UIHLEIN WILSON
ARCHITECTS

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LETTER OF TRANSMITTAL

To: Michael Kinateder, Project Manager
KMI Construction
17150 W. Pleasant Drive
Brookfield, Wisconsin 53005

Date: November 9, 2017

Project: Milwaukee County Historical Center
Exterior Renovation and Exterior Grate Restoration

UWA PN: 16-118

Milwaukee County PN: **O118-13449** / O247-16440

From: Debra R. Zins, AIA LEED^{AP}, CDT
Project Architect

We are sending you: ☐ Enclosed ☐ Under separate cover

Via: ☐ Mail ☐ Express courier ☐ Delivery service
☐ Hand ☐ Hold for pick-up ☒ email

Qty	Date	Item
E	11/09/17	Reviewed Resubmittal: Mortar PD

☒ For your use ☐ For review and comment ☒ Reviewed as noted
☐ For approval ☐ For your information ☐ Per your request

Copies to:
Project File

KMI Construction
17150 W. Pheasant Drive
Brookfield, WI 53005

LETTER OF TRANSMITTAL

DATE:	10/24/2017	JOB NO.: 17132
ATTENTION:	**Debra Zins**	LOT NO.: 011
RE:	**Division Four Product Data/Test Reports**	
	Milwaukee County Historical Society	
	910 N. Old World 3rd Street	
	Milwaukee, WI 53203	
	County Project #: O118-13449	

TO: **Uihlein Wilson Architects**
322 East Michigan Street
Milwaukee, WI 53202

WE ARE SENDING YOU **_x_Attached** _____ Under separate cover via_____the following items:

__ Shop drawings ___ Plans ___ Specifications __ Samples

___ Copy of letter ___ Change order **_x_ Submittals** __ Other

COPIES	DATE	SECTION	DESCRIPTION
1	**10/24/2017**	**04 03 42**	**Existing Mortar Test Results(East Elevation Balustrade Rail)**

THESE ARE TRANSMITTED as checked below:

_X_ For approval __ Approved as submitted

__ For your use __ Approved as noted

__ As requested __ Returned for corrections

___ For review and comment ___ Other

REMARKS

Debra,

Enclosed you will find the mortar product data for the Milwaukee County Historical Society.
Please contact our office with any questions or concerns.

Thank you,
Mike Kinateder
mike@kmi-construction.com

COPY TO: FILE (1), DJW, Bill Banach, John Bialk

SIGNED: Mike Kinateder

SUBMITTAL REVIEW

- ☐ **Conforms with design concept, no exceptions/comments noted.**
- ☒ **Conforms with design concept, exceptions/comments noted.**
- ☐ **Does not conform with design concept. Revise and resubmit for full review.**
- ☐ **Revise as noted, resubmit two revised sets for A/E records.**
- ☐ **Not Reviewed. Submittal not required by Contract Documents.**
- ☐ **Submit specified item(s) where indicated.**
- ☐ **Rejected.**

This review is made for the limited purposes stipulated by the Contract Documents. Corrections or exceptions/comments made on these drawings during this review do not relieve the Contractor from compliance with requirements found in the Contract Documents. The Contractor remains responsible for verifying all sizes, types, quantities and dimensions, means and methods of construction, and coordination of this contractors work with that of all other trades.

ZS LLC
10501 West Research Drive
Milwaukee, WI 53226
T. 414-727-5000
F. 414-727-6666

By: SOLGER **Date:** 11/08/2017

CONTRACTOR TO COORDINATE A MEETING TO DISCUSS CURING PLAN WITH MORTAR PRODUCT FIELD REPRESENTATIVE, ENGINEER, AND ARCHITECT BEFORE PROCEEDING WITH WORK

SUBMITTAL

- ☐ CONFORMS AS SUBMITTED
- ☑ CONFORMS AS NOTED
- ☐ CONFORMS AS NOTED, SUBMIT RECORD COPY

If checked above, fabrication MAY be undertaken. Changes to Contract are not authorized unless stated in separate letter or Change Order.

If checked below, fabrication WILL NOT be undertaken. Resubmit corrected copies for review. Correction shall be limited to items marked.

- ☐ DOES NOT CONFORM
- ☐ REVISE AND RESUBMIT
- ☐ REVIEW NOT REQUIRED BY CONTRACT DOCUMENTS

Review is only for conformance with the design concept of the project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the site for information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences, and procedures of construction, and for coordination of all trades of the Work.

UIHLEIN/WILSON ARCHITECTS, INC.
322 E. Michigan St. Milwaukee, WI 53202

By: DRZ 11/09/17

Producer	Graymont / Eden	Graymont / Eden		
Type	Pozzolanic Hydraulic Lime	Pozzolanic Hydraulic Lime		
Date	3/1/2015	3/1/2015		
Sample ID	PHL3.5	PHL5.0		
MORTAR TESTS			**ASTM C 1707 SPEC**	
Mix Ratio	1:3	1:3		
Gilmour Set Test				
- Initial (min)	246	270	**1440 max**	
- Final (min)	383	420	**2880 max**	
Air Content (%)				
- Air Entrainment Meter	11.2	12.7	**7 max**	
- Weighted 400ml Mortar				
Water Retention (%)	90	93	**70 min**	
Compressive Strength (psi) (by weight)				
- 7 Days	223	285		
- 14 Days	345	386		
- 28 Days	446	468	**> 350 psi**	
- 56 Days				
Expansion Plugs (%)	0.05	0.70	**0.80 max**	
PARTICLE SIZE ANALYSIS				
Sieve Analysis (Dry)(Cum % On)				
- Plus 30 Mesh	0.0	0.0	**< 0.05**	
- Plus 50 Mesh	0.0	0.0		
- Plus 200 Mesh	4.2	8.5	**< 15**	
Bulk Density (lbs/ft^3)				
- Loose	28.3	29.6		
- Packed	35.5	37.9		
- Working	32.0	33.7		

Per ASTM C1707 for Air Entrained PHL, Max Air Content = 12%

PHL 5.0

GRAYMONT
Building Lime Products

Description

NIAGARA® PHL 5.0 is a high-purity Blended Hydraulic Lime using a high purity dolomitic limestone like our NIAGARA Mature Lime Putty.

NIAGARA PHL 5.0 Blended Hydraulic Lime complies with ASTM 1707-09 (Pozzolanic Hydraulic Lime for Structural Purposes).

Uses

Authentic restoration applications and designed to duplicate the original mortar, plaster, and stuccos used on many prestigious and historic buildings.

Sustainable Construction such as Strawbale and Hempcrete. PHL provides breathability, flexibility and durability to these types of sustainable applications.

Advantages

No Portland
NIAGARA PHL 5.0 contains absolutely no Portland Cement, which helps reduce potential damage in historic applications where it was not originally used.

High Plasticity
NIAGARA PHL 5.0 develops exceptional plasticity and workability.

Excellent Water Retention
Increased water retention allows for better bond strengths, also there is less retempering required during use.

Limited Maximum Strength
Average 28 day strength 750 PSI. Which is designed to work in historical and sustainable applications where weaker materials are desired.

Water Vapor Permeability
As a lime based mortar this product provides excellent water vapor transference. This is especially important in non-portland cement based applications such as historic restoration or sustainable building.

Preparation

Control of water absorption is important to success of material. Substrate should not have standing water nor should it be too dry that water is rapidly absorbed. A fine mist may be used to control the rate of absorption. Any issues that may attribute to the substrate retaining moisture must be repaired prior to work being done.

GRAYMONT
P.O. Box 57
West Bend, WI 53095
1-800-433-0036
saleswl@graymont.com

NIAGARA

PHL 5.0

GRAYMONT
Building Lime Products

Mixing Directions

The typical mix ratio for PHL 5.0 is 1:3 (lime vs. sand) based on volume.

The use of clean water and sand meeting ASTM C144 is recommended.

The lime and sand should be mixed prior to adding any water. This will help ensure that too much water is not added initially.

Once dry materials are mixed, water may be added in order to reach the right consistency, however keep in mind that too much water will cause the finished material to shrink and potentially be weaker than desired.

Curing
Material must be protected from drying wind, frost, direct sun and rain for a minimum 7 days. The use of wet burlap, plastic and fine misting may be needed in conditions that require it. Freezing conditions will require special care be taken so that material does not freeze during curing.

Coverage
When mixing at a 1:3 ratio:

50lb. bag will repoint approximately 400 sq. ft. (estimate based on 3/8" x 3/8" joint size).

50lb. bag will repoint 1200 linear feet of stonework (estimate based on 3/8" x 3/8" joint size).

50lb. bag will plaster or stucco approximately 100 sq. ft. (estimate based on 1/4" thick).

WARNING:

MAY CAUSE EYE OR SKIN BURNS, HARMFUL IF SWALLOWED.
CONTAINS: Hydrated Lime (calcium magnesium hydroxide)
Avoid contact with eyes or skin. Do not take internally.
Avoid breathing lime dust.

Always wear NIOSH approved eye goggles when handling lime, in case of eye contact, flush eyes thoroughly, including under eyelids, with water for fifteen minutes. CALL PHYSICIAN IMMEDIATELY.

Wear protective clothing to prevent skin contact. If skin contact occurs wash with water. Should skin irritation continue, SEE PHYSICIAN.

If swallowed CALL PHYSICIAN IMMEDIATELY.

Ventilate or use dust collector to prevent airborne lime dust. If there is airborne lime dust use a NIOSH approved dust respirator.

KEEP OUT OF REACH OF CHILDREN.

Hazardous ingredient info - (419) 855-8336 1-800-537-4489

GRAYMONT

Section 04902

Masonry Restoration

1. PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Assessment of existing conditions
   2. Historic mortar analysis.
   3. Replacement sands, binders, and mortars.
   4. Climate requirements.
   5. Sun, wind, rain, and frost protection
   6. Removing and salvaging historic host.
   7. Removing and salvaging historic host masonry.
   8. Absorption control.
   9. Mortar mixes.
   10. Re-pointing mortar joints.
   11. Curing.
   12. Clean up.

1.2 REFERENCES

A. Small-Scale Lime Burning by Michael Wingate. Intermediate Technology Publications, 9 King Street, London, 1985. ISBN 0 946688.
B. ASTM C 136-96a – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 1996
C. ASTM C 1707 – Standard Specification for Pozzolanic Hydraulic Lime
D. ASTM C 144 – Standard Specification for Aggregate for Masonry Mortar; 1997
E. ASTM E 11 – Specification for Wire-cloth and Sieves for Testing Purposes; Book of Standards Volume 14.02.
F. ASTM C 1324 – Standard Test Method for Examination and Analysis of Hardened Masonry Mortar; 2004
G. TECHNICAL ADVICE NOTE 1, Preparation and Use of Lime Mortars, Historic Scotland, ISB 1903570, Revised Edition 2003.

1.3 SUBMITTALS

A. Product Data:
    a. Graymont
        i. Product data sheets for all mix ingredients.
        ii. Mix design.
        iii. Aggregate sieve analysis.
        iv. Manufacturer's storage and shipping requirements information.
        v. Manufacturer's climate requirements for installation and curing.
    b. Graymont Niagara PHL
        i. Product data sheets.
        ii. Manufacturer's storage and shipping requirements information.
        iii. Manufacturer's climate requirements for installation and curing.
    c. Aggregate for Site Mix
        i. Historic Sand
            1. Sieve Analysis.
            2. Aggregate void ratio.
            3. Gradation pictogram.
        ii. Replacement Sand
            1. Sieve Analysis.
            2. Aggregate void ratio.
            3. Gradation pictogram.
    d. Written Procedure for:
        i. Obtaining water supply.
        ii. Diagram of water distribution system.
B. Testing and Analysis
    a. Historic Mortar Analysis Report – Provide mortar analysis as the basis for determining the design mix. Mortar analysis shall include the following laboratory examination of building mortar in each type of masonry to determine the composition of the historic mortars.
        i. Petrographic Examination per ASTM C 1324
        ii. XRD per ASTM C 1324
        iii. Determine binder to aggregate ratio by one of the following methods as determined by the Historic Materials Scientist.
            1. Chemical analysis per ASTM C 1324
            2. Acid dissolution.
C. Samples
    a. Graymont Niagara PHL
        i. 1 cup sample of product.
    b. Aggregate for site mix
        i. Historic Sand
            1. 1 cup clean sample of product
        ii. Replacement Sand
            1. 1 cup clean sample of product

D. Installer Qualifications
    a. Name of Lead Restoration Bricklayer or Stone Mason.
    b. Names of Restoration Bricklayers or Stone Masons performing the work.
    c. Names of masonry tenders.
    d. Affidavit or orientation to historic lime mortars for Restoration Bricklayers or Stone Masons or evidence of past completed projects using the specified products.
    e. Evidence, including photographs and relevant contact information, or prior successful experience in comparable restoration projects. Obtain access to completed projects for the Architect so that they may review the completed work.

E. Tools and Accessories to be reviewed on site:
    a. Garden spray assembly.
    b. Very-low pressure spray assembly.
    c. Shims.
    d. Pneumatic hammer.
    e. Chisels: Sway, clean-up, very thing, extended length.
    f. Pointing irons.
    g. Bench grinder.
    h. Angle grinder.
    i. Masonry jointers.
    j. Brushes.
    k. Hand held water misting bottles.
    l. Roller pan mixer (for site mixed lime putty mortars).
    m. Paddle mixer (for site mixed PHL mortars).
    n. Soft plastic and wood scrapers.
    o. Pool for soaking masonry.
    p. Burlap.
    q. Cotton canvas.
    r. Shade cloths.
    s. General masonry tools as required by project conditions.

1.4 Definitions

A. Restoration Bricklayers or Stone Masons: individual workers who have demonstrated experience in historic masonry restoration and have been approved by the Architect to perform the work. The approval shall not be transferable either to their company of employ or to other individuals.

B. Lead Restoration Bricklayer or Stone Mason: an individual Restoration Bricklayer or Stone Mason with exemplary skills in historic masonry restoration who has been approved by the Architect to serve as crew leader, shall be present at all times during masonry restoration, and shall personally direct the work.

C. Masonry Crew Members: Restoration Bricklayers or Stone Masons, Lead Restoration Bricklayer or Stone Mason, and Masonry Tenders.

D. Historic Materials Scientist: a scientist meeting the "Qualifications of Petrographer and Chemist". Section 5 ASTM C 1324 and with a demonstrated expertise in the analysis of historic building materials.

1.5 Quality Assurance

A. It is required that the work of this Section be the responsibility of a single Trade Contractor.
B. Installer: Work must be performed by a firm having successful experience in comparable masonry restoration projects and employing personnel skilled in the restoration process and operations indicated.
C. Restoration Bricklayers or Stone Masons:
    a. Deteriorated material removal, material salvage, absorption control, mixing, re-pointing, curing, and finishing operations shall be performed by approved Restoration Bricklayers or Stone Masons.
    b. Before project start-up, every Restoration Bricklayer or Stone Mason shall perform mock-ups.
    c. All members of the Masonry Crew shall be trained in procedures for handling historic and salvaged materials. During the progress of the project if additional Masonry Crew Members are required due to personnel rotation and attrition or changes in the project schedule or the need to increase rate of production, the Subcontractor will be permitted to arrange for training of replacement or additional Masonry Crew Members providing, however, that at no time shall the number of approved Masonry Crew Members fall below seventy five percent, nor two thirds on any given crew of three, not one half of any given crew of two.
    d. Replacement Crew Members must be approved by the Architect via the submittal process and shall perform mock-ups.
D. Historic Materials Analyst:
    a. Analysis shall be performed by a testing facility with expertise in the evaluation of historic materials.
E. Mock-Ups:
    a. Every Restoration Bricklayer or Stone Mason shall construct a mock-up for each activity that they will perform. Only Restoration Bricklayers or Stone Masons who have demonstrated proficiency in a task per the approval of the Architect shall be permitted to perform that particular task.
    b. Mock-ups of the following shall be constructed:
        i. Shall (up to one and one half inches deep) re-pointing.
        ii. Deep (exceeding one and one half inches deep or multiple lifts) re-pointing.
        iii. Filling small holes with mortar.
        iv. Demonstration of procedures including:
            1. Joint Removal including a demonstration of removal of unsound or friable mortar and rinsing of debris from joints.
            2. Removal of old cement mortar from masonry surfaces.

3. Removal of old lime mortar from masonry surfaces.
4. Proper handling and storage of salvaged materials.
5. Scoring joints with angle grinder.

c. Mock-ups shall be witnessed by the Architect.
d. Obtain Architect's approval of mock-ups before starting the remainder of the work.
e. Retain approved mock-ups in undisturbed condition, suitably identified, during restoration as a standard for judging completed work.

F. Approvals:
a. Approved samples and mock-ups shall remain as a part of permanent work.
b. Obtain approval of raking out and surfaces preparation before finishing joints.
c. Final Viewing of finished joints for approval will occur approximately fourteen days after finishing for non-hydraulic mortars.
d. For approval of finished appearance, joints will be viewed from a distance of eight feet, except in areas naturally seen from close proximity, or as the scaffold configuration allows.
e. Approval of technical considerations in joint construction is not limited by viewing distance.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site and store in manufacturer's original unopened containers and packaging, bearing labels as to type and names of products and manufacturers.
B. Protect restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth and other types of materials.
C. Obtain affidavit from delivery service stating that materials were stored and shipped per manufacturer's requirements.

1.7 PROJECT CONDITIONS

A. Do not perform any masonry application unless weather conditions meet manufacturer's recommendations.
B. Provide sun, wind, frost, and rain, protection for work in progress, and curing the mortar.

PART 2 – PRODUCTS

2.1 MORTAR MATERIALS

A. The mortar mix shall be one or more of the following:
B. Pre-mixed mortars
C. Site mixed mortars.
a. Hydraulic lime: "Graymont Hydraulic Lime." Available from: Graymont P.O. Box 158, Genoa, OH 43430 419-855-8682.

b. Manufacturer shall maintain quality control procedures and maintain records of production. Manufacturer to provide samples of proposed materials for mock up panels at the site.
c. Hydraulic Lime shall comply with ASTM C 1707.

D. Sand for sire mixed mortar:
a. Sand shall match color and gradation or original sand. Two or more sands and aggregates may be blended to achieve the color, gradation, and inclusions match. If necessary to improve workability, sand may be amended to improve gradation. The gradation standards of ASTM C144 may be used as a guideline, but the characteristics of the original mortar shall supersede.

E. Water shall be clean, clear, and potable.

F. Pigments shall be synthetic or natural, alkali, resistant, iron oxide pigments as required to achieve the desired color. The weight of pigment shall not exceed 10 per cent of the weight of the binder.

2.2 TOOLS AND ACCESSORIES

A. Garden Spray: Spray hand-pump-up garden-type ("Hudson") sprayer with nozzle adjusted to a cone-shape. Powered garden-type sprayers providing equivalent spray are also acceptable.

B. Very-Low Pressure spray: 30 psi (nominal) through a three/fourths inch diameter hose fitted with a nozzle producing a conical spray of approximately 60 degrees applied at a distance not closer than 4 feet from the surface. Provide pressure/ volume cut off valve at the discharge end.

C. Shims: wood, removable, size and shape as required for temporary support of masonry and pinning of burlap.

D. Pneumatic hammer: Trow and Holden Type "B" short stroke Pneumatic Hammer Mortar Removal Set with hose assembly.

E. Chisels: Carbide-tipped masonry carving chisels by Trow & Holden. Modify as necessary to allow removal of mortar without damage to the host masonry.

F. Hand chisels as required by project conditions.

G. Pointing irons: Width slightly less than joint width. Various widths required suiting project conditions. Have Capacity to grind pointing tools at the jobsite to achieve suitable widths.

H. Variable Speed Bench Grinder/Sharpener: grinder for the sharpening tools and modifying width of pointing irons and chisels as required by project conditions.

I. Angle Grinder: grinder for scoring center of bed joints to relive stress in existing hard mortars. Blade shall be no larger than four and one half inch diameter and one eighth inch thick. The grinder must have a butterfly switch. Lock switches are not allowed.

J. Masonry jointers as required to reproduce historic joint finish. Jointers may require custom fabrication.

K. Non-metallic bristle brushes of various sizes for cleaning raked-out joints.

L. Hand water mister bottle and garden sprayer for curing, cleaning, and finishing pointed joints.
M. Mixing Equipment: Roller pan mixer (for site mixed lime putty mortars only) or paddle mixer for other mixes.
N. Soft plastic and wood scrapers.
O. Site fabricated or purchased pool for pre-soaking replacement masonry units.
P. Burlap for protection masonry. Provide ample supply for protecting all work in progress.
Q. Cotton canvas for protection of masonry. Provide ample supply for protecting all work in progress.
R. Shade cloths for sun protection of the masonry.
S. Other tools as necessary for the Work.

2.3 MORTAR MIXES

A. The replacement mortar mix shall be determined by the Architect and shall be governed by the results of the Historic Mortar Analysis.

PART 3-EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Lead Restoration Bricklayer or Stone Mason present, for conditions affecting performance of masonry.
B. Do not proceed until unsatisfactory conditions have been corrected. One the Subcontractor begins work he has accepted all conditions have been corrected. Once the Subcontractor begins work he has accepted all conditions and shall bear the cost of any later corrections required by unsatisfactory conditions.
C. Before removing any deteriorated work establish bond patterns, levels, wall conditions, joint details, and coursings.

3.2 PROTECTION

A. Prior to commencing masonry work assemble sun, wind, rain, and frost protection. Keep assembly in place until the completion of curing.
B. Prevent mortars and grouts form staining the face of masonry or other surfaces to be left exposed. Remove mortars and grouts that come in contact with such surfaces.
C. Cover partially completed work when work is not in progress to prevent premature curing of the mortar.
D. Protect sills, ledges, windows, doors, and projections from droppings and splatters.
E. Secure burlap with wood shims in existing joints. Do not use tapes or adhesive on any masonry surface.

3.3 REMOVING ANCHORS

A. Small anchors, nails, and pins have been driven into the masonry at various locations. Remove and discard anchors, nails, pins, and similar devices.
B. If anchor is suspected to be historic, notify the Architect.

C. Remove ferrous material completely. Do not allow portions to remain embedded.
D. Where brittle materials cannot be pulled out intact, remove remaining embedded material by drilling.
E. Determine finish of hole with Architect.

3.4 REMOVING EXISTING MORTAR

A. All existing cement mortar must be carefully removed by skilled Restoration Bricklayer or Stone Masons. Horizontal joints may be raked out by carefully scoring the center of the mortar joint with angle grinder to relieve the stress on the joint. Do not use the grinder on head joints. The remaining mortar in head and bed joints shall be removed to the required depth using hand or pneumatic stone carving chisels. Do not grind mortar from any surface of the host masonry.
B. Raking out shall leave a clean, square face of sound mortar at the back of the joint, and clean masonry surfaces. Shallow or feather edging will not be permitted.
C. Existing historic lime-based mortar shall be removed by hand. Use only hand or pneumatic stone carving chisels that are no wider than one half the width of the existing masonry joints.
D. Do not widen the existing masonry joints. Do not spawl or chip the surrounding masonry edges in the process of mortar removal. Damage to masonry resulting from rotary blade over running shall not be permitted. Subcontractor shall be subject to liquidation damages of $400.00 per linear inch measured to the nearest 1/8” inch for any damages caused by rotary blades.
E. Remove debris from joints by brushing joint faces, vacuuming, or blowing with pressurized air. Joints may be rinsed using very low pressure spray assembly with caution. Verify that water will not migrate to other areas and cause damage. Ensure that all surfaces below rinse areas are wet prior to cleaning out joints.

3.5 MORTAR REMOVAL DEPTH

A. Existing mortar joints shall be raked out to whichever depth is greatest:
    a. One inch
    b. Two and one half times the width of the existing mortar joint
    c. Until bonded, cohesive existing mortar is encountered

3.6 REMOVING MORTAR EXCESS FROM MASONRY FACES

A. Existing excess mortar from prior masonry work and excess mortar from the work of this contract shall be removed from the faces of the masonry using the gentlest means possible.
B. Existing excess mortar from prior masonry work shall be carefully picked off taking care not to damage the host masonry. If, per the directive of the Architect, the mortar cannot be removed from the face of the host masonry without damage, then the mortar shall be left in place.

3.7 FULL DEPTH POINTING

A. Provide temporary support where necessary to prevent displacement of masonry during re-pointing and until mortar has achieved sufficient strength.
B. Where required to maintain support of units, rake out and re-point each area in stages, allowing freshly re-pointed portions to cure sufficiently before raking out and re-pointing remaining portion of joints supporting the unit.
C. Remove temporary shims and supports when no longer necessary, and re-point voids left by temporary shims and supports.

3.8 CONTROL OF ABSORPTION RATE

A. Absorption rate is dependent upon the properties of the original host masonry and mortar, climate conditions, and the condition of the historic masonry. Masonry conditions and moisture levels will vary from one location to another in a historic structure. Evaluate existing conditions to determine methods of absorption control.
B. Brush joint faces and flush out with water to remove dirt and loose debris, working from top to bottom of wall. Thoroughly dampen wall below to avoid soiling. Time the pre-soaking 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.
C. Achieve the proper absorption rate before masonry repair commences. Project conditions may require pre-wetting in dry conditions, or drying in wet conditions. The Lead Restoration Bricklayer or Stone Mason shall evaluate conditions with the Architect and determine methods for control of absorption rate.
D. Masonry units shall be damp but without standing water at the time of re-pointing.
E. Maintain hand mister bottles or a garden sprayer with clean, clear, potable water immediately available to masons at all times during the re-pointing process. A very low-pressure spray may be used over large areas providing erosion of joints is prevented.
F. Exposed surface of masonry adjacent to joint shall be damp prior to re-pointing.

3.9 RE-POINTING OF MORTARS JOINTS

A. Joints shall be re-pointed in layers or “lifts” where the joints are deeper than three quarters inch.
    a. Joints greater than three quarters of an inch deep shall be re-pointed with an initial lift to bring the joint depth to a uniform three quarters of an inch depth.
    b. Compact each layer at the time it is placed in the joint by applying firm pressure with the pointing tool to ensure close contact between the lifts. Pack mortar firmly against the previously placed mortar.
    c. Roughen face of previous lift to create bond with subsequent lift.
    d. Allow each lift to become thumbprint hard before applying the next lift.

B. Finishing Face Joints: Refer to project documents.
C. Finishing Skyward Facing Joints: When mortar is thumbprint hard the joints shall be finished by striking off with a tool, leaving the joint proud approximately a trowel's thickness but not more than one sixteenths inch from the face of the masonry.
D. Finish joint uniformly. Do not overwork. Leave the surface of the masonry clean.

3.10 CLEANING

A. Maintain clean surfaces on the face, sills, ledges, and projections of masonry on a daily basis.
B. With a trowel, strike off minor dabs of adherent mortar from face of masonry
C. After mortar is thumbprint hard and joint finish is achieved, lightly dry brush masonry face to remove small mortar burrs.
D. Refer to manufacturer's guidelines on final cleaning.

3.11 CURING

A. Keep mortar from drying out too quickly.
B. Freshly re-pointed mortar shall be maintained as described below.
    a. Apply water to the re-pointed masonry in a fine, low volume mist with a garden sprayer to maintain a damp environment for the first twenty four. Do not wash out fresh mortar or damage joint details.
    b. Refer to manufacturer's guidelines for subsequent steps in curing.
    c. Ensure that curing occurs on schedule including Saturdays, Sundays, and holidays.
    d. Curing and protection may last for several months in extreme conditions after installation of mortar. Refer to manufacturer's guidelines for duration of curing in specific project conditions.
C. Protect freshly re-pointed areas with damp burlap or cotton canvas, or both in extreme conditions, for the first seventy two hours after installation. Keep burlap and canvas clean.
D. Shield from direct sun and drying winds for the first seven days after installation.

See project specification for additional curing and cleaning requirements. For all discrepancies, stricter/longer requirements shall be followed. All materials including mortar components, water, and limestone to be at a temperature above 40deg before working per NCMA.