Workshops are offered by U.S. Heritage Group, Inc., at 3516 North Kostner Ave., Chicago, IL 60641 Phone: 773-286-2100; Fax 773-286-1852. Course schedule is available at www.usheritage.com, advance registration is required.
 2. Samples of all specified materials and Material Safety Data Sheets (MSDS) as appropriate.

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3. Certificates, except where the material is labeled with such certification by the producers of the materials, that all materials supplied comply with all the requirements of these specifications and the appropriate standards.
4. Color-match repointing mortar samples to existing mortar or specified alternative.
5. Written verification that all specified items will be used. Provide purchase orders, shipping tickets, receipts, etc. to prove that the specified materials were ordered and received.
6. Restoration Program: Submit written program for each phase of restoration process including protection of surrounding material on building and site during operations. Describe in detail material, methods and equipment to be used for each phase of restoration work. (Contractors proposal/bid can serve this purpose.)

D. Product Data: Submit data on cleaning compounds, cleaning solutions, and manufacturer's printed literature for each product.

E. Samples: Submit four unit samples of masonry units to illustrate color, texture, and extremes of color range to match existing where replacements are necessary.

F. Manufacturer's Installation Instructions: Submit installation procedures for products selected for use, manufacturer's installation instructions, perimeter conditions requiring special attention, and test data indicating compliance with requirements, and installation instructions.

1.4 SUBSTITUTIONS

A. If alternative methods and materials to those indicated are proposed for any phase of restoration work, provide written description, and program of testing to demonstrate effectiveness for use on this project. Provide documentation showing compliance with the requirements for substitutions and the following information: Coordination information, including a list of changes needed to other work that will be necessary to accommodate the substitution.

B. A comparison of the substitution with the specified products and methods, including performance, weight, size, durability, and visual effect.

C. Certification that the substitution conforms to the contract documents and is appropriate for the applications indicated. Material substitution requests must be accompanied by independent laboratory test reports from a lab designated by the architect to establish equivalent performance levels and specification compliance. The submitting party shall pay for testing.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1 requirements.

B. All repointing must be performed by a craftsman that is familiar with historic lime mortar formulations, curing conditions and performance characteristics. Contractor shall provide proof of such knowledge to the Architect by submitting a certificate from a U.S. Heritage Group Lime Mortar Workshop, similar workshop course, or sufficient proven project experience. Work must be performed by a firm having not less than 5 years successful experience in comparable masonry restoration projects and employing personnel skilled in the restoration process and operations indicated.

C. Only skilled journeymen masons who are familiar and experienced with the materials and methods specified and are familiar with the design requirements shall be used for masonry restoration. One

1 skilled journeyman mason, trained and Certified by the specified manufacturer, shall be present at
2 all times during masonry restoration and shall personally direct the work.

3 D. Source of Materials: Obtain materials for stone repair and mortar repointing from a single
4 manufacturer source to ensure match quality, color, texture, and detailing.

5 E. Test Panels: Before full-scale application, test products to be used on panel mock-ups on the
6 actual building to be approved by the Architect.

7 1.6 QUALIFICATIONS

8 A. Manufacturer: Company specializing in manufacturing products specified in this section with
9 minimum five years documented experience.

10 B. Installer: Company specializing in performing Work of this section with minimum five years
11 documented experience.

12 1.7 MOCKUP

13 A. Section 01 40 00 - Quality Requirements: Mockup requirements.

14 B. Field Construction Mock-ups: Prior to start of general masonry restoration, prepare the following
15 sample panels and sample areas on building where directed by Architect. Obtain Architect's
16 acceptance of visual qualities before proceeding with the work.

17 C. Mortar Repointing: Prepare 2 separate sample areas of approximately 3-feet high by 3-feet wide
18 for each type of repointing required, one for demonstrating methods and quality of workmanship
19 expected in removal of mortar from joints and the other for demonstrating quality of materials and
20 workmanship expected in pointing mortar joints. Prepare, install, and finish each sample according
21 to specifications. Sample must be applied to the actual masonry. Samples should cure a minimum
22 of 14 days prior to Architect approval.

23 D. Stone Patching With Stone Repair Mortar: Prepare separate sample area of a masonry unit for
24 each type of stone patch repair required (ornamental and face stone). Prepare, install and finish
25 each sample according to specifications. Sample must be applied to the actual masonry. Samples
26 should cure a minimum of 14 days prior to Architect approval.

27 E. Cleaning: Areas slated for cleaning are small. Prepare 3 separate spot cleaning sample areas for
28 each type required to determine the extent of cleaning, cleaning methods, dwell time, and cleaning
29 products. One test sample MUST consist of a hot water wash at low psi using a flat 25-50 degree
30 wide spray stainless steel tip. Record and note all dwell times, surface and air temperatures at the
31 time of testing each possible solution. Architect to be present during mockup execution. Note
32 cleaning detergent or chemical mix, psi, nozzle orifice distance from wall face, dwell times, and
33 any other specific cleaning procedures.

34 F. Repeat, using different cleaning methods up to three locations, until acceptable without causing
35 surface damage.

36 G. Locate where directed by Architect.

37 H. Acceptable panel illustrating results of restoration and cleaning will become standard for work of
38 this section. Retain acceptable panels in undisturbed condition, suitably marked, during restoration
39 as a standard for judging completed work.

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1.8 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Deliver masonry, stone, and all other materials neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

C. Store all mortar ingredients in manufacturer's packaging, or when delivered loose, with adequate weatherproof covering.

D. Deliver materials to site in manufacturer's original unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

E. Deliver and store restoration material in manufacturer's original, unopened containers with the grade, batch and production data shown on the container or packaging.

F. Protect restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.

G. Protect mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

H. Comply with the manufacturers written specifications and recommendations for mixing, application, and curing of repointing mortars and patching materials.

I. Deliver products in time to avoid construction delays.

J. Deliver and store products in manufacturer's original packaging with identification labels intact.

K. Store products protected from weather and at temperature and humidity conditions recommended by manufacturer.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F (4 degrees C) will remain so for at least 48 hours after completion of work.

C. Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower the freezing point of mortar by the use of admixtures or anti-freeze agents, and do not use chlorides in the mortar.

1 D. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater
2 than 100 degrees F (38 degrees C) or surface and ambient air temperature is greater than 90
3 degrees F (32 degrees C) with wind velocity greater than 8 mph (13 km/h). Phase repointing
4 during hot weather by completing process on the shady side of the building or schedule
5 installation of materials during cooler evening hours to prevent premature evaporation of the
6 mortar.

7 E. Do not apply products under conditions outside manufacturer's requirements, which include:
8 1. Surfaces that are frozen; allow complete thawing prior to installation.
9 2. When surface or air temperature is not expected to remain above 40 degrees F for at least
10 8 hours after application.
11 3. Wind conditions that may blow materials onto surfaces not intended to be treated.
12 4. Less than 24 hours after a rain.
13 5. When rain is expected less than 6 hours after installation.

14 1.11 SEQUENCING

15 A. Section 01 10 00 - Summary: Work sequence.

16 B. Perform repointing after cleaning masonry surfaces.

17 1.12 OTHER PROJECT CONDITIONS

18 A. Protect persons, motor vehicles, building site and surrounding buildings from injury resulting from
19 masonry restoration work. This includes surface areas on adjacent wall surfaces or roofs not
20 included in this scope of work.

21 B. Prevent repointing mortar from staining the face of masonry or other surfaces to be left exposed.
22 Immediately remove all repointing mortar that comes in contact with such surfaces.

23 C. Cover partially completed work when work is not in progress.

24 D. Protect sills, ledges and projections from droppings.

25 E. Damage occurring to the building as a result of work of this section of Contractor's failure to
26 protect against such damage shall be the Contractor's responsibility. The contractor shall restore
27 damaged areas to the complete satisfaction of the Architect at no expense to the Owner.

28 1.13 WARRANTY

29 A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

30 B. Provide manufacturer's standard warranty for not less than one year, commencing on Date of
31 Substantial Completion.

32 1.14 SCHEDULING

33 A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

34 B. Perform cleaning, washing, stripping, repointing, etc. to exterior masonry and stone between hours
35 of 7 AM to 9 PM.

PART 2 - PRODUCTS

2.1 REPOINTING MORTAR MATERIALS

- A. Repointing mortar shall be prepared and placed in accordance with the Department of the Interior National Park Service Cultural Resources Preservation Briefs 2, "Repointing Mortar Joints in Historic Masonry Buildings", Revised edition October 1998, and in compliance with the guidelines set forth by the Secretary of the Interior's Standards for Rehabilitation.
- B. The repointing mortar shall match the original in color, composition, aggregate (size/gradation/color), texture, and tooling profile. The compressive strength of the repointing mortar shall be equal or less than the compressive strength of the original mortar and surrounding brick or stone. The replacement mortar shall contain approximately the same ingredient proportions of the original mortar.
- C. All replacement mortar ingredients and mortar formulations will be established from test data gathered from the original materials sampled from site. Test sampling analysis to be completed by USHG. Lab report "Custom Mortar Matching Report" and "Sieve Analysis Report" provided by Architect.
- D. Mortar Testing Contact: U.S. Heritage Group, Inc., 3516 North Kostner Ave. Chicago, IL 60641 Phone: 773-286-2100 Fax: 773-286-1852. Email: info@usheritage.com; www.usheritage.com.
- E. The testing laboratory shall supply a ready mixed mortar sample sufficient in size for a mock up sample at the site.
- F. Mixing of individual mortar ingredients at the construction site will not be permitted.
- G. Repointing mortars shall be pre blended in single containers in a factory-controlled environment. All ingredients will be converted from volume measurements to weight measurements to ensure quality production of the mortar.
- H. All containers shall be marked including manufacturing date and batch number. Manufacture is required to maintain production-sampling procedures for each batch for quality control purposes. Manufacturer to provide samples of proposed materials for mock up panels at the site. All pre blended products are to meet applicable ASTM standards and project specification requirements.
- I. Mortar Materials Contact: U.S. Heritage Group, Inc., 3516 North Kostner Ave., Chicago, IL 60641 Phone: 773-286-2100 Fax: 773-286-1852. Email: info@usheritage.com; www.usheritage.com. Mortar supplied from other suppliers is acceptable provided that these sources meet the standards outlined in this document, match the historic mortar formulation and aesthetics, and meet or exceed the quality standards of USHG mortars.

2.2 MASONRY RESTORATION AND CLEANING

- A. Masonry Cleaners shall be in accordance with the Department of the Interior National Park Service Cultural Resources Preservation Brief 1, "The Cleaning and Waterproof Coating of Masonry Buildings", and Preservation Brief 6 "Dangers of Abrasive Cleaning to Historic Buildings", and in compliance with the guidelines set forth by the Secretary of the Interior's Standards for Rehabilitation.
- B. Cleaning baseline procedure: Hot water wash at low psi. If hot water wash proves to be insufficient, see item "J" for acceptable manufacturers of alternate cleaning products. Pressure to

be measured at the gun or as closely to it as possible. 200-300 psi may be satisfactory; 400-800 psi (field test psi ranges) are more typical. A bristle brush may be used to supplement the water wash as long as it does not remove or damage the limestone surface. Nozzle size and configuration: Stainless steel flat tip with 25-50 degree wide spray. Distance from nozzle orifice and the surface being cleaned shall be evaluated and tested during the mock-up phase.

C. Algae growth: Treat areas of algae/moss growth with an anti-fungal agent prior to masonry cleaning.

D. Sample cleaning area: An initial test-cleaning sample with hot water at low psi is requested to evaluate this methods effectiveness and establish a baseline for cleaning techniques. Work with architect to determine locations of cleaning test panels (1'x1').

E. All cleaning techniques should use the gentlest means possible to avoid etching, staining, bleaching, or masonry damage.

F. The goal of the masonry cleaning is not to remove 100% of surface soiling but to generally enhance the stone by removing sufficient particulate caused by pollution. Architect will establish parameters on-site for acceptable levels of cleaning.

G. Heavily soiled areas (likely carbon and sulfates): The undersides of limestone sills, ornament, belt courses, etc., may require alternate cleaning methods or additional applications of cleaner to achieve successful results.

1. Diedrich Chemicals Restoration Technology, Model 808 Black Incrustation Remover (for spot treatment of carbon encrusted black streaks).

2. Substitutions: Approved equal or better.

H. Dwell times: For all cleaning methods, testing and implementation, dwell times shall be closely watched and adhered to in an effort to avoid damaging the masonry (etching the surface).

I. Properly protect all adjacent wall surfaces, roofs, clock faces, windows, doors, glass, adjacent plant material, etc., from overspray.

J. Manufacturers:

1. Mortar Materials Contact: U.S. Heritage Group, Inc., 3516 North Kostner Ave., Chicago, IL 60641 Phone: 773-286-2100 Fax: 773-286-1852. Email: info@usheritage.com; www.usheritage.com

2. Cleaning Materials:

a. PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. ASD. Tel: (800) 255-4255 or (785) 865-4200. Fax: (785) 830-9797. Email:

marketing@prosoco.com; www.prosoco.com

b. Diedrich Technologies, Inc., 7373 South 6th Street, Oak Creek, WI 53154. Tel: (800) 323-3565 or (414) 764-0058. Fax: (414) 764-6993. Email:

diedtech@execpc.com; www.diedrichtechnologies.com

3. Substitutions: See Section 01600 - Product Requirements.

4. See Section 04 – Stone Repair Mortar for products including steel anchors.

2.3 COMPONENTS

A. Cleaning Agent: Premixed solvent cleaner type.

B. Blasting Sand: NOT permitted.

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1 C. Mortar Materials: Conform to requirements of Section 04 05 03.

2 D. Stone: Indiana limestone (carved and ornamental).

3 E. Brick: Solid red face brick (field).

4 F. Brick: Solid common brick (parapet back-up), proposed.

5 **PART 3 - EXECUTION**

6 **3.1 EXAMINATION**

7 A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

8 B. Verify surfaces to be cleaned and restored are ready for work of this section.

9 C. Examine conditions, with installer present, for compliance with requirements for installation
10 tolerances and other specific conditions, and other conditions affecting performance of unit
11 masonry.

12 D. Do not proceed until unsatisfactory conditions have been corrected.

13 E. Verify that substrates are acceptable for product installation; do not begin until substrates meet
14 manufacturer's requirements.

15 F. Do not begin until Architect and Owner have approved test panels.

16 G. Replacement of masonry units to be confirmed by Project Architect prior to execution.

17 **3.2 PREPARATION**

18 A. Protect elements surrounding work of this section from damage or disfiguration.

19 B. Immediately remove stains, efflorescence, or other excess resulting from work of this section.

20 C. Protect roof membrane and flashings from damage. Lay 1/2-inch (13 mm) plywood on roof
21 surfaces over full extent of work area and traffic route.

22 D. Provide waterproof dams to divert flowing water to exterior drains and catch basins.

23 E. Carefully remove and store fixtures, fittings, finishing hardware, accessories.

24 F. Close off, seal, mask, and/or board up areas, materials, and surfaces not receiving work of this
25 section to protect from damage.

26 G. Construct dust proof and weatherproof partitions to close off occupied areas, if any.

27 **3.3 INSTALLATION**

28 A. Rebuilding:
29

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1. Cut out damaged and deteriorated masonry with care in manner to prevent damage to adjacent remaining materials.
2. Shore or support structure in advance of cutting out units to maintain stability of remaining materials. Cut away loose or unsound adjoining masonry and mortar to provide firm and solid bearing for new work. Cut out full units from joint to joint and in a manner to permit the replacement of full size units.
3. Build in reclaimed masonry units following procedures for new work specified in Section 04 05 03.
4. Mortar Mix: As specified in Section 04 05 03.
5. Ensure anchors, ties, reinforcing, stone cramps and dowels, and flashings are correctly located and built in.
6. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in openings, accessories and fittings.
7. Re-use masonry to the fullest extent possible. Integrate new replacement masonry in concealed areas or shielded from public view.
8. All brick units added to the building to match the existing in color, size, voids/no voids, surface texture, and shall consist of salvaged historic matching material. Architect to approve samples.
9. Build new masonry to the full thickness as shown on drawings. Key brick or stone into existing structure wherever possible providing mortar as required.

B. Repointing:

1. Leave one intact and serviceable example of original mortar on the building; location and size to be determined with Architect.
2. All joints (unless otherwise noted) shall be raked back to sound, solid, back up material. All raking out should leave a clean, square face at the back of the joint to provide for maximum contact of pointing mortar with the masonry back up mortar. Shallow or feather edging shall not be permitted.
3. Existing mortar joints shall be raked out a minimum depth of 2.5 times the height of the existing mortar joints, however, so as not to compromise the structural stability of the wall, the joint should not be raked out more than half the width of the masonry unit.
Note: In some areas the mortar is decomposed more than 2.5 times the height of the joint. In these cases, the mortar should be removed back to stable material, this may result in the need to reset loose brick.
EXAMPLES:
 - a. 1/16" Mortar joint needs to be cut out to a depth of 3/16" minimum
 - b. 1/8" Mortar joint needs to be cut out to a depth of 5/16" minimum
 - c. 1/4" Mortar joint needs to be cut out to a depth of 5/8" minimum
 - d. 1/2" Mortar joint needs to be cut out to a depth of 1-1/4" minimum
 - e. 3/4" Mortar joint needs to be cut out to a depth of 1-7/8" minimum
 - f. 1" Mortar joint needs to be cut out to a depth of 2-1/2" minimum
4. Utilize hand tools and power tools only after test cuts determine no damage to masonry unit results. Vertical joints (head joints) SHALL NOT be raked out using rotary power saws. All vertical head joints must be removed by hand in stonework unless a demonstration can be made that rotary use can be implemented without over cutting the joint, i.e. "over running." *Vertical joints exceeding 6" in height may be approved for cutting with rotary power saws pending a successful demonstration to the Project Architect.*
5. Do not damage masonry units.
6. Existing horizontal mortar joints (bed joints) that are filled with a hard Portland mortar may be raked out using a diamond blade that is narrower than the joint width. The middle

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- one-third of the mortar joint may be cut using a rotary power saw. The remaining mortar shall be removed from the masonry joints by hand using masonry chisels or pneumatic carving tools powered by air.
7. Existing historic mortar shall be removed using only small-headed chisels that are no wider than half the width of the existing masonry joints. Pneumatic air carving chisels are permitted.
8. Contractor shall not widen the existing masonry joints. The surrounding masonry edges shall not be spalled or chipped in the process of mortar removal. Damage to surrounding stone resulting from rotary blade over running shall not be permitted. Contractor shall replace all brick or stone damaged during mortar removal with replacement units that match the original exactly.
9. Brush, vacuum, blow out, or flush joints with water to remove dirt and loose debris, working from top to bottom of wall.
10. Exposed surface of masonry adjacent to joint shall be wet prior to repointing. Maintain a water sprayer on site at all times during the repointing process.
11. Walls should be pre-soaked with water 10 minutes prior to pointing.
12. Rinse masonry joint with water to remove dust and mortar particles. Time the rinsing application so that at the time of pointing excess water has evaporated or run off. Joint surfaces should be damp but free from standing water.
13. Mortar shall be mixed according to manufacturer recommendations. The mortar material shall resemble the consistency of brown sugar during installation. This drier consistency enables the material to be tightly packed into the joint and allows for cleaner work and prevents shrinkage cracks as the mortar cures.
14. Joints should be pointed in layers or "lifts" where the joints are deeper than one and one-quarter inch (1-1/4 inch or 9mm). Apply in layers not greater than 1/2 the depth but not more than 1-1/4 inch or until a uniform depth is formed. Compact each layer thoroughly and allow it to become thumbprint hard before applying the next layer.
15. LIFT EXAMPLES:
- a. 3/16" joint depth (1/16" joint existing) point in one lift
 - b. 5/16" joint depth (1/8" joint existing) point in one lift
 - c. 5/8" joint depth (1/4" joint existing) point in one lift
 - d. 5/16" joint depth (3/8" joint existing) point in one lift
 - e. 1-1/4" joint depth (1/2" joint existing) point in one lift
 - f. 1-7/8" joint depth (3/4" joint existing) point in two lifts approx.-1" (each)
 - g. 2-1/2" joint depth (1" joint existing) point in three lifts approx.+3/4" (ea.)
 - h. Over 2-3/4 joint depth- point in lifts of no more than 1-1/4" (each)
16. When mortar is thumbprint hard the joints shall be finished to match the original historic joint profile.
- a. Indiana Limestone: Raked joint
 - b. Face brick: Raked joint
 - c. Confirm with Architect once scaffold is erect and direct inspection of protected areas is possible.
17. Keep mortar from drying out to quickly. Protection from direct sun, high winds for the first 72 hours after installation. Thoroughly soak the wall after the mortar has set and the finish joint profile is complete. Water soaking the wall is to be carried out nine (9) separate times allowing the wall to dry out between applications. Protect freshly pointed areas with plastic sheeting for the first 24 hours after installation.
18. Nine (9) wet-and-dry cycles are required and can usually be completed immediately after installation by water soaking the repointing work three times per day for three days. Nine (9) wet-and-dry cycles may take two days or one week depending on the conditions of the wall and the environment.

- 1 19. Acceptable curing methods include covering the repointed wall with plastic sheeting,
2 periodic hand misting, and periodic mist spraying using a system of pipes, mist heads,
3 and timers.
4 20. Adjust curing methods to ensure that the pointing mortar is damp without eroding the
5 surface of the mortar.

6 C. Cleaning Existing Masonry:

- 7
8 1. Clean only the areas specified in the exterior elevation drawings.
9 2. Clean all exposed surfaces of masonry using materials specified, so that resulting
10 surfaces have a uniform appearance.
11 3. When cleaning stains and tough dirt, test masonry for composition and select appropriate
12 cleaner in accordance with manufacturer's instructions and recommendations; use cleaner
13 and cleaning methods selected to minimize damage to surfaces and deterioration of
14 appearance.
15 4. Mockup testing will determine the most appropriate cleaning solution, treatment, dwell
16 time, psi, and nozzle orifice distance from wall surface.
17 5. Install and clean up as per manufacturer's recommendations and standards.
18 6. Capture, store, and dispose of all cleaning products, overspray, wash, and after wash as
19 per EPA and local government standards.

20 D. Install Work in accordance with State and local Municipality standards.

21 3.4 CLEANING

- 22 A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
23 B. As work proceeds and on completion, remove excess mortar, smears, droppings.
24 C. Clean surrounding surfaces.

25 3.5 REPAIR OF MASONRY

- 26 A. Removing metal anchors and filling holes.
27 B. Repair, patch and fill cracks, voids, defects, and damaged areas to satisfaction of the Architect;
28 allow repair materials to cure completely.
29 C. Seal joints with sealant and allow to cure completely.

30 END OF SECTION

1 SECTION 04 01 40

2 STONE REPAIR MORTAR – INDIANA LIMESTONE

3 PART 1 - GENERAL

4 1.1 SUMMARY OF WORK

- 5 A. Submit the following items in time to prevent delay of the work and to allow adequate
6 time for review, do not order materials or start work before receiving the written
7 approval:
8
- 9 1. Samples of all specified materials and Material Safety Data Sheets (MSDS) as
10 appropriate.
 - 11
 - 12 2. Install mortar samples on building masonry. Execute one sample for Architect
13 approval on ornamental and subsequently on flat work demonstrating stone repair
14 techniques with the specified (or approved equal or better) stone repair mortar.

15 1.2 QUALITY ASSURANCE/TEST REQUIREMENTS

- 16 A. Stone Repair Mortar Samples: Prepare a sample of each type of repair listed below,
17 using masonry removed from the building where designated by the Owner. Prepare,
18 install, and finish each sample repair according to the specifications. All samples must be
19 applied to masonry. Prepare samples in an area where they will be exposed to the same
20 conditions as will be present on the building during curing. Allow samples to cure at
21 least seven but preferably fourteen days before obtaining Owner's approval for color
22 match. Mortar colors will continue to lighten as they cure and are exposed to the
23 weather, so samples should be installed as far in advance as possible. Samples should be
24 viewed from a minimum distance of 12 feet.
- 25 B. Project Architect to approval all replacement of stone units prior to execution.
- 26 C. Patching of Existing Stone Benchmarks
27
- 28 1. Spalls of less than 6" in diameter can be patched with stone repair mortar.
 - 29 2. Spalls larger than 6" and in locations nor readily visible can be repaired with a
30 "Dutchman" patch. Depending on the location and size of the patch, complete
31 replacement of the stone unit may be required.
 - 32 3. Smalls isolated cracks in the limestone can be filled with lime injection mortars.

33 1.3 DELIVERY, STORAGE, AND HANDLING

- 34 A. Materials are to be delivered, stored, and handled to protect them from damage, extreme
35 temperature, and moisture in accordance with Manufacturer's written instructions.
- 36 B. Deliver and store material in Manufacturer's original, unopened containers with the
37 production date shown on the container or packaging.

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- C. Comply with the Manufacturer's written specifications and recommendations for mixing, application, and curing of mortars.

1.4 PROTECTION/SITE CONDITIONS

- A. Cold Weather Requirements: Do not work in temperatures below 40° F, when the substrate is colder than 40° F, or when the temperature is expected to fall below 40° F for 48 hours after installation of repair mortars. Building an enclosure and heating areas to maintain this temperature may only be done with the written approval of the Specifier.
- B. *Hot Weather Requirements:* Protect repair mortar from direct sunlight and wind. Do not use or prepare mortar when ambient air temperature is above 90° F.

PART 2 - PRODUCTS

2.1 MASONRY REPAIR MORTARS, ANCHORS, AND EPOXY

- A. HL 15 Heritage Repair Mortars for Limestone are manufactured by U.S. Heritage Group, Inc., 3516 N. Kostner Street, Chicago, Illinois 60641 Phone: 773/ 286.2100 Fax: 773/ 286.1852. HL 15 Heritage Repair Mortars for Limestone are mineral-based, single component products that are mixed with water. The material is formulated using only natural binders; no synthetic polymers or additives are used. It is vapor permeable. Skilled masons can easily apply Heritage Restoration Mortars; no special certification is required. Designed to decrease significantly the time required to complete stone repairs, HL 15 Heritage Repair Mortars for Limestone can be ready for sculpting in 3 hours at room temperature.
- B. Stone Anchors: Type 302 Threaded Solid Stainless Steel, use of carbon steel is prohibited. Anchors to be set in moisture insensitive epoxy resin. Diameter and length of anchor determined by conditions but generally are as follows – 1/4" diameter anchors for reattachment of face bedding layers and small loose details as well as reinforcement of stone repair mortar; 1/2" diameter anchors for stone unit reattachment, sill repair, large cracks, and large spalls.
- C. Epoxy: Moisture insensitive epoxy resins to be used for setting stainless steel anchors and filling adjacent related cracks. Utilize clay dams to plug flow of epoxy from the stone face; remove clay dam once epoxy set.
- D. Setting Buttons: Plastic, steel washers are prohibited from use.
- E. Substitutions: Approved equal or better.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Do not use any additives, such as bonding agents, accelerators, or retardants in the mortar.

3.2 PREPARATION FOR REPAIRS

- A. Remove all loose mortar and masonry prior to installation of the repair mortar. "Sound" masonry with a hammer to verify its integrity. If necessary, cut away an additional 1/2" of the substrate to ensure the surface to be repaired is solid and stable. Remove any sealant residue.
- B. Where cramp anchors, threaded rod anchors, or dowels have been cut and pieces remain embedded in the substrate: Anchors that are free of rust, solidly embedded, and do not project beyond the surface of the masonry unit may remain. All others should be removed.
- C. Cut the edges of the repair area to provide a minimum depth of 1/4". The edges of the repair should be square cut. Do not allow any feathered edges in the repair area.
- D. Install mechanical anchors in all repair areas if specified on the Contract Drawing or as otherwise directed by the Architect.
- E. Clean all dust from surface and pores of the substrate, using clean water and a scrub brush.
- F. For very dry or porous surfaces, pre-wet the substrate ahead of time to prevent the substrate from drawing moisture out of the repair too quickly. Re-wet the surface immediately before applying the repair material.

3.3 MIXING MORTAR FOR REPAIR

- A. It is recommended that a dust mask be worn during mixing. Do not mix more material than can be used within 30 minutes. Discard any mixed material that has been unused for 30 minutes or more.
- B. All repairs require a minimum two-coat application consisting of a skim coat and a build-out coat. Additional build-out coats may be applied to meet the required thickness.

Skim coat: For the initial skim coat, mix approximately 5 parts dry powder to approximately 1 part potable water. The prepared mixture should be the consistency of peanut butter. Temperature and humidity will affect the amount of water required. Mixing may be done by hand or using a low-speed drill (300 to 450 rpm) for 2 to 4 minutes. Do not over mix.

Build-Out Coat: The consistency of the mortar for the build-out coat should be similar to wet sand. For any additional build-out coats use slightly less water in the mix. Working

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time is approximately 60 minutes depending on temperature, humidity and wind conditions.

3.4 APPLICATION OF REPAIR MATERIAL

A. Cut away all loose and deteriorated stone. Clean the area to be repaired with clean water and a bristle brush to remove any loose stone particles. Neutralize any salt deposits (efflorescence) with distilled water. Sound off and chisel out delaminated stone. Dampen with clean water until glistening with no standing water. Square cut edges of repair area using hand tools or pneumatic carving tools. Repair area should not be less than 1/4" in depth.

B. Skim coat: Pre-wet the stone surface, so that it is glistening wet, with no standing water. Remove loose material from the stone and wash down the stone a second time. The installation of non-corrosive screws and wires when the stone repair exceeds 4" in thickness is recommended. Use trowels and plaster detailing tools to apply the skim coat to small areas. IMPORTANT: Make sure the skim coat adheres to all surfaces of the repair area of the stone. Check the skim coat after 5 minutes. Do not allow the surface of the skim coat to dry completely. If it does dry out, moisten the surface with clean water. The drying time will be affected by weather conditions, careful monitoring is critical. Additional Coats: Scoop wet mix from the mixing container by hand (wear latex gloves) or with a small trowel and apply it by pressing and rubbing it into the skim coat. Make sure to fill all pores and voids of the stone. The repair mortar may be built up to a thickness of 3" in one lift. Finger test each coat before applying the next. If the mortar moves under your finger, wait until it sets before applying the next coat. If additional coats are applied the next day or later, you must wet and scratch the previous coat before adding additional coats.

3.5 FINISHING TECHNIQUES

A. The surface of the repair may be either tooled or scraped to the required finish. You may finish the same day or wait until the following day. For soft edges, carve the mortar when it is wet. For sharp edges, carve with sharp carving tools when it is partially cured. It may be desirable to wait longer for particular finishes. Always test finishing techniques before applying to large areas. Craftsmen should understand the timing of the finishing techniques, and make adjustments for weather conditions. Air chisels may be used to create the desired finishes.

3.6 CURING PROCEDURE

A. Keep the repair area, plus an additional 2" (2 inches) surrounding the repair area damp for a minimum of 36 hours. Spray mist the repair area with clean water, covering with plastic sheeting to keep the repair area damp. Adjust curing methods to prevent the repair from drying out too quickly.

B. Curing methods will vary in different parts of the country and at different times of the year, calling for different amounts of water to be used in the first 36 hours after application. Adjustments also have to take into account how much time is remaining before freezing weather arrives.

1 3.7 CLEAN UP

2 A. Remove mortar from tools and mixing equipment with water immediately after use.
3 Repair mortar is difficult to remove after it has set.

4

5

6 **END OF SECTION**

1 SECTION 04 05 03

2 MASONRY MORTARING AND GROUTING

3 PART 1 GENERAL

4 1.1 SUMMARY

- 5 A. Section includes mortar for masonry.
- 6 B. Related Sections – 04 01 00 Maintenance of Masonry.

7 1.2 SUBMITTALS

- 8 A. Samples: Submit two samples of mortar (in addition to the required mock-up),
9 comparable in size to the mortar joint, illustrating mortar color and color range.

10 1.3 QUALITY ASSURANCE

- 11 A. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry
12 Structures and ACI 530.1 Specification for Masonry Structures.
- 13 B. Perform Work in accordance with National Park Service, Secretary of the Interior, State
14 Historical Society, and Municipal standards.
- 15 C. Reference: 04 01 00 Maintenance of Masonry, Part I General, Section 105 Quality
16 Assurance for further information.
- 17 D. Maintain one copy of each document on site.

18 1.4 ENVIRONMENTAL REQUIREMENTS

- 19 A. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or
20 temperature of masonry units is less than 40 degrees F (4 degrees C).
- 21 B. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is
22 greater than 100 degrees F (38 degrees C) or ambient temperature is greater than 90
23 degrees F (32 degrees C) with wind velocity greater than 8 mph (13 km/h).

24 PART 2 PRODUCTS

25 2.1 MORTAR

- 26 A. Manufacturers:
- 27 1. US Heritage Group, Inc. Model – Heritage Custom-Blended Type O Mortar.
- 28 2. Substitutions: Permitted – Approved equal or better.

2.2 COMPONENTS

- A. Mortar Aggregate: ASTM C144, to match existing historic mortar in color, size, shape, and gradation as per lab analysis results.
- B. Non-hydraulic hydrated lime, Type S, ASTM C207.
- C. Cement: ASTM C150, White
- D. Mortar Color: Color to match existing mortar color as per lab analysis results.
- E. Water: Clean and potable.
- F. Calcium chloride is not permitted.

2.3 MIXES

A. Mortar Mixes:

- 1. Mortar for Face Brick Masonry: US Heritage Group, Inc., Heritage Custom-Blended Type O Mortar, 1 part Portland cement, 2 parts non-hydraulic hydrated lime, and 8 parts sand (to match historic mortar (as per lab analysis) in color, aggregate, appearance, and composition).
- 2. Mortar for Indiana Limestone Masonry: US Heritage Group, Inc., Heritage Custom-Blended Type O Mortar, 1 part Portland cement, 2 parts non-hydraulic hydrated lime, and 8 parts sand (to match historic mortar (as per lab analysis) in color, aggregate, appearance, and composition).
- 3. Substitutions: No substitutions for the mortar mixes are allowed; manufacturer substitutions of equal or better are allowed.

B. Mortar Mixing:

- 1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use... or Pre-blended US Heritage Group mortar will arrive on site in sealed pre-mixed containers.
- 2. Water component to be added as per manufacturer's recommendations and instructions.
- 3. Re-temper as per manufacturer's recommendations only.
- 4. Mixing of individual mortar ingredients on site will not be permitted.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install mortar in accordance with Section 04 01 00.

1 3.2 FIELD QUALITY CONTROL

- 2 A. Testing Frequency: One set of specified tests for every 5,000sf (465 sq m) of completed
3 wall area.
- 4 B. Testing of Mortar Mix: In accordance with ASTM C780.

5 END OF SECTION



Preserving America's Historic Masonry

INSTALLATION GUIDELINES AND PROCEDURES FOR LIME PUTTY AND HYDRAULIC LIME MORTARS FOR REPOINTING APPLICATIONS

Wall Preparation for Repointing

A. Tools & Approach

1. **Power Tools**— When used in a controlled way, power tools with diamond-impregnated metal blades — with a maximum 1/8-inch-thickness and 4-inch diameter — can be very helpful in the mortar-removal process. It is when power tools are used to “clean out the entire joint,” often in two passes and edging the top and bottom sides of the masonry units, that irreversible damage can and often does occur.
2. **Center-Cut Method (CCM)** — The CCM is a combination of power-tool and hand-chiseling techniques for successfully removing existing mortar from a wall without damaging the masonry units. The CCM allows the use of power tools to remove existing mortar joints — if the width of the existing bed joint is at least 3/8 inch. The CCM was developed to protect existing masonry units and joint profiles by eliminating contact between cutting blades and masonry units. It is for horizontal joints only. Center cutting of the vertical head joints should not be allowed. Once the center is cut from the joint, the top and bottom of the mortar between the masonry units can be easily removed by carefully using a five-in-one, a chisel and hammer, or pneumatic carving tools.

Strictly adhere to a written quality-control program to prevent damage due to worker fatigue. The quality-control program should include provisions for demonstrating the ability of operators to use power tools without damaging masonry, for supervising performance, and for preventing damage due to worker fatigue.
3. **Hand Chiseling** — It is wrong to assume that removing existing mortar by hand causes less damage to masonry units than does using angle grinders. The use of five-in-ones, tile scrapers, and chisels and hammers can also cause irreversible damage.
4. **Raking Out Lime Mortar** — Soak the joint with water to soften the lime mortar before removal. Rake out or scrape the mortar by hand with a five-in-one or a chisel and hammer. Lime mortar removal does not usually require the use of power tools.

B. Mortar Removal

1. **Depth of Removal** — Rake out joints to a minimum depth of 2.5 times the width of the existing mortar joint but not less than that required to reach sound existing mortar. However, so as not to compromise the structural stability of the wall, the joint should not be raked out more than half the width of the masonry unit.

Examples: 1/16" Mortar joint needs to be cut out to a depth of 3/16" minimum
1/8" Mortar joint needs to be cut out to a depth of 5/16" minimum
1/4" Mortar joint needs to be cut out to a depth of 5/8" minimum
3/8" Mortar joint needs to be cut out to a depth of 15/16" minimum
1/2" Mortar joint needs to be cut out to a depth of 1-1/4" minimum
3/4" Mortar joint needs to be cut out to a depth of 1-7/8" minimum
1" Mortar joint needs to be cut out to a depth of 2-1/2" minimum

2. **Square Back Reveals** – Remove existing mortar from masonry surfaces within the raked-out joints to provide reveals with square backs and to expose masonry for contact with the repointing mortar. Brush, vacuum, or flush the joints with water to remove dirt and loose mortar. Do not spall or chip masonry units in the process of mortar removal.
3. **Featheredging** – For the long-term performance and appearance of the replacement mortar, do not feather the edge of the existing mortar. Featheredging happens when a joint has not been raked out deep enough, when square-back corners have not been cut, or when the grinding wheel is removed from the joint. To promote bonding between the existing and the replacement mortars, the meeting point should be clean-cut at a 90-degree angle.
4. **Changing the Visual Appearance of the Wall** – Do not widen the existing masonry joints by cutting into the surrounding edges of the masonry units.

C. Mixing & Application

1. Mixing

- a. **Mixing** – Mortar should be mixed according to the manufacturer's recommendations. The mortar material should resemble the consistency of brown sugar during installation. This drier consistency allows the material to be tightly packed into the joint, provides for cleaner work, and prevents shrinkage cracks as the mortar cures.

2. Application

- a. **Presoak Masonry Wall** – Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time the rinsing applications so that the joint surfaces are damp but free of standing water when it is time to point. If the rinse water dries, dampen the masonry-joint surfaces before pointing.
- b. **Back Pointing** – The replacement mortar should be applied to the deepest cut/deteriorated areas in the existing mortar first.
- c. **Layers** – Mortars for repointing can be applied in single lifts up to a maximum one and one-quarter inch (1-1/4 inch or 9 mm). When the depth of the mortar application exceeds 1-1/4 inch, then divide the application depth by two – for example a joint depth of 1-1/2 inch can be pointed in two 3/4-inch layers. Fully compact each layer and allow it to become thumbprint hard before applying the next layer. Thumbprint hard is when the applied mortar has dried enough that it is tight when you touch it with your thumb or finger.
- d. **Placing Mortar** – After the deepest areas have been filled to the same depth as the remaining joints, point all joints by placing mortar in layers not greater than one and one-quarter inch (1-1/4 inch or 9 mm). Fully compact the mortar into the joint. Overfill the mortar past the face of the masonry units but do not allow it to spread over the edges onto the masonry surfaces. Do not featheredge the mortar. Where existing bricks or stones have worn edges, slightly recess the finished mortar surface below the face to avoid widened joint faces.
- e. **Finishing Mortar** – When the mortar is thumbprint hard, remove excess mortar from the edge of the joint by cutting with a trowel or raking tool. Match the original joint profile and finish. The point at which the mortar becomes thumbprint hard will depend on several factors: the mortar formulation, weather conditions, the rate at which the masonry units absorb water, the application depth, and the width of the joint. Lime mortar can often be finished within hours of installation or the following day. Follow the mortar manufacturer's recommendation regarding the timing for finishing the joints. The joints should be finished to match the original historic joint profile. The use of a churn brush to stipple the joints is recommended. Finishing the joints with a steel concave striking tool is not recommended.



D. Carbonation & Curing

1. Carbonation

- a. **Setting Time** – Lime mortar sets by carbonation rather than by hydration and requires more time to set than does Portland cement mortar. During carbonation, the mortar hardens as the lime putty slowly converts back to limestone by absorbing carbon dioxide from the atmosphere. It is necessary to initiate the carbonation process by water misting the material after the tooling of the joint profile has been completed. Nine (9) complete wet-and-dry cycles are required usually within the first three days after application.
- b. **Speed of Carbonation** – The speed at which the carbonation process initially starts depends on the ability of a masonry wall to dry out as it releases moisture by evaporation. Carbon dioxide is pulled into the mortar as the moisture evaporates from the surface of the joint. Air temperature, wall surface temperature, direct sunlight, air circulation, application width and depth, and the tooling style will dictate the frequency of misting and the length of time required to complete the nine wet and dry cycles. Water misting is still necessary in wetter climates, but the amount of water used will vary as will the timing between water misting applications.

2. Curing Methods

- a. **Methods** – Acceptable curing methods include covering the repointed wall with plastic sheeting, periodic hand misting, and periodic mist spraying using a system of pipes, mist heads, and timers. Adjust curing methods to ensure that the pointing mortar is damp without eroding the surface of the mortar. Curing methods will vary in different parts of the country and at different times of the year, calling for different amounts of water to be used in the wet-and-dry cycles. Adjustments also have to take into account how much time is remaining before freezing weather arrives.

It is important to note that keeping the wall in a damp condition for 72 hours, which is a common instruction in specifications for cement-based mortar, provides no benefit at all and will slow the carbonation process. The wall must be allowed to dry out and then be misted with water again to initiate the carbonation process.

- b. **Wet & Dry Cycles** – The carbonation of lime mortar initially requires these cycles, which can be created by water misting the joints after the mortar application. The joint profile should be finished before these cycles are started. Water misting should be carried out until a full nine (9) alternating wet-and-dry cycles are completed. If weather conditions permit the work to dry between mistings, the nine (9) wet-and-dry cycles can usually be completed immediately after installation by water misting the repointing work three times per day for three days. It is more practical; however, to specify the number of cycles required because weather conditions vary. Nine wet-and-dry cycles may take only two days or several weeks depending on the conditions of the wall and the environment.
- c. **Protection** – Keep the mortar from drying out too quickly or from becoming too wet. Protect it from direct sun and high winds for the first 72 hours after installation or from driving rain for the first 24 hours, using plastic sheeting if necessary. Be careful not to create a greenhouse effect by sealing off air movement in an attempt to protect the wall with plastic. Air circulation is important in the carbonation process.

E. Cleaning

1. Timing

- a. **Tools & Method** – When possible, it is better to clean existing masonry before repointing. When repointing work precedes the cleaning of existing masonry, allow the mortar to harden to the point that cleaning can be accomplished without eroding the surface of the mortar. This can be carried out as early as three days after repointing is finished and as long as one month later depending on the curing conditions. After the replacement mortar has fully hardened, thoroughly clean the exposed masonry surfaces of excess mortar and foreign matter. Use wood scrapers, stiff-nylon or fiber brushes and clean water that is spray-applied at garden-hose pressure.

Do not use metal scrapers or brushes.

Do not use acidic or alkaline cleaners.

F. Common Problems

1. Cleaning Chemicals

- a. **Muratic Acid** – The use of Muratic or other acid-based cleaners can cause discoloration in lime mortars to a greater degree than they do to Portland cement mortars. Because lime mortars are more porous, they grab the cleaners and pull them into the body of the material faster than do cement mortars. The cleaners cause early deterioration of the lime and discolor the mortar. Recent trends in masonry restoration techniques to “tone down” or to “expose the aggregate” of newly installed restoration mortars using Muratic acid in field-mixed solutions or brand-name cleaners containing acidic materials **are not** recommended. While these trends create the visual effect of an aged mortar joint, the life cycle performance of the joint may have lost 15 to 20 years. Other techniques are now available to create an aged visual appearance of the new joint without the use of acidic solutions.