BLOUNT · BENNETT

BBA

ARCHITECTS Ltd.

Project Manual For:

Stone Barn Envelope Repairs
Colt State Park

Route 114, Bristol, Rhode Island 02809

Prepared For:

Rhode Island Department of Environmental Management
Planning and Development

235 Promenade Street
Providence, Rhode Island 02906

Architect:

Blount Bennett Architects, Ltd.

865 Waterman Ave. Unit B
East Providence, Rhode Island 02914

Architects Project #01752.00

ISSUE DATE: 9/25/2018

SECTION 000101

PROJECT TITLE PAGE

PROJECT MANUAL

FOR

STONE BARN ENVELOPE REPAIRS
COLT STATE PARK
ROUTE 114
BRISTOL , RHODE ISLAND 02809

ARCHITECT'S PROJECT NUMBER: 01752.00

OWNER

RI DEM PLANNING & DEVELOPMENT

DATE: SEPTEMBER 25TH, 2018

PREPARED BY:

BLOUNT BENNETT ARCHITECTS, LTD.

END OF SECTION 000101

SECTION 000103
PROJECT DIRECTORY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification of project team members and their contact information.

1.02 OWNER:

A. Name: Rhode Island Department of Environmental Management - Planning and Development.
   1. Address Line 1: 235 Promenade Street.
   2. City: Providence.
   3. State: Rhode Island.
   4. Zip Code: 02906.

B. Primary Contact: All correspondence from the Contractor to the Architect will be direct, with copies to this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.

1.03 CONSULTANTS:

A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   1. Company Name: Blount Bennett Architects, Ltd..
      a. Address Line 1: 865 Waterman Avenue.
      b. Address Line 2: Unit B.
      c. City: East Providence.
      d. State: Rhode Island.
      e. Zip Code: 02914.
      f. Telephone: 401-431-1922.
   2. Primary Contact: .
      a. Title: Staff Architect.
      b. Name: George Bennett, AIA
      c. Email: gbennett@bbaltd.com.

B. Structural Engineering Consultant:
   1. Company Name: Geisser Engineering Corporation.
      a. Address Line 1: 227 Wampanoag Trail.
      b. City: East Providence.
      c. State: Rhode Island.
      d. Zip Code: 02915.
      e. Telephone: 401-438-7711.
   2. Primary Contact: .
      a. Title: Senior Engineer.
      b. Name: Steven A. Bogle.
      c. Email: sab@geisserengineering.com.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 000103

SECTION 000110
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END OF SECTION 000110

SECTION 000115

LIST OF DRAWING SHEETS

PART 1 - LIST OF DRAWING SHEETS

1.01 LIST OF DRAWINGS

A. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

1. Cover Cover Sheet
2. AE100 Basement Floor Plan
3. AE101 First Floor Plan
4. AE102 Second Floor Plan
5. AE103 Roof Plan
6. AE400 Exterior Elevations
7. AE401 Exterior Elevations
8. AE402 Exterior Elevations
9. AE403 Exterior Elevations
10. AE550 Details
11. AE551 Details
12. AE552 Details
13. AE553 Details
14. AE800 Window Repair Schedule

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 000115

SECTION 003100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of the Contract Documents, as follows:
   1. Hazardous Material Inspection Report - Stone Barn at Colt State Park: As prepared by Environmental Consulting and Management dated January 31, 2018 (Section 003101).
   2. Hazardous Material Inspection Report - Stone Barn Work Shop, Storage and Out Building at Colt State Park: As prepared by Environmental Consulting and Management dated May 7, 2018 (Section 003102)

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 003100

SECTION 003101

HAZARDOUS MATERIAL INSPECTION REPORT

PART 1 GENERAL

1.01 HAZARDOUS MATERIAL INSPECTION REPORT

A. The Hazardous Material Inspection Report - Stone Barn at Colt State Park, as prepared by Environmental Consulting and Management dated January 31, 2018 has been prepared by the Owner's design consultant and applies to the existing building areas referenced specifically therein. This report identifies areas of observed and tested asbestos and lead paint. The report was limited to areas that were able to be observed without any significant destructive investigation. A copy of the report can be found following this section.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 003101

January 31, 2018

Blount Bennett Architects
Attn: Mr. James Marshall
865 Waterman Avenue, Unit B
East Providence, RI 02914

RE: ECM Project # 180014 – Stone Barn at Colt State Park, Bristol, RI – Hazardous Material Inspection Report.

Dear Mr. Marshall:

Enclosed are the analytical results, observations, and recommendations associated with the pre-renovation asbestos, lead paint, and universal waste inspection performed by Environmental Consulting & Management Inc. (ECM) of the Stone Barn at Colt State Park in Bristol, Rhode Island.

Methodology and Scope

On January 18, 2018 a pre-renovation asbestos, lead paint, and universal waste inspection was conducted by Mr. Andrew Perreault (AAC-0914) of ECM. During the course of the inspection ECM collected samples of accessible suspect asbestos containing building materials (ACBM) and lead containing paints that may be impacted during the renovation of the basement, 1st floor and 2nd floor of the area of the stone barn containing the Parks and Recreations and Environmental Police Offices. The renovations will consist of replacement and removal of all windows and doors, repairing damaged walls and ceilings, upgrading the lighting and upgrading the south east room into a temporary holding cell. The inspection was conducted according to the Environmental Protection Agency (EPA) Asbestos Hazard Emergency Response Act (AHERA) asbestos bulk sampling protocols. Interior and exterior materials anticipated to be impacted by the up coming renovations were surveyed as part of this inspection. No roofing materials were surveyed as part of this inspection. The building was occupied at the time of the inspection.

Asbestos

The tables found on the following page(s) indicates sampled materials, location of materials, notes about the materials, the quantity of asbestos containing materials, and the respective testing results. All samples were analyzed utilizing Polarized Light Microscopy as suggested by EPA method 600/R-93/116. Please refer to **Appendix A** for the laboratory analytical results.

Table 1: Stone Barn at Colt State Park, Bristol, RI WO# 18002535

Sample #s	Material Description	Material Location	Results	Quantity
01A-E	Wall Skim Plaster	Walls Throughout the Renovation Area, Except Proposed Holding Cell	None Detected	NA
02A-E	**Wall Base Plaster**	**Walls Throughout the Renovation Area, Except Proposed Holding Cell**	**2% Chrysotile**	**7,500 SF**
03A-E	Ceiling Skim Plaster	Ceilings Throughout Renovation Area, Except Proposed Holding Cell	None Detected	NA
04A-E	**Ceiling Base Plaster**	**Ceiling Throughout Renovation Area, Except Proposed Holding Cell**	**2% Chrysotile**	**2,900 SF**
05A-B	Drywall	Walls in Proposed Holding Cell	None Detected	NA
06A-B	Subway Tile Setting Bed	Walls and Ceilings in 1st Floor Kitchen, Entryway, Break Room, Parks and Rec Office 3, Vending Area, Env. Police Office 1, Env. Police Entryway	None Detected	NA
07A-B	Subway Tile Grout	Walls and Ceilings in 1st Floor Kitchen, Entryway, Break Room, Parks and Rec Office 3, Vending Area, Env. Police Office 1, Env. Police Entryway	None Detected	NA
08A-C	Decorative Plaster Door Frame / Mantel	Parks and Recreation Office 1 and Office 2	None Detected	NA
09A	2'x2' Ceiling Tile	Ceiling Proposed Holding Cell	None Detected	NA
10A	Brown 3" Cove Base	Proposed Holding Cell	None Detected	NA
11A	Adhesive to Brown 3" Cove Base	Proposed Holding Cell	None Detected	NA
12A	Window Glazing to Metal Framed Interior Windows	1st Floor Vending Area, Break Room, and Parks and Recreation Office 3	None Detected	NA
13A	Carpet Glue	1st Floor Parks and Recreation Office 3	None Detected	NA
14A	Wood Panel Adhesive	Parks and Recreation Office 3, Proposed Holding Cell	None Detected	NA

Sample #s	Material Description	Material Location	Results	Quantity
15A	Beige 3” Cove Base	Basement Bathroom	None Detected	NA
16A	Adhesive to Beige 3” Cove Base	Basement Bathroom	None Detected	NA
17A-C	Plaster Over Beams	Basement	None Detected	NA
18A-B	Mortar to Ceramic Brick	1st Floor Hallway	None Detected	NA
19A-B	**Window Glazing to 2nd Floor Wood Sash Windows**	**Windows on 2nd Floor**	**2% Chrysotile**	**7 Windows 20 LF per Window Total 140 LF of Galzing**
20A-C	*Insulation Above Ceiling*	*2nd Floor Above Plaster Ceiling*	*<1% Chrysotile*	*1,300 SF*
21A-B	Paper Under Hardwood Floors	2nd Floor Floors	None Detected	NA
22A-C	Decorative Skim Coat on Ceiling, Bricks	2nd Floor Parks and Recreation Office	None Detected	NA
23A	Glazing to Shutter Windows	Shutter Windows on 1st and 2nd Floor of West Tower (Octagon)	None Detected	NA
24A	**Residual Door Caulk**	**Exterior Doors between Frame and Masonry**	**15% Chrysotile**	**4 Exterior Doors 20 LF per Door Total 80 LF of Caulk**
25A-B	Glazing to 1st Floor Wood Sash Windows with Curved Upper Panes	Windows on 1st Floor	None Detected	NA
26A-B	Mortar Around Windows	Exterior Windows Between Frame and Masonry	None Detected	NA
27A-B	Terracotta Block	Silo Interior	None Detected	NA
28A-B	Mortar to Terracotta Block	Silo Interior	None Detected	NA
--	Safe Insulation	2nd Floor Parks and Recreation Office	Assumed Asbestos	1 Safe

SF – Square Foot
LF – Linear Foot

Asbestos: Recommendations & Summary

Asbestos containing wall base plaster, ceiling base plaster, window glazing to the 2nd floor wood sash windows, and the residual caulking to the exterior doors were identified during the course of the inspection.

The loose fill insulation above the ceiling on the second floor was found to contain <1% asbestos. Materials that are found to contain less than 1% asbestos can be considered a negative material by the Rhode Island Department of Health (RIDOH) and EPA regulations. However, theses materials are still regulated by the Occupational Health and Safety Administration (OSHA). OSHA recommends that personal protective equipment be worn when dealing with asbestos containing materials.

If the amount of the identified asbestos containing materials to be remove greater than 25 square feet/10 linear feet, an asbestos abatement plan will need to be created and submitted to the RIDOH. Removal of the asbestos containing material will need to be conducted by a RI licensed asbestos abatement contractor.

After the abatement plan is submitted to the RIDOH, the approval process takes approximately 2 to 3 weeks. Once the abatement plan is approved, a letter will be sent out to the building owner with an identification number designated to the project. The approval number is then utilized by the abatement contractor to submit the 10-day notification to the RIDOH, where activities cannot begin until 10 calendar days after the notification is submitted.

If less than 25 square feet/10 linear feet of asbestos containing material is to be impacted, an asbestos plan is not needed and removal can be conducted as a spot abatement by a RI licensed asbestos abatement contractor.

Any suspect asbestos containing material not listed within this report must be assumed to contain asbestos and disposed of accordingly unless future sampling determines otherwise.

Lead Report

Lead paint chip samples were collected from the renovation area to establish the lead concentration. The samples were analyzed utilizing EPA test method sw846/3050B/7000B. The results can be found in the following chart. Please refer to **Appendix B** for the laboratory results.

Table 2: Stone Barn at Colt State Park – Lead Paint Chip Sample Results #18002546

Sample ID	Material	Location	Lead Results (ppm)	Lead Results (%)
PB01A	White Paint	Plaster Ceiling / 2nd Floor Room 1	2056.6	0.2057
PB02A	White Paint	Plaster Wall / 2nd Floor Room 1	2220.3	0.222
PB03A	Gray Paint	Wood Trim / Stairwell by Environmental Police	222061.6	22.2062
PB04A	Gray Paint	Wood Door / 1st Floor Hallway	484.7	0.485
PB05A	Gray Paint	Wood Door Frame / 1st Floor Hallway	27839.8	2.784
PB06A	Gray Paint	Wood Floor / Stairwell by Environmental Police	1805	0.1805
PB07A	White Paint	Wood Window Sash / Env. Police Room 1	194861.8	19.4862
PB08A	White Paint	Wood Window Frame / Env. Police Room 1	160058.8	16.0059
PB09A	White Paint	Metal Interior Window Frame / 1st Floor Vending Area	1093.2	0.1093
PB10A	White Paint	Wood Wall Panel / 1st Floor Hallway	265.5	0.0265
PB11A	Gray Paint	Wood Window Sash / 2nd Floor Room 2	94331.8	9.4332
PB12A	Gray Paint	Wood Window Frame / 2nd Floor Room 2	8763.8	0.8764
PB13A	Painted Brick Mural	Ceiling Skim Coat / 2nd Floor Parks and Recreation Office	94.8	0.0095
PB14A	White Paint	Exterior Wood Windows	176661.5	17.6662

Lead Conclusion:

The paint chip samples collected within the renovation area ranged from a low to elevated levels of lead content. ECM recommends utilizing OSHA standards when impacting the lead based paint.

OSHA's lead in construction standard applies to all construction, modification, or repair where workers may be exposed to lead. OSHA's Lead Standard for the Construction Industry, Title 29 Code of Federal Regulations 1926.62, establishes maximum limits of exposure to lead for all workers. The permissible exposure limit (PEL) sets the maximum worker exposure to lead at 50 micrograms per cubic meter ($\mu g/m^3$) of air averaged over an eight-hour period. The action level (AL), regardless of respirator use, is an airborne concentration of 30 $\mu g/m^3$ averaged over an eight-hour period. The AL is the level at which an employer must begin specific compliance activities.

Until an exposure assessment is performed, and documentation showing that workers are not exposed above the PEL, OSHA requires that personal protective equipment (PPE) must be utilized.

Hazardous Materials:

In addition to the asbestos and lead sampling, ECM inventoried materials existing at the site that may require special handling/disposal in the event that the materials need to be discarded. The chart below indicates observed materials and their respective potential hazards.

Table 3: Observed HAZMAT Chart

Material	Hazard	Quantity
4' Fluorescent Light Bars	Mercury	20
CFL Light Bulbs	Mercury	3
Ballasts Fluorescent Light Fixtures	PCBs/DEHP	10
Honeywell Thermostat	Mercury	1
Water Bubbler/Chiller	Refrigerants	2
Refrigerators / Freezers	Refrigerants	5
Window Unit Air Conditioners	Refrigerants	3
Fire Extinguishers	Contents under Pressure	5
Paints, Thinners, and Stains	Various	9
House Hold Cleaners/ Degreasers	Various	40
Insecticides / Rodent Poisons	Various	6
Oils / Starters	Oils	3
Above Ground Oil Tanks	Oils	2

Hazardous Materials Conclusion:

It is the contractor's responsibility to ensure that waste materials are disposed of in accordance with the Resource Conservation and Recovery Act (RCRA). Contractors should refer to 40 CFR Part 261-263 for specific regulations pertaining to hazardous waste classification, generation and transportation.

Limitations:

This inspection was limited by visibility, accessibility, and scope of work. Components that could affect building operation and endanger the safety of the inspector such as active mechanical or electrical systems were not scrutinized during this inspection unless otherwise noted.

Sampling was performed for a specific scope of work. Should the planned scope of work change, additional sampling may be required

This report was prepared under the request of Blount Bennett Architects. This report should not be represented, reproduced, or disseminated without the written approval of Environmental Consulting and Management or Blout Bennett Architects. No warranties other than those expressed in the contract for this project are expressed or implied.

A hard copy of this report can be provided for your records via mail upon request. If you have any further questions feel free to contact myself at 401-304-6615.

Sincerely,
Environmental Consulting & Management, Inc.

Andrew Perreault
Project Manager
RI Inspector License: AAC-0914

Appendix A:
Asbestos Laboratory Reports

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Environmental Consulting & Management Inc

Report Date: 1/29/2018

Project Name: Colt State Park - Stone Barn-Amended Report JT

Project #: 180014

SanAir ID#: 18002535

NVLAP TESTING

NVLAP LAB CODE 200870-0

1551 Oakbridge Dr. Suite B | Powhatan, Virginia 23139-8061
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com

SanAir ID Number
18002535
FINAL REPORT
1/29/2018 2:21:10 PM

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809
Phone: 401-438-1360

Project Number: 180014
P.O. Number:
Project Name: Colt State Park - Stone Barn-Amended Report JT
Collected Date: 1/18/2018
Received Date: 1/19/2018 10:25:00 AM

Dear Andrew Perreault,

We at SanAir would like to thank you for the work you recently submitted. The 63 sample(s) were received on 1/19/2018 10:25:00 AM via FedEx. The final report(s) is enclosed for the following sample(s): 01A, 01B, 01C, 01D, 01E, 02A, 02B, 02C, 02D, 02E, 03A, 03B, 03C, 03D, 03E, 04A, 04B, 04C, 04D, 04E, 05A, 05B, 06A, 06B, 07A, 07B, 08A, 08B, 08C, 09A, 10A, 11A, 12A, 13A, 14A, 15A, 16A, 17A, 17B, 17C, 18A, 18B, 19A, 19B, 20A, 20B, 20C, 21A, 21B, 22A, 22B, 22C, 23A, 24A, 25A, 25B, 26A, 26B, 27A, 27B, 28A, 28B. The following sample(s) were unusable and were not tested: 12B

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
62 samples in Good condition.
1 samples in Sample Not Received condition.

SanAir Technologies Laboratory

SanAir ID Number
18002535
FINAL REPORT
1/29/2018 2:21:10 PM

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809
Phone: 401-438-1360

Project Number: 180014
P.O. Number:
Project Name: Colt State Park - Stone Barn-Amended Report JT
Collected Date: 1/18/2018
Received Date: 1/19/2018 10:25:00 AM

Analyst: Steiner, Tara

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
01A / 18002535-001 Wall Skim Plaster / 1st Fl Break Room	White Non-Fibrous Homogeneous		100% Other	None Detected
01B / 18002535-002 Wall Skim Plaster / 2nd Fl Break Room	White Non-Fibrous Homogeneous		100% Other	None Detected
01C / 18002535-003 Wall Skim Plaster / 2nd Fl Room 2	White Non-Fibrous Heterogeneous		100% Other	None Detected
01D / 18002535-004 Wall Skim Plaster / 2nd Fl Room 4	White Non-Fibrous Heterogeneous		100% Other	None Detected
01E / 18002535-005 Wall Skim Plaster / 2nd Fl P & R Bathroom	White Non-Fibrous Heterogeneous		100% Other	None Detected
02A / 18002535-006 Wall Base Plaster / 1st Fl Break Room	Grey Non-Fibrous Heterogeneous		98% Other	2% Chrysotile
02B / 18002535-007 Wall Base Plaster / 2nd Fl Room 1	Grey Non-Fibrous Heterogeneous	2% Cellulose	96% Other	2% Chrysotile
02C / 18002535-008 Wall Base Plaster / 2nd Fl Room 2	Grey Non-Fibrous Heterogeneous		98% Other	2% Chrysotile
02D / 18002535-009 Wall Base Plaster / 2nd Fl Room 4	Grey Non-Fibrous Heterogeneous		98% Other	2% Chrysotile
02E / 18002535-010 Wall Base Plaster / 2nd Fl P & R Bathroom	Grey Non-Fibrous Heterogeneous		100% Other	None Detected

Amended Report: Additional Analysis

Certification

Analyst: Tara C. Steiner

Approved Signatory:

Analysis Date: 1/29/2018

Date: 1/29/2018

SanAir Technologies Laboratory

SanAir ID Number
18002535
FINAL REPORT
1/29/2018 2:21:10 PM

Name: Environmental Consulting & Management Inc
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Received Date: 1/19/2018 10:25:00 AM

Analyst: Steiner, Tara

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
03A / 18002535-011 Ceiling Skim Plaster / 2nd Fl Room 1	White Non-Fibrous Homogeneous		100% Other	None Detected
03B / 18002535-012 Ceiling Skim Plaster / 2nd Fl Room 4	White Non-Fibrous Homogeneous		100% Other	None Detected
03C / 18002535-013 Ceiling Skim Plaster / 2nd Fl Room 5	White Non-Fibrous Homogeneous		100% Other	None Detected
03D / 18002535-014 Ceiling Skim Plaster / 2nd Fl Room 2	White Non-Fibrous Homogeneous		100% Other	None Detected
03E / 18002535-015 Ceiling Skim Plaster / 2nd Fl P & R Bathroom	White Non-Fibrous Homogeneous		100% Other	None Detected
04A / 18002535-016 Ceiling Base Plaster / 2nd Fl Room 1	Tan Non-Fibrous Heterogeneous		98% Other	2% Chrysotile
04B / 18002535-017 Ceiling Base Plaster / 2nd Fl Room 4	Tan Non-Fibrous Heterogeneous		100% Other	< 1% Chrysotile
04C / 18002535-018 Ceiling Base Plaster / 2nd Fl Room 5	Tan Non-Fibrous Heterogeneous		98% Other	2% Chrysotile
04D / 18002535-019 Ceiling Base Plaster / 2nd Fl Room 2	Tan Non-Fibrous Heterogeneous		98% Other	2% Chrysotile
04E / 18002535-020 Ceiling Base Plaster / 2nd Fl P & R Bathroom	Tan Non-Fibrous Heterogeneous	3% Hair	97% Other	None Detected

Amended Report: Additional Analysis

Certification

Analyst: Tara C. Steiner

Approved Signatory:

Analysis Date: 1/29/2018

Date: 1/29/2018

SanAir Technologies Laboratory

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18002535
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Analyst: Steiner, Tara

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
05A / 18002535-021 Drywall / Env. Police Room 2	White Non-Fibrous Heterogeneous	10% Cellulose 2% Glass	88% Other	None Detected
05B / 18002535-022 Drywall / Env. Police Room 2	White Non-Fibrous Homogeneous	10% Cellulose 2% Glass	88% Other	None Detected
06A / 18002535-023 Subway tile Setting Bed / 1st Fl Break Room	White Non-Fibrous Homogeneous		100% Other	None Detected
06B / 18002535-024 Subway tile Setting Bed / End. Police Room 1	Various Non-Fibrous Heterogeneous		100% Other	None Detected
07A / 18002535-025 Subway Tile Grout / 1st Fl Break Room	White Non-Fibrous Heterogeneous		100% Other	None Detected
07B / 18002535-026 Subway Tile Grout / Env. Police Room 1	White Non-Fibrous Heterogeneous		100% Other	None Detected
08A / 18002535-027 Decorative Plaster Door Frame / Mantel / 1st Fl P & R Office	Grey Non-Fibrous Homogeneous		100% Other	None Detected
08B / 18002535-028 Decorative Plaster Door Frame / Mantel / 1st Fl P & R Office	Grey Non-Fibrous Homogeneous		100% Other	None Detected
08C / 18002535-029 Decorative Plaster Door Frame / Mantel / 1st Fl P & R Office	Grey Non-Fibrous Homogeneous		100% Other	None Detected
09A / 18002535-030 2'X2' Ceiling Tile / Env. Police Room 2	White Fibrous Homogeneous	40% Cellulose 20% Glass 5% Min. Wool	35% Other	None Detected

Amended Report: Additional Analysis

Certification

Analyst: Tara C. Steiner

Approved Signatory:

Analysis Date: 1/29/2018

Date: 1/29/2018

SanAir Technologies Laboratory

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Analyst: Steiner, Tara

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
10A / 18002535-031 3" Cove Base / Env. Police Room 2	Brown Non-Fibrous Homogeneous		100% Other	None Detected
11A / 18002535-032 Adhesive to 10A / Env. Police Room 2	Yellow Non-Fibrous Heterogeneous	3% Cellulose	97% Other	None Detected
12A / 18002535-033 Window Glazing To Interior Metal Windows / Vending Area	Various Non-Fibrous Heterogeneous	3% Cellulose	97% Other	None Detected
12B / 18002535-034 Window Glazing To Interior Metal Windows / Vending Area				Not Submitted
13A / 18002535-035 Carpet Glue / 1st Fl P & R Room 3	Yellow Non-Fibrous Heterogeneous		100% Other	None Detected
14A / 18002535-036 Wood Panel Adhesive / Env. Police Room 2	Yellow Non-Fibrous Heterogeneous		100% Other	None Detected
15A / 18002535-037 3" Cove Base / Basement Bathroom	Beige Non-Fibrous Homogeneous		100% Other	None Detected
16A / 18002535-038 Adhesive To 15A / Basement Bathroom	Cream Non-Fibrous Homogeneous		100% Other	None Detected
17A / 18002535-039 Plaster Over Beams / Basement	Beige Non-Fibrous Heterogeneous		100% Other	None Detected
17B / 18002535-040 Plaster Over Beams / Basement	Beige Non-Fibrous Heterogeneous		100% Other	None Detected

Amended Report: Additional Analysis

Certification

Analyst: Tara C. Steiner

Approved Signatory:

Analysis Date: 1/29/2018

Date: 1/29/2018

SanAir Technologies Laboratory

SanAir ID Number
18002535
FINAL REPORT
1/29/2018 2:21:10 PM

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809
Phone: 401-438-1360

Project Number: 180014
P.O. Number:
Project Name: Colt State Park - Stone Barn-Amended Report JT
Collected Date: 1/18/2018
Received Date: 1/19/2018 10:25:00 AM

Analyst: Steiner, Tara

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
17C / 18002535-041 Plaster Over Beams / Basement	Beige Non-Fibrous Heterogeneous		100% Other	None Detected
18A / 18002535-042 Mortar To Ceramic Brick / 1st Fl Hallway	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
18B / 18002535-043 Mortar To Ceramic Brick / 1st Fl Hallway	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
19A / 18002535-044 Window Glazing To 2nd Flooor Sash Windows / 2nd Fl Room 2	White Non-Fibrous Homogeneous		98% Other	2% Chrysotile
19B / 18002535-045 Window Glazing To 2nd Flooor Sash Windows / 2nd Fl Room 4				Not Analyzed
20A / 18002535-046 Insulation Above Ceiling / 2nd Fl Room 1	Grey Fibrous Heterogeneous	75% Min. Wool 10% Cellulose	15% Other	< 1% Chrysotile
20B / 18002535-047 Insulation Above Ceiling / 2nd Fl Room 2	Grey Fibrous Heterogeneous	75% Min. Wool 15% Cellulose	10% Other	< 1% Chrysotile
20C / 18002535-048 Insulation Above Ceiling / 2nd Fl Room 5	Grey Fibrous Heterogeneous	75% Min. Wool 15% Cellulose	10% Other	< 1% Chrysotile
21A / 18002535-049 Paper Under Hardwoods / 2nd Fl Room 5	Brown Fibrous Homogeneous	90% Cellulose	10% Other	None Detected
21B / 18002535-050 Paper Under Hardwoods / 2nd Fl Room 3	Brown Fibrous Homogeneous	90% Cellulose	10% Other	None Detected

Amended Report: Additional Analysis

Certification

Analyst: Tara C. Steiner

Approved Signatory:

Analysis Date: 1/29/2018

Date: 1/29/2018

SanAir Technologies Laboratory

SanAir ID Number
18002535
FINAL REPORT
1/29/2018 2:21:10 PM

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809
Phone: 401-438-1360

Project Number: 180014
P.O. Number:
Project Name: Colt State Park - Stone Barn-Amended Report JT
Collected Date: 1/18/2018
Received Date: 1/19/2018 10:25:00 AM

Analyst: Steiner, Tara

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
22A / 18002535-051 Decorative Skim Coat / 2nd Fl P & R Office	Off-White Non-Fibrous Homogeneous		100% Other	None Detected
22B / 18002535-052 Decorative Skim Coat / 2nd Fl P & R Office	Off-White Non-Fibrous Homogeneous		100% Other	None Detected
22C / 18002535-053 Decorative Skim Coat / 2nd Fl P & R Office	Off-White Non-Fibrous Homogeneous		100% Other	None Detected
23A / 18002535-054 Window Glazing To Shutter Windows / Exterior 1st Fl P & R Ro	Various Non-Fibrous Heterogeneous		100% Other	None Detected
24A / 18002535-055 Residual Door Caulk / Exterior Door To Env. Police	Grey Non-Fibrous Heterogeneous		85% Other	15% Chrysotile
25A / 18002535-056 Glazing To Wood Sash Windows / Exterior 1st Fl	White Non-Fibrous Heterogeneous		100% Other	None Detected
25B / 18002535-057 Glazing To Wood Sash Windows / Exterior 1st Fl	White Non-Fibrous Heterogeneous		100% Other	None Detected
26A / 18002535-058 Mortar Around Windows / Exterior Wood Sash Windows	Various Non-Fibrous Heterogeneous		100% Other	None Detected
26B / 18002535-059 Mortar Around Windows / Exterior Wood Sash Windows	Various Non-Fibrous Heterogeneous		100% Other	None Detected
27A / 18002535-060 Terracotta Block / Silo	Tan Non-Fibrous Homogeneous		100% Other	None Detected

Amended Report: Additional Analysis

Certification

Analyst: Tara C. Steiner

Approved Signatory:

Analysis Date: 1/29/2018

Date: 1/29/2018

SanAir ID Number
18002535
FINAL REPORT
1/29/2018 2:21:10 PM

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809
Phone: 401-438-1360

Analyst: Steiner, Tara

Project Number: 180014
P.O. Number:
Project Name: Colt State Park - Stone Barn-Amended Report JT
Collected Date: 1/18/2018
Received Date: 1/19/2018 10:25:00 AM

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
27B / 18002535-061 Terracotta Block / Silo	Tan Non-Fibrous Homogeneous		100% Other	None Detected
28A / 18002535-062 Mortar To Terracotta Block / Silo	Tan Non-Fibrous Heterogeneous		100% Other	None Detected
28B / 18002535-063 Mortar To Terracotta Block / Silo	Tan Non-Fibrous Heterogeneous		100% Other	None Detected

Amended Report: Additional Analysis

Certification

Analyst: Tara C. Steiner

Approved Signatory:

Analysis Date: 1/29/2018

Date: 1/29/2018

Disclaimer

The final report cannot be reproduced, except in full, without written authorization from SanAir. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample and information provided by the client. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Samples are held for a period of 60 days.

For NY state samples, method EPA 600/M4-82-020 is performed.

Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Certifications
NVLAP lab code 200870
City of Philadelphia: ALL-460
PA Department of Environmental Protection Number: 68-05397
California License Number: 2915
Colorado License Number: AL-23143
Connecticut License Number: PH-0105
Massachusetts License Number: AA000222
Maine License Number: LB-0075
New York ELAP lab ID: 11983
Rhode Island License Number: AAL-126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia 3333000323
Washington State License Number: C989
West Virginia License Number: LT000566
Vermont License: AL166318

Revision Date: 11/30/2017

SanAir Technologies Laboratory
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Powhatan, VA 23139
804.897.1177 / 888.895.1177
Fax 804.897.0070
sanair.com

Asbestos Chain of Custody

Form 140, Rev 1, 1/20/2017

SanAir ID Number: 18002535

Company: ECM Inc.	Project #: 180014	Collect by: Andrew Perreault
Address: 181 Amaral Street	Project Name: Colt State Park - Stone Barn	Phone #: 401-304-6615
City, St., Zip: Riverside, RI 02915	Date Collected: 1/18/2018	Fax #:
State of Collection: RI Account#: 2667	P.O. Number:	Email: aperreault@ecmne.com

Bulk

ABB	PLM EPA 600/R-93/116	■
	Positive Stop ■	
ABEPA	PLM EPA 400 Point Count	☐
ABB1K	PLM EPA 1000 Point Count	☐
ABBEN	PLM EPA NOB**	☐
ABBCH	TEM Chatfield**	☐
ABBTM	TEM EPA NOB**	☐
ABQ	PLM Qualitative	☐

** Available on 24-hr. to 5-day TAT

Water

ABHE	EPA 100.2	☐

Air

ABA	PCM NIOSH 7400	☐
ABA-2	OSHA w/ TWA*	☐
ABTEM	TEM AHERA	☐
ABATN	TEM NIOSH 7402	☐
ABT2	TEM Level II	☐
Other:		☐

New York ELAP

PLM NY	PLM EPA 600/M4-82-020	☐
ABEPA2	NY ELAP 198.1	☐
ABENY	NY ELAP 198.6 PLM NOB	☐
ABBNY	NY ELAP 198.4 TEM NOB	☐

Soil

ABSE	PLM EPA 600/R-93/116 (Qual.)	☐

Vermiculite & Soil

ABSP	PLM CARB 435 (LOD <1%)	☐
ABSP1	PLM CARB 435 (LOD 0.25%)	☐
ABSP2	PLM CARB 435 (LOD 0.1%)	☐

Dust

ABWA	TEM Wipe ASTM D-6480	☐
ABDMV	TEM Microvac ASTM D-5755	☐

Matrix	Other	
		☐

Turn Around Times	3 HR (4 HR TEM) ☐	6 HR (8HR TEM) ☐	12 HR ☐	24 HR ☐
	☐ 2 Days	☐ 3 Days	■ 4 Days	☐ 5 Days

Special Instructions

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
01A	Wall Skim Plaster / 1st FL Break Room					
01B	Wall Skim Plaster / 2nd FL Room 1					
01C	Wall Skim Plaster / 2nd FL Room 2					
01D	Wall Skim Plaster / 2nd FL Room 4					
01E	Wall Skim Plaster / 2nd FL P&R Bathroom					
02A	Wall Base Plaster / 1st FL Break Room					
02B	Wall Base Plaster / 2nd FL Room 1					
02C	Wall Base Plaster / 2nd FL Room 2					
02D	Wall Base Plaster / 2nd FL Room 4					
02E	Wall Base Plaster / 2nd FL P&R Bathroom					
03A	Ceiling Skim Plaster / 2nd FL Room 1					
03B	Ceiling Skim Plaster / 2nd FL Room 4					

Relinquished by	Date	Time	Received by	Date	Time
[signature]	1/18/18	1600	JB	1/19/18	10:25

If no technician is provided, then the primary contact for your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm EST Friday will begin at 8 am Monday morning. Weekend or holiday work must be scheduled ahead of time and is charged for rush turnaround time. SanAir covers Standard Overnight FedEx shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

Page 1 of 3

18002535

Form 140, Revision 1, 1/20/2017

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
03C	Ceiling Skim Plaster / 2nd FL Room 5					
03D	Ceiling Skim Plaster / 2nd FL Room 2					
03E	Ceiling Skim Plaster / 2nd FL P&R Bathroom					
04A	Ceiling Base Plaster / 2nd FL Room 1					
04B	Ceiling Base Plaster / 2nd FL Room 4					
04C	Ceiling Base Plaster / 2nd FL Room 5					
04D	Ceiling Base Plaster / 2nd FL Room 2					
04E	Ceiling Base Plaster / 2nd FL P&R Bathroom					
05A	Drywall / Env. Police Room 2					
05B	Drywall / Env. Police Room 2					
06A	White Subway Tile Setting Bed / 1st FL Break Room					
06B	White Subway Tile Setting Bed / Env. Police Room 1					
07A	White Subway Tile Grout / 1st FL Break Room					
07B	White Subway Tile Grout / Env. Police Room 1					
08A	Decorative Plaster Door Frame / Mantel /1st FL P&R Office 1					
08B	Decorative Plaster Door Frame / Mantel /1st FL P&R Office 1					
08C	Decorative Plaster Door Frame / Mantel /1st FL P&R Office 1					
09A	2'x2' Fissure Ceiling Tile / Env. Police Room 2					
10A	Brown 3" Cove Base / Env. Police Room 2					
11A	Adhesive to 10A / Env. Police Room 2					
12A	Window Glazing to Interior Metal Windows / Vending Area					
12B	Window Glazing to Interior Metal Windows / Vending Area					
13A	Yellow Carpet Glue / 1st FL P&R Room 3					
14A	Wood Panel Adhesive / Env. Police Room 2					
15A	Beige 3" Cove Base / Basement Bathroom					
16A	Adhesive to 15A / Basement Bathroom					
17A	Plaster Over Beams / Basement					
17B	Plaster Over Beams / Basement					
17C	Plaster Over Beams / Basement					
18A	Mortar to Ceramic Brick / 1st FL Hallway					
18B	Mortar to Ceramic Brick / 1st FL Hallway					

Special Instructions	

Relinquished by	Date	Time	Received by	Date	Time
[signature]	1/18/18	1600	JG	1/19/18	10:25

If no technician is provided, then the primary contact for your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm EST Friday will begin at 8 am Monday morning. Weekend or holiday work must be scheduled ahead of time and is charged for rush turnaround time. SanAir covers Standard Overnight FedEx shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

Page 2 of 3

18002535

Form 140, Revision 1, 1/20/2017

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
19A	Window Glazing to 2nd Floor Sash Windows / 2nd FL Room 2					
19B	Window Glazing to 2nd Floor Sash Windows / 2nd FL Room 4					
20A	Insulation above Ceiling / 2nd FL Room 1					
20B	Insulation above Ceiling / 2nd FL Room 2					
20C	Insulation above Ceiling / 2nd FL Room 5					
21A	Paper under Hardwoods / 2nd FL Room 5					
21B	Paper under Hardwoods / 2nd FL Room 3					
22A	Decorative Skim Coat / 2nd FL P&R Office					
22B	Decorative Skim Coat / 2nd FL P&R Office					
22C	Decorative Skim Coat / 2nd FL P&R Office					
23A	Window Glazing to Shutter Windows / Exterior 1st FL P&R Room 1					
24A	Residual Door Caulk / Exterior Door to Env. Police					
25A	Glazing to Wood Sash Windows / Exterior 1st FL					
25B	Glazing to Wood Sash Windows / Exterior 1st FL					
26A	Mortar around Windows / Exterior Wood Sash Windows					
26B	Mortar around Windows / Exterior Wood Sash Windows					
27A	Terracotta Block / Silo					
27B	Terracotta Block / Silo					
28A	Mortar to Terracotta Block / Silo					
28B	Mortar to Terracotta Block / Silo					

Special Instructions	

Relinquished by	Date	Time	Received by	Date	Time
[signature]	1/18/17	1600	JG	1/19/18	10:25

If no technician is provided, then the primary contact for your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm EST Friday will begin at 8 am Monday morning. Weekend or holiday work must be scheduled ahead of time and is charged for rush turnaround time. SanAir covers Standard Overnight FedEx shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

Page 3 of 3

Appendix B:
Lead Paint Laboratory Reports

SanAir Technologies Laboratory

Analysis Report

prepared for

Environmental Consulting & Management Inc

Report Date: 1/26/2018
Project Name: Colt State Park - Stone Barn
Project #: 180014
SanAir ID#: 18002546

NVLAP LAB CODE 200870-0

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL LEAD ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 LAB # 162952

Virginia SBE Certification # 652931

Texas Licensed Mold Analysis Laboratory License # LAB0166

SanAir Technologies Laboratory

804.897.1177 www.sanair.com

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

Environmental Consulting & Management Inc
50 Kickemuit Ave
Bristol, RI 02809

January 26, 2018

SanAir ID # 18002546
Project Name: Colt State Park - Stone Barn
Project Number: 180014

Dear Andrew Perreault,

We at SanAir would like to thank you for the work you recently submitted. The 14 sample(s) were received on Friday, January 19, 2018 via FedEx. The final report(s) is enclosed for the following sample(s): PB01A, PB02A, PB03A, PB04A, PB05A, PB06A, PB07A, PB08A, PB09A, PB10A, PB11A, PB12A, PB13A, PB14A.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Abisola Kasali
Metals Laboratory Director
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

sample conditions:
14 sample(s) in Good condition

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

18002546

FINAL REPORT

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809

Project Number: 180014
P.O. Number:
Project Name: Colt State Park - Stone Barn

Collected Date: 1/18/2018
Received Date: 1/19/2018 10:25:00 AM
Report Date: 1/26/2018 9:23:37 AM
Analyst: Laverty, Jaynie

Lead Paint Analysis

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-001	PB01A / White Ceiling Paint / Plaster / 2nd Fl Room 1	207	0.1008	99.2	2056.6 µg/g (ppm)	0.2057 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-002	PB02A / White Wall Paint / Plaster / 2nd Fl Room 1	230	0.1036	96.5	2220.3 µg/g (ppm)	0.222 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-003	PB03A / Gray Trim / Wood / Env. Police Stairwell	23916	0.1077	92.9	222061.6 µg/g (ppm)	22.2062 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-004	PB04A / Gray Door / Wood / 1st Fl Hallway	49	0.1001	99.9	484.7 µg/g (ppm)	0.0485 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-005	PB05A / Gray Door Frame / Wood / 1st Fl Hallway	2945	0.1058	94.5	27839.8 µg/g (ppm)	2.784 % By Weight

Certification

SanAir Technologies Laboratory, Inc. participates in the certification for environmental lead analysis programs as administered by AIHA-ELLAP (Lab ID 162952) and the State of New York-ELAP (Lab Id 11983), and has met the EPA's NLLAP program standards.

Signature: Date: 1/24/2018

Reviewed: Date: 1/24/2018

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

18002546

FINAL REPORT

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809

Project Number: 180014
P.O. Number:
Project Name: Colt State Park - Stone Barn

Collected Date: 1/18/2018
Received Date: 1/19/2018 10:25:00 AM
Report Date: 1/26/2018 9:23:37 AM
Analyst: Laverty, Jaynie

Lead Paint Analysis

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-006	PB06A / Gray Wood Floor / Wood / Env. Police Stairwell	158	0.0875	114.3	1805 µg/g (ppm)	0.1805 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-007	PB07A / White Window Sash / Wood / 1st Fl Env. Police Room 1	21298	0.1093	91.5	194861.8 µg/g (ppm)	19.4862 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-008	PB08A / White Window Frame / Wood / 1st Fl Env. Police Room 1	16246	0.1015	98.5	160058.8 µg/g (ppm)	16.0059 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-009	PB09A / White Interior Window Frame / Meatl / 1st Fl Vending Area	113	0.1031	97	1093.2 µg/g (ppm)	0.1093 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-010	PB10A / White Wall Paint / Wood / 1st Fl Hallway	28	0.1059	94.4	265.5 µg/g (ppm)	0.0265 % By Weight

Certification

SanAir Technologies Laboratory, Inc. participates in the certification for environmental lead analysis programs as administered by AIHA-ELLAP (Lab ID 162952) and the State of New York-ELAP (Lab Id 11983), and has met the EPA's NLLAP program standards.

Signature: Date: 1/24/2018

Reviewed: Date: 1/24/2018

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

18002546

FINAL REPORT

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809

Project Number: 180014
P.O. Number:
Project Name: Colt State Park - Stone Barn

Collected Date: 1/18/2018
Received Date: 1/19/2018 10:25:00 AM
Report Date: 1/26/2018 9:23:37 AM
Analyst: Laverty, Jaynie

Lead Paint Analysis

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-011	PB11A / Gray Window Sash / Wood / 2nd Fl Room 2	9471	0.1004	99.6	94331.8 µg/g (ppm)	9.4332 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-012	PB12A / Gray Window Frame / Wood / 2nd Fl Room 2	891	0.1017	98.3	8763.8 µg/g (ppm)	0.8764 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-013	PB13A / Painted Brick / Decorative Skim Coat / 2nd Fl P & R Office	10	0.1057	94.6	94.8 µg/g (ppm)	0.0095 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18002546-014	PB14A / White Exterior Window Frames / Wood / Exterior 1st Fl	18373	0.104	96.2	176661.5 µg/g (ppm)	17.6662 % By Weight

Certification

SanAir Technologies Laboratory, Inc. participates in the certification for environmental lead analysis programs as administered by AIHA-ELLAP (Lab ID 162952) and the State of New York-ELAP (Lab Id 11983), and has met the EPA's NLLAP program standards.

Signature: Date: 1/24/2018

Reviewed: Date: 1/24/2018

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

18002546

FINAL REPORT

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809

Project Number: 180014
P.O. Number:
Project Name: Colt State Park - Stone Barn

Collected Date: 1/18/2018
Received Date: 1/19/2018 10:25:00 AM
Report Date: 1/26/2018 9:23:37 AM
Kasali, Abisola O.

ORGANISM DESCRIPTIONS

The descriptions of the organisms presented are derived from various reference materials. The laboratory report is based on the data derived from the samples submitted and no interpretation of the data, as to potential, or actual, health effects resulting from exposure to the numbers of organisms found, can be made by laboratory personnel. Any interpretation of the potential health effects of the presence of this organism must be made by qualified professional personnel with first hand knowledge of the sample site, and the problems associated with that site.

Disclaimer

Final reports cannot be reproduced, except in full, without written authorization from SanAir Technologies Laboratory, Inc. SanAir is not responsible for sample collection or interpretation made by others. This report does not constitute endorsement by AIHA/NVLAP and/or any other U.S. governmental Agencies; and may not be certified by every local, state or federal regulatory agencies. SanAir Technologies Laboratory, Inc only assures the precision and accuracy of the data it generates and assumes no responsibility for errors or biasing that occur during collection prior to SanAir's receipt of the the sample. SanAir's Method Detection Limits (MDL) and Reporting Limits (RL) have been derived using wipe materials meeting ASTM-E1792. The MDL and RL may not be relevant or applicable for other forms of wipe materials. All quality control results are acceptable unless otherwise noted. All quality control results are acceptable unless otherwise noted. Results are not corrected for blanks.

Lead Exposure Limits

Air

1.5 µg/m^3	EPA National Ambient Air Quality Standard (Quality Time – Weight Average)
30 µg/m^3	OSHA Action Level (8-hour time weighted average)
50 µg/m^3	OSHA Permissible Exposure Limit (General Industry)
50 µg/m^3	OSHA Permissible Exposure Limit (Construction)

Dust

Non-Grant Funded Projects (Standard Clearance Applies):

40ug/ft^2	HUD Clearance Level for Floors
250ug/ft^2	HUD Clearance Level for Window Sills
400ug/ft^2	HUD Clearance Level for Window Troughs

Grant Funded Clearance (OLHCHH; LBPHC; LHRD Grantees):

10ug/ft^2	HUD Clearance Level for Floors
100ug/ft^2	HUD Clearance Level for Window Sills and Window Troughs
40ug/ft^2	HUD Clearance Level for Porch Floors

Water

15 ppb (µg/liter)	EPA Maximum Containment Level

Paint

0.5% by weigh	HUD definition of lead based paint
1.0 mg/cm^2	
5000 ppm	

Soil

400 ppm	HUD-Play areas and high-contact areas for children

TCLP EPA Limits

5.0 mg/L	Silver (Ag)	100 mg/L	Barium (Ba)	5.0 mg/L	Chromium (Cr)	5.0 mg/L	Lead (Pb)
5.0 mg/L	Arsenic (As)	1.0 mg/L	Cadmium (Cd)	0.2 mg/L	Mercury (Hg)	1.0 mg/L	Selenium (Se)

Revision Date 9/19/2017

SanAir Technologies Laboratory
1551 Oakbridge Dr STE B
Powhatan, VA 23139
804.897.1177 / 888.895.1177
Fax 804.897.0070
sanair.com

Metals & Lead Chain of Custody

Form 70, Revision 9, 01/19/2017

SanAir ID Number: 18002546

Company: ECM Inc.	Project #: 180014	Phone #: 401-304-6615
Address: 181 Amaral Street	Project Name: Colt State Park - Stone Barn	Phone #:
City, St., Zip: Riverside, RI 02915	Date Collected: 1/18/18	Fax #:
Samples Collected By: Andrew Perreault	P.O. Number:	Email: aperreault@ecmne.com
Account #: 2667	U.S. State Collected in: RI	Email:

Matrix Types

Metals Analysis Types

☐ Air (ug/m^3)	Total Concentration of Lead ☐	☐ ICP-total concentration of metals (please list metals):
☐ Wipe (ug/ft^2)	Total Concentration of RCRA 8 Metals ☐	
■ Paint ☐Soil ☐Bulk (ug/g or ppm)	TCLP for Lead ☐	
☐ Other:	TCLP for RCRA 8 Metals ☐	

Turn Around Time				
	Same Day ☐	1 Day ☐	2 days ☐	3 Days ☐
	■ Standard (5 day)	☐ Full TCLP (10d)		

Sample #	Collection Date & Time	Sample Identification/Location	Flow Rate	Start Time	Stop Time	Volume (L) Area (Sq ft)
PB01A	1/18/18	White Ceiling Paint / Plaster / 2nd FL Room 1				
PB02A	1/18/18	White Wall Paint / Plaster / 2nd FL Room 1				
PB03A	1/18/18	Gray Trim / Wood / Env. Police Stairwell				
PB04A	1/18/18	Gray Door / Wood / 1st FL Hallway				
PB05A	1/18/18	Gray Door Frame / Wood / 1st FL Hallway				
PB06A	1/18/18	Gray Wood Floor / Wood/ Env. Police Stairwell				
PB07A	1/18/18	White Window Sash / Wood / 1st FL Env. Police Room 1				
PB08A	1/18/18	White Window Frame / Wood / 1st FL Env. Police Room 1				
PB09A	1/18/18	White Interior Window Frame / Metal / 1st FL Vending Area				
PB10A	1/18/18	White Wall Paint / Wood / 1st FL Hallway				
PB11A	1/18/18	Gray Window Sash / Wood / 2nd FL Room 2				
PB12A	1/18/18	Gray Window Frame / Wood / 2nd FL Room 2				
PB13A	1/18/18	Painted Brick / Decorative Skim Coat / 2nd FL P&R Office				
PB14A	1/18/18	White Exterior Window Frames / Wood / Exterior 1st FL				

Special Instructions

Relinquished by	Date	Time	Received by	Date	Time
[signature]	1/18/18	1600	JG	1/19/18	10:25

If no technician is provided, then the primary contact of your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm will begin at 8 am the next business morning. Weekend or holiday work must be scheduled ahead of time and is charged at 150% of the Rush TAT rate. There is a minimum charge of $100 for weekend work. A courier charge will be applied for same day and one-day turnaround times for offsite work. SanAir covers Standard Overnight FedEx shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

Page 1 of 1

SECTION 003102

HAZARDOUS MATERIAL INSPECTION REPORT

PART 1 GENERAL

1.01 HAZARDOUS MATERIAL INSPECTION REPORT

A. The Hazardous Material Inspection Report - Stone Barn Work Shop, Storage and Out Building at Colt State Park, as prepared by Environmental Consulting and Management dated May 7, 2018 has been prepared by the Owner's design consultant and applies to the existing building areas referenced specifically therein. This report identifies areas of observed and tested asbestos and lead paint. The report was limited to areas that were able to be observed without any significant destructive investigation. A copy of the report can be found following this section.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 003102

May 7, 2018

Blount Bennett Architects
Attn: Mr. James Marshall
865 Waterman Avenue, Unit B
East Providence, RI 02914

RE: ECM Project # 180014B – Stone Barn Work Shop, Storage and Out Building - Colt State Park, Bristol, RI – Hazardous Material Inspection Report.

Dear Mr. Marshall:

Enclosed are the analytical results, observations, and recommendations associated with the pre-renovation asbestos, lead paint, and universal waste inspection performed by Environmental Consulting & Management Inc. (ECM) of the Stone Barn at Colt State Park in Bristol, Rhode Island.

Methodology and Scope

On April 23, 2018 a pre-renovation asbestos, lead paint, and universal waste inspection was conducted by Mr. Andrew Perreault (AAC-0914) of ECM. During the course of the inspection ECM collected samples of accessible suspect asbestos containing building materials (ACBM) and lead containing paints that may be impacted during the renovation of the attic, work shop, work shop offices and closets, picnic table storage storage, paint room, cellar and out building of the stone barn at Colt State Park in Bristol, RI. The renovations will consist of replacement and removal of all windows and doors, repairing damaged walls and ceilings, and upgrading the lighting. The inspection was conducted according to the Environmental Protection Agency (EPA) Asbestos Hazard Emergency Response Act (AHERA) asbestos bulk sampling protocols. Interior and exterior materials anticipated to be impacted by the up coming renovations were surveyed as part of this inspection. No roofing materials were surveyed as part of this inspection. The building was occupied at the time of the inspection.

A pre-renovation asbestos, lead paint and universal waste survey of the Parks and Recreations Office and Environmental Police areas of the building was previously conducted on January 18, 2018 by ECM Inc. of Riverside, RI. Asbestos containing base coat plaster walls and ceilings, window glazing to the rectangular wooden sash windows on the second floor and residual door caulking were identified in this report. All painted surfaces tested as part of the survey were identified as lead containing.

Asbestos

The tables found on the following page(s) indicates sampled materials, location of materials, notes about the materials, the quantity of asbestos containing materials, and the respective testing results. All samples were analyzed utilizing Polarized Light Microscopy as suggested by EPA method 600/R-93/116. Please refer to **Appendix A** for the laboratory analytical results.

Table 1: Stone Barn at Colt State Park, Bristol, RI WO# 18017109

Sample #s	Material Description	Material Location	Results	Quantity
01A-C	Parge Coat on Field Stone Wall	Attic Walls	None Detected	NA
02A-E	Skim Coat Wall Plaster	Exterior Walls in Hallway, Work Shop, Silo Closet, Tool Closet, Picnic Table Storage, Paint Room	None Detected	NA
03A-E	Base Coat Wall Plaster	Exterior Walls in Hallway, Work Shop, Silo Closet, Tool Closet, Picnic Table Storage, Paint Room	None Detected	NA
04A-E	Skim Coat Ceiling Plaster	Hallway, Work Shop, Silo Closet, Tool Closet, Storage Closet, Work Shop Office 1 & 2, Picnic Table Storage	None Detected	NA
05A-E	Base Coat Ceiling Plaster	Hallway, Work Shop, Silo Closet, Tool Closet, Storage Closet, Work Shop Office 1 & 2, Picnic Ta ble Storage	None Detected	NA
06A	Grout to Subway Tile	Exterior Walls of Hallway, Work Shop, Silo Closet, Tool Closet, Picnic Table Storage, Paint Room	None Detected	NA
07A	Setting Bed to Subway Tile	Exterior Walls of Hallway, Work Shop, Silo Closet, Tool Closet, Picnic Table Storage, Paint Room	None Detected	NA
08A-B	Pressboard Ceiling Panel	Picnic Table Storage, Paint Room	None Detected	NA
09A	**Glazing to 2 Pane Windows**	**Silo Exterior**	**2% Chrysotile**	**4 Windows 10 LF Each Total 40 LF**
10A	Glazing to 4 Pane, Round Top Windows	Out Building Exterior	<1% Chrystoile	NA

Sample #s	Material Description	Material Location	Results	Quantity
11A	**Caulk to 8 Pane Round Top Windows**	**Exterior of Stone Barn Exterior of Out Building**	**8% Chrysotile**	**22 Windows 12 LF Each Total 265 LF**
12A-B	Glazing to 9 Pane Windows	Exterior of Out Building	None Detected	NA
13A	Glazing to 8 Pane Round Top Windows	Exterior of Stone Barn Exterior of Out Building	<1% Chrysotile	NA
14A	Glazing to Window in Door	Exterior of Out Building	None Detected	NA
15A-C	Parge Coat	Out Building Interior	None Detected	NA
16A	Wall Covering	Out Building Storage	None Detected	NA
--	**Window Glazing to 2nd Floor Wood Sash Windows**	**Windows in Attic**	**Assumed Based on Previous Testing**	**5 Windows 20 LF Each Total 100 LF**

SF – Square Foot
LF – Linear Foot

Asbestos: Recommendations & Summary

Asbestos containing window glazing to the 2 pane windows on the silos and caulk around the 8 pane round top windows were identified during the course of the inspection. The window glazing to the 2nd floor wood wash windows in the attic are assumed to be asbestos containing based upon the testing performed by ECM on January 18, 2018.

The glazing to the four pane round top windows on the out building and the 8 pane round top windows were found to contain <1% asbestos. Materials that are found to contain less than 1% asbestos can be considered a negative material by the Rhode Island Department of Health (RIDOH) and EPA regulations. However, theses materials are still regulated by the Occupational Health and Safety Administration (OSHA). OSHA recommends that personal protective equipment be worn when dealing with asbestos containing materials.

The base coat wall plaster and base coat ceiling plaster collected from the hallway, work shop, picnic table storage, and paint room all tested negative for asbestos. Preivous testing conducted by ECM on January 18, 2018 of the Parks and Recreation Office and DEM Offices had asbestos containing base coat wall plaster and base coat ceiling plaster. Laboratory analysis indicated that the base coat ceiling plaster and base coat wall plaster collected during this inspection was a slightly different color than the asbestos containing plasters collected during the survey on January 18, 2018.

If the amount of the identified asbestos containing materials to be remove greater than 25 square feet/10 linear feet, an asbestos abatement plan will need to be created and submitted to the RIDOH. Removal of the asbestos containing material will need to be conducted by a RI licensed asbestos abatement contractor.

After the abatement plan is submitted to the RIDOH, the approval process takes approximately 2 to 3 weeks. Once the abatement plan is approved, a letter will be sent out to the building owner with an

identification number designated to the project. The approval number is then utilized by the abatement contractor to submit the 10-day notification to the RIDOH, where activities cannot begin until 10 calendar days after the notification is submitted.

If less than 25 square feet/10 linear feet of asbestos containing material is to be impacted, an asbestos plan is not needed and removal can be conducted as a spot abatement by a RI licensed asbestos abatement contractor.

Any suspect asbestos containing material not listed within this report must be assumed to contain asbestos and disposed of accordingly unless future sampling determines otherwise.

Lead Report

Lead paint chip samples were collected from the renovation area to establish the lead concentration. The samples were analyzed utilizing EPA test method sw846/3050B/7000B. The results can be found in the following chart. Please refer to **Appendix B** for the laboratory results.

Table 2: Stone Barn at Colt State Park – Lead Paint Chip Sample Results #18017111

Sample ID	Material	Location	Lead Results (ppm)	Lead Results (%)
PB01A	**White / Wood Wall**	**Picnic Table Storage, Hallway, Work Shop, Supply**	**1309.8**	**0.131**
PB02A	**White / Plaster Ceiling**	**Hallway, Work Shop, Silo Closet, Supply Closet, Picnic Supply Closet**	**11278.3**	**1.1278**
PB03A	**Gray / Wood Trim**	**Hallway, Work Shop, Silo Closet, Supply Closet, Picnic Supply Closet**	**222477**	**22.2477**
PB04A	**Gray / Wood Door**	**Hallway, Work Shop, Silo Closet, Supply Closet, Picnic Supply Closet**	**47888.4**	**4.7888**
PB05A	**Brown / Wood Door**	**Exterior Doors**	**211988.9**	**21.1989**
PB06A	**White / Wood Windows**	**Interior of Windows**	**99106.5**	**9.9106**
PB07A	**White / Wood Windows**	**Exterior of Windows**	**143966.9**	**14.3967**
PB08A	**Gray / Parge Coat**	**Interior of Out Building**	**225530.2**	**22.553**
PB09A	**White / Wood Ceiling**	**Interior of Out Building**	**195805.6**	**19.5806**
PB10A	White / Concrete Ceiling	Cellar	<97.2	0.0097

Lead Conclusion:

The paint chip samples collected within the renovation area, with the exception of the white paint on concrete ceilings in the cellar, ranged from a low to elevated levels of lead content. ECM recommends utilizing OSHA standards when impacting the lead based paint.

OSHA's lead in construction standard applies to all construction, modification, or repair where workers may be exposed to lead. OSHA's Lead Standard for the Construction Industry, Title 29 Code of Federal Regulations 1926.62, establishes maximum limits of exposure to lead for all workers. The permissible exposure limit (PEL) sets the maximum worker exposure to lead at 50 micrograms per cubic meter ($\mu g/m^3$) of air averaged over an eight-hour period. The action level (AL), regardless of respirator use, is an airborne concentration of 30 $\mu g/m^3$ averaged over an eight-hour period. The AL is the level at which an employer must begin specific compliance activities.

Until an exposure assessment is performed, and documentation showing that workers are not exposed above the PEL, OSHA requires that personal protective equipment (PPE) must be utilized.

Hazardous Materials:

In addition to the asbestos and lead sampling, ECM inventoried materials existing at the site that may require special handling/disposal in the event that the materials need to be discarded. The chart below indicates observed materials and their respective potential hazards.

Table 3: Observed HAZMAT Chart

Material	Hazard	Quantity
4' Fluorescent Bar Bulb	Mercury	40 Loose/In Fixtures 1 Box
8' Fluorescent Bar Bulb	Mercury	6 Loose/In Fixtures 4 Boxes
Fluorescent Light Ballasts	PCBs/DEHPs	20
Mercury Thermostat	Mercury	1
Automotive Batteries	Lead/Acids	6
CRT Monitors	Heavy Metals	3
Window Unit Air Conditioner	Refrigerants	1
Mini-Fridge	Refrigerants	1
Oils/Grease	Oils	40 Loose Containers 3 55 Gallon Drums Many Boxes in Supply Closet
Cleaners/Degreaser	Various	32 Loose Containers Many Boxes in Supply Closet
Hydraulic Oils/Fluids	Oils	4 33 Gallon Drums
Antifreeze	Metals/Ethylene Glycol	11

Material	Hazard	Quantity
Paints/Primers	Various	113 1 Gallon Cans 10 5 Gallon Buckets
Spray Paint	Various	125 Cans 10 Boxes
Fire Extigunisers	Contents under Pressure	20
Compressed Gas Cylinders	Contents under Pressure	3
Exit Signs	Possible Radioactive	2

Hazardous Materials Conclusion:

It is the contractor's responsibility to ensure that waste materials are disposed of in accordance with the Resource Conservation and Recovery Act (RCRA). Contractors should refer to 40 CFR Part 261-263 for specific regulations pertaining to hazardous waste classification, generation and transportation.

Limitations:

This inspection was limited by visibility, accessibility, and scope of work. Components that could affect building operation and endanger the safety of the inspector such as active mechanical or electrical systems were not scrutinized during this inspection unless otherwise noted.

Sampling was performed for a specific scope of work. Should the planned scope of work change, additional sampling may be required

This report was prepared under the request of Blount Bennett Architects. This report should not be represented, reproduced, or disseminated without the written approval of Environmental Consulting and Management or Blout Bennett Architects. No warranties other than those expressed in the contract for this project are expressed or implied.

A hard copy of this report can be provided for your records via mail upon request. If you have any further questions feel free to contact myself at 401-304-6615.

Sincerely,
Environmental Consulting & Management, Inc.

Andrew Perreault
Project Manager
RI Inspector License: AAC-0914

Appendix A:
Asbestos Laboratory Reports

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Environmental Consulting & Management Inc

Report Date: 5/2/2018

Project Name: Colt State Park - Stone Barn

Project #: 180014B

SanAir ID#: 18017109

NVLAP TESTING

NVLAP LAB CODE 200870-0

1551 Oakbridge Dr. Suite B | Powhatan, Virginia 23139-8061
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | IAQ@SanAir.com | SanAir.com

SanAir ID Number
18017109
FINAL REPORT
5/2/2018 6:51:31 PM

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809
Phone: 401-438-1360

Project Number: 180014B
P.O. Number:
Project Name: Colt State Park - Stone Barn
Collected Date: 4/25/2018
Received Date: 4/26/2018 9:55:00 AM

Dear Andrew Perreault,

We at SanAir would like to thank you for the work you recently submitted. The 38 sample(s) were received on Thursday, April 26, 2018 via FedEx. The final report(s) is enclosed for the following sample(s): 01A, 01B, 01C, 02A, 02B, 02C, 02D, 02E, 03A, 03B, 03C, 03D, 03E, 04A, 04B, 04C, 04D, 04E, 05A, 05B, 05C, 05D, 05E, 06A, 07A, 08A, 08B, 09A, 10A, 11A, 12A, 12B, 13A, 14A, 15A, 15B, 15C, 16A.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 38 samples in Good condition.

SanAir Technologies Laboratory

SanAir ID Number
18017109
FINAL REPORT
5/2/2018 6:51:31 PM

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809
Phone: 401-438-1360

Project Number: 180014B
P.O. Number:
Project Name: Colt State Park - Stone Barn
Collected Date: 4/25/2018
Received Date: 4/26/2018 9:55:00 AM

Analyst: Steiner, Tara | Pisula, Nicholas | Toth, Elizabeth

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
01A / 18017109-001 Parge Coat/ Field Stone Walls In Attic	Grey Non-Fibrous Homogeneous		100% Other	None Detected
01B / 18017109-002 Parge Coat/ Field Stone Walls In Attic	Grey Non-Fibrous Homogeneous		100% Other	None Detected
01C / 18017109-003 Parge Coat/ Field Stone Walls In Attic	Grey Non-Fibrous Homogeneous		100% Other	None Detected
02A / 18017109-004 Skim Coat Plaster Wall/ Silo Closet	White Non-Fibrous Homogeneous		100% Other	None Detected
02B / 18017109-005 Skim Coat Plaster Wall/ Picnic Table Storage	White Non-Fibrous Homogeneous		100% Other	None Detected
02C / 18017109-006 Skim Coat Plaster Wall/ Paint Room	White Non-Fibrous Homogeneous		100% Other	None Detected
02D / 18017109-007 Skim Coat Plaster Wall/ Workshop	White Non-Fibrous Homogeneous		100% Other	None Detected
02E / 18017109-008 Skim Coat Plaster Wall/ Picnic Storage	White Non-Fibrous Homogeneous		100% Other	None Detected
03A / 18017109-009 Base Coat Plaster Wall/ Silo Closet	Grey Non-Fibrous Homogeneous		100% Other	None Detected
03B / 18017109-010 Base Coat Plaster Wall/ Picnic Table Storage	Grey Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: Tara C. Steiner

Approved Signatory: Sandra Sobrino

Analysis Date: 5/2/2018

Date: 5/2/2018

SanAir Technologies Laboratory

SanAir ID Number
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Analyst: Steiner, Tara | Pisula, Nicholas | Toth, Elizabeth

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
03C / 18017109-011 Base Coat Plaster Wall/ Paint Room	Grey Non-Fibrous Homogeneous		100% Other	None Detected
03D / 18017109-012 Base Coat Plaster Wall/ Workshop	Grey Non-Fibrous Homogeneous		100% Other	None Detected
03E / 18017109-013 Base Coat Plaster Wall/ Picnic Storage	Grey Non-Fibrous Homogeneous		100% Other	None Detected
04A / 18017109-014 Skim Coat Plaster Ceiling/ Silo Closet	White Non-Fibrous Homogeneous		100% Other	None Detected
04B / 18017109-015 Skim Coat Plaster Ceiling/ Picnic Table Storage	White Non-Fibrous Homogeneous		100% Other	None Detected
04C / 18017109-016 Skim Coat Plaster Ceiling/ Picnic Table Storage	White Non-Fibrous Homogeneous		100% Other	None Detected
04D / 18017109-017 Skim Coat Plaster Ceiling/ Workshop	White Non-Fibrous Homogeneous		100% Other	None Detected
04E / 18017109-018 Skim Coat Plaster Ceiling/ Hallway	White Non-Fibrous Homogeneous		100% Other	None Detected
05A / 18017109-019 Base Coat Plaster Ceiling/ Silo Closet	Grey Non-Fibrous Homogeneous		100% Other	None Detected
05B / 18017109-020 Base Coat Plaster Ceiling/ Picnic Table Storage	Grey Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: Tara C. Steiner

Approved Signatory: Sandra Sobrino

Analysis Date: 5/2/2018

Date: 5/2/2018

SanAir Technologies Laboratory

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Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
05C / 18017109-021 Base Coat Plaster Ceiling/ Picnic Table Storage	Grey Non-Fibrous Homogeneous		100% Other	None Detected
05D / 18017109-022 Base Coat Plaster Ceiling/ Workshop	Grey Non-Fibrous Homogeneous		100% Other	None Detected
05E / 18017109-023 Base Coat Plaster Ceiling/ Hallway	Grey Non-Fibrous Homogeneous		100% Other	None Detected
06A / 18017109-024 Grout To Subway Tile/ Picnic Table Storage	Grey Non-Fibrous Homogeneous		100% Other	None Detected
07A / 18017109-025 Setting Bed To Subway Tile/ Picnic Table Storage	Grey Non-Fibrous Homogeneous		100% Other	None Detected
08A / 18017109-026 Pressboard Ceiling/ Paint Room	Brown Fibrous Homogeneous	95% Cellulose	5% Other	None Detected
08B / 18017109-027 Pressboard Ceiling/ Picnic Table Storage	Brown Fibrous Homogeneous	95% Cellulose	5% Other	None Detected
09A / 18017109-028 Glaizng To 2 Pane Windows/ Exterior Silo	White Non-Fibrous Homogeneous		98% Other	2% Chrysotile
10A / 18017109-029 Glazing To 4 Pane Round Top Window/ Outbuilding Exterior	White Non-Fibrous Homogeneous		100% Other	< 1% Chrysotile
11A / 18017109-030 Caulk To 8 Pane Round Top Window/ Exterior	Grey Non-Fibrous Heterogeneous		92% Other	8% Chrysotile

Analyst: Tara C. Steiner

Approved Signatory: Sandra Sobrino

Analysis Date: 5/2/2018

Date: 5/2/2018

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Analyst: Steiner, Tara | Pisula, Nicholas | Toth, Elizabeth

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non Fiberous	Asbestos Fibers
12A / 18017109-031 Glazing To 9 Pane Windows/ Outbuilding Exterior	White Non-Fibrous Homogeneous		100% Other	None Detected
12B / 18017109-032 Glazing To 9 Pane Windows/ Outbuilding Exterior	White Non-Fibrous Homogeneous		100% Other	None Detected
13A / 18017109-033 Glazing To 8 Pane Round Top Window/ Exterior	White Non-Fibrous Homogeneous		100% Other	< 1% Chrysotile
14A / 18017109-034 Glazing To Window In Door/ Outbuilding Exterior	White Non-Fibrous Homogeneous		100% Other	None Detected
15A / 18017109-035 Parge Coat/ Outbuilding	Grey Non-Fibrous Homogeneous		100% Other	None Detected
15B / 18017109-036 Parge Coat/ Outbuilding	Grey Non-Fibrous Homogeneous		100% Other	None Detected
15C / 18017109-037 Parge Coat/ Outbuilding	Grey Non-Fibrous Homogeneous		100% Other	None Detected
16A / 18017109-038 Wall Covering/ Outbuilding Storage	Brown Fibrous Homogeneous	90% Cellulose	10% Other	None Detected

Analyst: Tara C. Steiner

Approved Signatory: Sandra Sobrino

Analysis Date: 5/2/2018

Date: 5/2/2018

Disclaimer

The final report cannot be reproduced, except in full, without written authorization from SanAir. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample and information provided by the client. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Samples are held for a period of 60 days.

For NY state samples, method EPA 600/M4-82-020 is performed.

Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Certifications
NVLAP lab code 200870
City of Philadelphia: ALL-460
PA Department of Environmental Protection Number: 68-05397
California License Number: 2915
Colorado License Number: AL-23143
Connecticut License Number: PH-0105
Massachusetts License Number: AA000222
Maine License Number: LB-0075
New York ELAP lab ID: 11983
Rhode Island License Number: AAL-126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia 3333000323
Washington State License Number: C989
West Virginia License Number: LT000566
Vermont License: AL166318

Revision Date: 11/30/2017

SanAir Technologies Laboratory

1551 Oakbridge Dr. STE B
Powhatan, VA 23139
804.897.1177 / 888.895.1177
Fax 804.897.0070
sanair.com

Asbestos Chain of Custody
Form 140, Rev 1, 1/20/2017

SanAir ID Number 18017109

Company: ECM Inc.	Project #: 180014B	Collect by: Andrew Perreault
Address: 181 Amaral Street	Project Name: Colt State Park - Stone Barn	Phone #: 401-304-6615
City, St., Zip: Riverside, RI 02915	Date Collected: 04/25/2018	Fax #:
State of Collection: RI Account#: 2667	P.O. Number:	Email: aperreault@ecmne.com

Bulk

ABB	PLM EPA 600/R-93/116	■
	Positive Stop ☐	
ABEPA	PLM EPA 400 Point Count	☐
ABB1K	PLM EPA 1000 Point Count	☐
ABBEN	PLM EPA NOB**	☐
ABBCH	TEM Chatfield**	☐
ABBTM	TEM EPA NOB**	☐
ABQ	PLM Qualitative	☐

** Available on 24-hr. to 5-day TAT

Air

ABA	PCM NIOSH 7400	☐
ABA-2	OSHA w/ TWA*	☐
ABTEM	TEM AHERA	☐
ABATN	TEM NIOSH 7402	☐
ABT2	TEM Level II	☐
Other:		☐

New York ELAP

PLM NY	PLM EPA 600/M4-82-020	☐
ABEPA2	NY ELAP 198.1	☐
ABENY	NY ELAP 198.6 PLM NOB	☐
ABBNY	NY ELAP 198.4 TEM NOB	☐

Soil

ABSE	PLM EPA 600/R-93/116 (Qual.)	☐

Vermiculite & Soil

ABSP	PLM CARB 435 (LOD <1%)	☐
ABSP1	PLM CARB 435 (LOD 0.25%)	☐
ABSP2	PLM CARB 435 (LOD 0.1%)	☐

Dust

ABWA	TEM Wipe ASTM D-6480	☐
ABDMV	TEM Microvac ASTM D-5755	☐

Water

ABHE	EPA 100.2	☐

Matrix	Other	
		☐

Turn Around Times	3 HR (4 HR TEM) ☐	6 HR (8HR TEM) ☐	12 HR ☐	24 HR ☐
	☐ 2 Days	☐ 3 Days	■ 4 Days	☐ 5 Days

Special Instructions

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
01A	Parge Coat / Field Stone Walls in Attic					
01B	Parge Coat / Field Stone Walls in Attic					
01C	Parge Coat / Field Stone Walls in Attic					
02A	Skim Coat Plaster Wall / Silo Closet					
02B	Skim Coat Plaster Wall / Picnic Table Storage					
02C	Skim Coat Plaster Wall / Paint Room					
02D	Skim Coat Plaster Wall / Work Shop					
02E	Skim Coat Plaster Wall / Picnic Storage					
03A	Base Coat Plaster Wall / Silo Closet					
03B	Base Coat Plaster Wall / Picnic Table Storage					
03C	Base Coat Plaster Wall / Paint Room					
03D	Base Coat Plaster Wall / Work Shop					

Relinquished by	Date	Time	Received by	Date	Time
[signature]	4/25/18	1545	MC	APR 26 2018	9:55AM

If no technician is provided, then the primary contact for your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm EST Friday will begin at 8 am Monday morning. Weekend or holiday work must be scheduled ahead of time and is charged for rush turnaround time. SanAir covers Standard Overnight FedEx shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

Page 1 of 2

18017109

Form 140, Revision 1, 1/20/2017

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
03E	Base Coat Plaster Wall / Picnic Storage					
04A	Skim Coat Plaster Ceiling / Silo Closet					
04B	Skim Coat Plaster Ceiling / Picnic Table Storage					
04C	Skim Coat Plaster Ceiling / Picnic Table Storage					
04D	Skim Coat Plaster Ceiling / Work Shop					
04E	Skim Coat Plaster Ceiling / Hallway					
05A	Base Coat Plaster Ceiling / Silo Closet					
05B	Base Coat Plaster Ceiling / Picnic Table Storage					
05C	Base Coat Plaster Ceiling / Picnic Table Storage					
05D	Base Coat Plaster Ceiling / Work Shop					
05E	Base Coat Plaster Ceiling / Hallway					
06A	Grout to Subway Tile / Picnic Table Storage					
07A	Setting Bed to Subway Tile / Picnic Table Storage					
08A	Pressboard Ceiling / Paint Room					
08B	Pressboard Ceiling / Picnic Table Storage					
09A	Glazing to 2 Pane Windows / Exterior Silo					
10A	Glazing to 4 Pane Round Top Window / Outbuilding Exterior					
11A	Caulk to 8 Pane Round Top Window / Exterior					
12A	Glazing to 9 Pane Windows / Outbuilding Exterior					
12B	Glazing to 9 Pane Windows / Outbuilding Exterior					
13A	Glazing to 8 Pane Round Top Window / Exterior					
14A	Glazing to Window in Door / Outbuilding Exterior					
15A	Parge Coat / Outbuilding					
15B	Parge Coat / Outbuilding					
15C	Parge Coat / Outbuilding					
16A	Wall Covering / Outbuilding Storage					

Special Instructions	

Relinquished by	Date	Time	Received by	Date	Time
[illegible]	4/25/18	1545	MC	APR 2 6 2018	9:55AM

If no technician is provided, then the primary contact for your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm EST Friday will begin at 8 am Monday morning. Weekend or holiday work must be scheduled ahead of time and is charged for rush turnaround time. SanAir covers Standard Overnight FedEx shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

Page 2 of 2

Appendix B:
Lead Paint Laboratory Reports

SanAir Technologies Laboratory

Analysis Report

prepared for

Environmental Consulting & Management Inc

Report Date: 5/3/2018
Project Name: Colt State Park - Stone Barn
Project #: 180014B
SanAir ID#: 18017111

NVLAP LAB CODE 200870-0

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL LEAD ENVIRONMENTAL MICROBIOLOGY ISO/IEC 17025:2005 LAB # 162952

Virginia SBE Certification # 652931

Texas Licensed Mold Analysis Laboratory License # LAB0166

SanAir Technologies Laboratory

804.897.1177 www.sanair.com

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

Environmental Consulting & Management Inc
50 Kickemuit Ave
Bristol, RI 02809

May 3, 2018

SanAir ID # 18017111
Project Name: Colt State Park - Stone Barn
Project Number: 180014B

Dear Andrew Perreault,

We at SanAir would like to thank you for the work you recently submitted. The 10 sample(s) were received on Thursday, April 26, 2018 via FedEx. The final report(s) is enclosed for the following sample(s): PB01A, PB02A, PB03A, PB04A, PB05A, PB06A, PB07A, PB08A, PB09A, PB10A.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Abisola Kasali
Metals Laboratory Director
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

sample conditions:
10 sample(s) in Good condition

SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

18017111

FINAL REPORT

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809

Project Number: 180014B
P.O. Number:
Project Name: Colt State Park - Stone Barn

Collected Date: 4/25/2018
Received Date: 4/26/2018 9:55:00 AM
Report Date: 5/3/2018 9:22:29 AM
Analyst: Laverty, Jaynie

Lead Paint Analysis

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-001	PB01A / White/ Wood Wall/ Picnic Table Storage	157	0.1195	83.7	1309.8 µg/g (ppm)	0.131 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-002	PB02A / White/ Plaster Ceiling/ Picnic Table Storage	1274	0.113	88.5	11278.3 µg/g (ppm)	1.1278 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-003	PB03A / Gray/ Wood Trim/ Picnic Table Storage	23738	0.1067	93.7	222477 µg/g (ppm)	22.2477 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-004	PB04A / Gray/ Wood Door/ Picnic Table Storage	4971	0.1038	96.3	47888.4 µg/g (ppm)	4.7888 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-005	PB05A / Brown/ Wood Door/ Exterior	28555	0.1347	74.2	211988.9 µg/g (ppm)	21.1989 % By Weight

Certification

SanAir Technologies Laboratory, Inc. participates in the certification for environmental lead analysis programs as administered by AIHA-ELLAP (Lab ID 162952) and the State of New York-ELAP (Lab Id 11983), and has met the EPA's NLLAP program standards.

Signature: Date: 5/1/2018

Reviewed: Date: 5/1/2018

SanAir Technologies Laboratory, Inc.

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SanAir ID Number

18017111

FINAL REPORT

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809

Project Number: 180014B
P.O. Number:
Project Name: Colt State Park - Stone Barn

Collected Date: 4/25/2018
Received Date: 4/26/2018 9:55:00 AM
Report Date: 5/3/2018 9:22:29 AM
Analyst: Laverty, Jaynie

Lead Paint Analysis

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-006	PB06A / White/ Wood Window/ Picnic Table Storage	10704	0.108	92.6	99106.5 µg/g (ppm)	9.9106 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-007	PB07A / White/ Wood Window/ Exterior	14785	0.1027	97.4	143966.9 µg/g (ppm)	14.3967 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-008	PB08A / Gray/ Parge Coat/ Outbuilding Interior	27222	0.1207	82.9	225530.2 µg/g (ppm)	22.553 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-009	PB09A / White/ Wood Ceiling Beams/ Outbuilding Interior	23575	0.1204	83.1	195805.6 µg/g (ppm)	19.5806 % By Weight

Test Method: SW846/M3050B/7000B
NOTE: µg/g=ppm

Sample	Description	µg Pb in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
18017111-010	PB10A / White/ Concrete Ceiling/ Cellar Work Shop	< 10	0.1029	97.2	<97.2 µg/g (ppm)	<0.0097 % By Weight

Certification

SanAir Technologies Laboratory, Inc. participates in the certification for environmental lead analysis programs as administered by AIHA-ELLAP (Lab ID 162952) and the State of New York-ELAP (Lab Id 11983), and has met the EPA's NLLAP program standards.

Signature: Date: 5/1/2018

Reviewed: Date: 5/1/2018

SanAir Technologies Laboratory, Inc.

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Web: http://www.sanair.com E-mail: iaq@sanair.com

SanAir ID Number

18017111

FINAL REPORT

Name: Environmental Consulting & Management Inc
Address: 50 Kickemuit Ave
Bristol, RI 02809

Project Number: 180014B
P.O. Number:
Project Name: Colt State Park - Stone Barn

Collected Date: 4/25/2018
Received Date: 4/26/2018 9:55:00 AM
Report Date: 5/3/2018 9:22:29 AM
Kasali, Abisola O.

ORGANISM DESCRIPTIONS

The descriptions of the organisms presented are derived from various reference materials. The laboratory report is based on the data derived from the samples submitted and no interpretation of the data, as to potential, or actual, health effects resulting from exposure to the numbers of organisms found, can be made by laboratory personnel. Any interpretation of the potential health effects of the presence of this organism must be made by qualified professional personnel with first hand knowledge of the sample site, and the problems associated with that site.

Disclaimer

SanAir Technologies Laboratory, Inc. participates in the Environmental Lead Accreditation Program (ELAP) administered by AIHA-LAP, LLC (Lab ID162952). Refer to our accreditation certificate or www.aihaaccreditedlabs.org for an up to date list of the Fields of Testing for which we are accredited. SanAir also participates in the State of New Yorkôs DOH-ELAP (Lab Id 11983), and has met the EPA's NLLAP program standards.

Final reports cannot be reproduced, except in full, without written authorization from SanAir Technologies Laboratory, Inc. SanAir is not responsible for sample collection or interpretation made by others. This report does not constitute endorsement by AIHA-LAP, LLC and/or any other U.S. governmental agencies; and may not be accredited by every local, state or federal regulatory agency. SanAir Technologies Laboratory, Inc only assures the precision and accuracy of the data it generates and assumes no responsibility for errors or biasing that occur during collection prior to SanAirôs receipt of the sample(s). SanAirôs Method Detection Limits (MDL) and Reporting Limits (RL) have been derived using various materials meeting each accrediting agenciesô standards. All quality control results are acceptable unless otherwise noted. Results are not corrected for blanks.

Lead Exposure Limits

	Paint
0.5% by weigh	HUD definition of lead based paint
1.0 mg/cm^2	
5000 ppm	

Revision Date 1/12/2018

SanAir Technologies Laboratory
1551 Oakbridge Dr STE B
Powhatan, VA 23139
804.897.1177 / 888.895.1177
Fax 804.897.0070
sanair.com

Metals & Lead Chain of Custody

Form 70, Revision 9, 01/19/2017

SanAir ID Number: 18017111

Company: ECM Inc.	Project #: 180014B	Phone #: 401-304-6615
Address: 181 Amaral Street	Project Name: Colt State Park - Stone Barn	Phone #:
City, St., Zip: Riverside, RI 02915	Date Collected: 04/25/18	Fax #:
Samples Collected By: Andrew Perreault	P.O. Number:	Email: aperreault@ecmne.com
Account #: 2667	U.S. State Collected in: RI	Email:

Matrix Types	Metals Analysis Types	
☐ Air (ug/m³)	Total Concentration of Lead ■	☐ ICP-total concentration of metals (please list metals):
☐ Wipe (ug/ft²)	Total Concentration of RCRA 8 Metals ☐	
■ Paint ☐Soil ☐Bulk (ug/g or ppm)	TCLP for Lead ☐	
☐ Other:	TCLP for RCRA 8 Metals ☐	

Turn Around Time	Same Day ☐	1 Day ☐	2 days ☐	3 Days ☐
	■ Standard (5 day)	☐ Full TCLP (10d)		

Sample #	Collection Date & Time	Sample Identification/Location	Flow Rate	Start Time	Stop Time	Volume (L) Area (Sq ft)
PB01A	04/25/18	White / Wood Wall / Picnic Table Storage				
PB02A	04/25/18	White / Plaster Ceiling / Picnic Table Storage				
PB03A	04/25/18	Gray / Wood Trim / Picnic Table Storage				
PB04A	04/25/18	Gray / Wood Door / Picnic Table Storage				
PB05A	04/25/18	Brown / Wood Door / Exterior				
PB06A	04/25/18	White / Wood Window / Picnic Table Storage				
PB07A	04/25/18	White / Wood Window / Exterior				
PB08A	04/25/18	Gray / Parge Coat / Outbuilding Interior				
PB09A	04/25/18	White / Wood Ceiling Beams / Outbuilding Interior				
PB10A	04/25/18	White / Concrete Ceiling / Cellar Work Shop				

Special Instructions

Relinquished by	Date	Time	Received by	Date	Time
[signature]	4/20/18	1545	MC	APR 2 6 2018	9:55AM

If no technician is provided, then the primary contact of your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm will begin at 8 am the next business morning. Weekend or holiday work must be scheduled ahead of time and is charged at 150% of the Rush TAT rate. There is a minimum charge of $100 for weekend work. A courier charge will be applied for same day and one-day turnaround times for offsite work. SanAir covers Standard Overnight FedEx shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

Page 1 of 1

SECTION 004100
BID FORM

PART 1 GENERAL

1.01 BID FORM

A. The Bid Form to be utilized on this project is included following this page.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 004100

SECTION 004300
QUALIFICATIONS TO PERFORM WORK

PART 1 GENERAL

1.01 QUALIFICATIONS

A. The undersigned confirms the following information as evidence of its organizational qualifications to perform the work as bid upon according to all requirements of the plans and the specifications.
   1. The undersigned has been in business as a General Contractor under present business name and doing the same type of work for a minimum of 5 years.
   2. Due to the extremely sensitive nature of the work of portions of this project, and the special skills required for same, the bidder is experienced in restoration and rehabilitation of older buildings and with the Secretary of the Interior's Standards for Rehabilitation of Historic Places.

1.02 SUBMITTALS

A. To demonstrate experience and qualifications provide the following:
   1. Provide history of the firm, including number of years it has been in business doing general contracting; a list of representative projects with final cost, year completed and description of work (e.g. exterior painting, roof repairs, structural repairs, window replacement, finish carpentry, and distinguish between restoration work, remodeling, renovation or new construction).
   2. Provide resumes for principals and key personnel who will be assigned to the project, including a list of relevant projects with which they were personally involved.
   3. List three or more historic preservation projects on buildings 100 years old or more that were completed by this firm within the last five years. Include the date of completion, the age of the building, the cost of the project, the architect, a detailed description of the work, and a project reference with phone number.
   4. Subcontractors should provide the same information required of the General contractor including their experience with historic buildings within their area of expertise. Provide firm history, resume of principals, and a list of relevant projects for each subcontractor. Because of the sensitive nature of the subcontracting work, especially the masonry and clay roofing, no submittal will be considered if it does not include this information.

1.03 EVALUATION CRITERIA

A. Qualifications will be evaluated on the basis of similar project experience for:
   1. Completion of at least 3 similar historically significant projects within the past five years for both the general contractor and subcontractors..
   2. Size and dollar value of similar completed projects.
   3. Contractor's performance with similar projects. (references will be checked)
   4. Contractor's ability to subcontract with qualified firms.
   5. Relevant experience of individuals assigned to the project.

B. The owner reserves the right and sole discretion to determine equivalent or prior experience and the right to reject any or all bids which fail to demonstrate equivalent prior experience. The owner will contact project references, and reserves the right to reject bids based on poor performance with similar projects.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 004300

SECTION 005000
CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 COPYRIGHT

A. Contractor is responsible for obtaining a valid license to use all copyrighted documents specified but not included in the Project Manual.

1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. See Section 005200 - Agreement Form for the Agreement form to be executed.

B. See Section 007200 - General Conditions for the General Conditions.

1.03 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.

B. Bond Forms:
   1. Bid Bond Form: AIA A310.
   2. Performance and Payment Bond Form: AIA A312.

C. Release of Lien:
   1. Release of Liens Form: AIA G706A

D. Insurance certificate, supplemental attachment:
   1. ACORD Certificate of Insurance Form: AIA G715

E. Post-Award Certificates and Other Forms:
   1. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).

F. Clarification and Modification Forms:
   1. Request for Information Form: AIA G716.
   2. Substitution Request Form: CSI/CSC Form 1.5C (During the Bidding/Negotiating Stage).
   3. Substitution Request Form: CSI/CSC Form 13.1A (After the Bidding/Negotiating Stage).

G. Closeout Forms:
   1. Certificate of Substantial Completion Form: AIA G704.
   2. Affidavit of Payment of Debts and Claims Form: AIA G706.
   3. Consent of Surety to Final Payment Form: AIA G707.

1.04 REFERENCE STANDARDS

A. AIA A310 - Bid Bond; 2010.

B. AIA A312 - Performance Bond and Payment Bond; 2010.

C. AIA G706 - Contractor's Affidavit of Payment of Debts and Claims

D. AIA G706A - Release of Liens, 1994.

E. AIA G707 - Consent of Surety to Final Payment

F. AIA G715 - ACORD Certificate of Insurance, 1991.

G. AIA G702 - Application and Certificate for Payment; 1992.

H. AIA G703 - Continuation Sheet; 1992.

I. AIA G704 - Certificate of Substantial Completion; 2017.

J. AIA G716 - Request for Information; 2004

K. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

L. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 005000

SECTION 005200
AGREEMENT FORM

PART 1 GENERAL

1.01 AGREEMENT FORM

A. The Agreement Form to be utilized on this project is AIA Document A101-2017 as amended, a copy of which follows this page.

B. Agreement made as of the date of issue of the Purchase Order for this Work.

C. This Agreement is entered into as of the date of the applicable Purchase Order and is assumed as executed once the Purchase Order is issued.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 005200

SECTION 009000
ADDENDA AND MODIFICATIONS

PART 1 GENERAL

1.01 ADDENDA AND MODIFICATIONS

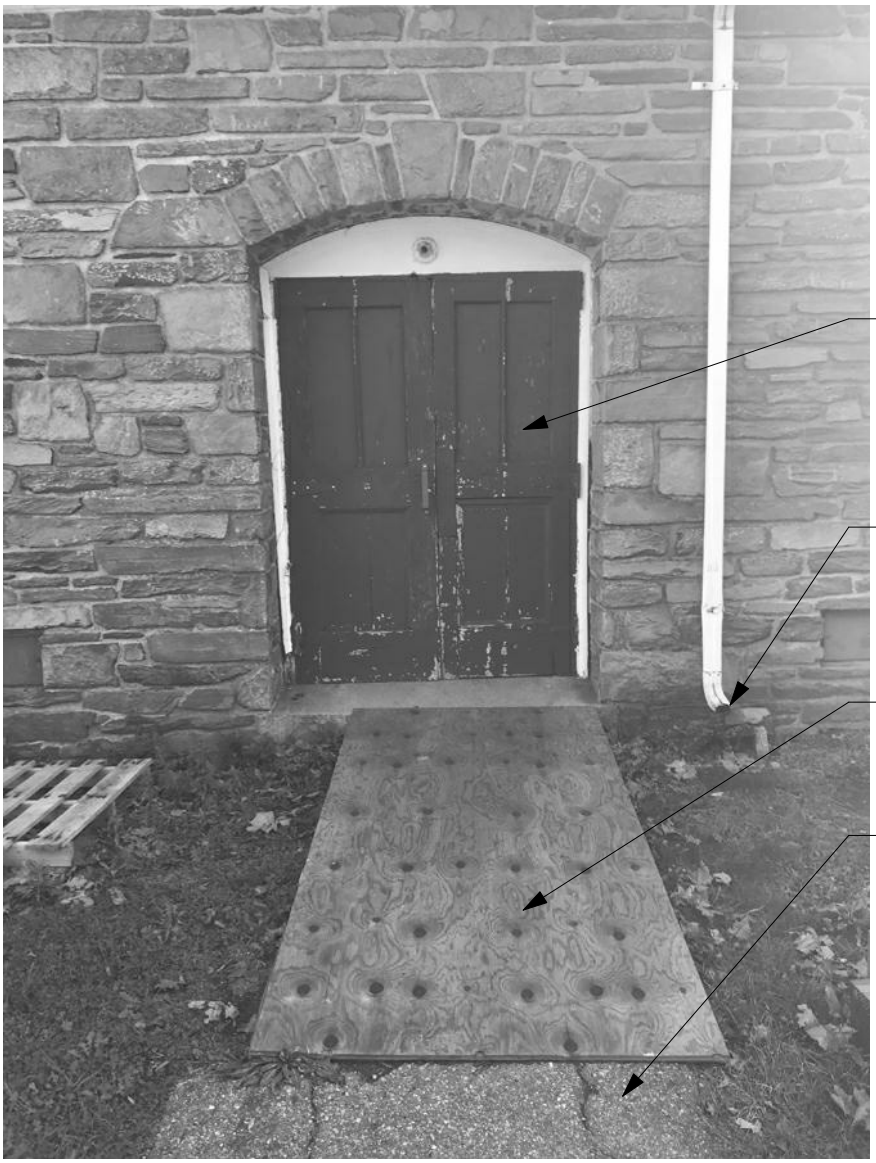
A. At the time of solicitation of this bid package, one addenda exists.

B. Should any additional Addenda be issued during the Bid Period, they will augment this Document and become a part of the Project Manual.

C. Such Addenda and Modifications when issued, with reference to the Project Manual, the General Conditions, Supplemental General Conditions, Drawings or Specifications, shall be inserted following this page and become integral parts of the Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED



REPAIR DAMAGE TO EXISTING DOOR, FRAME, AND CASING PER SPECIFICATIONS

REPAIR DAMAGE TO EXISTING RAIN LEADER OR REPLACE IN KIND. PROVIDE PRECAST CONCRETE SPLASH BLOCK

REMOVE AND DISPOSE OF EXISTING WOOD RAMP CONSTRUCTION AT THIS LOCATION

REGRADE AND REPLACE ASPHALT AS REQUIRED TO PROVIDE NEW ASPHALT WALKWAY LEVEL WITH T.O. EXISTING STONE SILL. MAX 1 IN 20 SLOPE AWAY FROM BUILDING. CORDINATE EXTENT OF REGRADING WITH OWNER AND EXISTING SITE CONDITIONS AS REQUIRED. RE-SEED ANY NEW OR DISTURBED LAWN AREAS IN KIND UPON COMPLETION OF ANY REGRADING WORK.

PROJECT

STONE BARN ENVELOPE REPAIRS
COLT STATE PARK
ROUTE 114, BRISTOL, RHODE ISLAND 02809

SHEET NO.

SK-01

DRAWING STATUS

ISSUED FOR CONSTRUCTION

DRAWING REFERENCE

04/AE552 WEST ELEVATION DOOR DETAIL

PROJECT NO.	1752	DATE ISSUED	09/28/18
DRAWN BY	JAM	REVISIONS	
CHECKED BY	GAB		

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BLOUNT BENNETT ARCHITECTS LTD.

BLOUNT · BENNETT
BBA
ARCHITECTS Ltd.

865 WATERMAN AVENUE UNIT B
EAST PROVIDENCE
RHODE ISLAND 02914
TEL: (401) 431-1922
www.bbaltd.com

THE STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Business Regulation

BUILDING CODE COMMISSION

560 Jefferson Blvd., Warwick, Rhode Island 02886

January 09, 2019

Project Approval Letter

RISBC Project Number and Name	Location: 1 Vally Road	**DESIGNER**	Name: GEORGE A BENNETT Company: BLOUNT BENNETT ARCHITECTS LTD. Address: 180 Oak Ridge Avenue N Attleboro MA 02760
DESCRIPTION	Repair the building envelope of the Colt Stone Barn by repairing windows, re pointing masonry, roof repair, painting, and trim woodwork.	**AGENCY**	Agency Contact Name: David DeCost Agency/Department Name: Department of Environmental Management Agency Address: 235 Promenade Street; Providence, RI 02908

Dear Sirs/Madams:

Plans and Specifications submitted for the above-referenced project have been reviewed and approved. Please be advised that permits will be issued upon application and payment of fees by the select Contractor.

The approval letter does not constitute permission to proceed to reproduce documents required by the agency or purchasing division for bidding purposes. Such authorization can only be granted by the User Agency or Department, who you should contact for authorization to proceed.

The User, Department, or Agency, is advised by copy of this notice that documents required for bidding purposes must be in a format designated by the Division of Purchasing. The contract recipient will submit a copy of this document and a copy of an approval requisition for the project to proceed to permitting, along with any conditions of this approval to be accepted by the Building Code Commission.

Very truly yours,

John P. Leyden, CBO
State Building Commissioner

To learn more, scan this barcode or visit rhodeisland.viewpointcloud.com/#/records/27649

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Stone Barn Envelope Repairs

B. Owner's Name: RI DEM Planning & Development.

C. Architect's Name: Blount Bennett Architects, LTD.

D. Additional Project contact information is specified in Section - 000103 - Project Directory.

E. The Project consists of the exterior envelope repair and restoration of the entire stone barn structure.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 005200 - Agreement Form.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. The Work of the Project is defined by the Contract Documents and consists of the following:
   1. Masonry cleaning, repairs, and restoration.
   2. Exterior window and door repair and restoration.
   3. Exterior refinishing and repair of wood surfaces.
   4. Exterior concrete walk and ramp repair.
   5. Clay tile and asphalt shingle repair and associated fascia repair.
   6. Cleaning, isolated repair of existing terra cotta, and opening modifications at the existing stone silo.
   7. Abatement of asbestos and / or lead paint where required by the scope of work as identified in the Asbestos Abatement Specification (Section 011002 - Summary Attachment A) following this section.

1.04 OWNER OCCUPANCY

A. Owner intends to continue to occupy portions of the existing building during the entire construction period.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Existing building spaces may not be used for storage.

E. Time Restrictions:
   1. Limit conduct of especially noisy exterior work to the hours of 7 A.M. to 5 P.M..
   2. Limit conduct of the hours of 7 A.M. to 5 P.M..

F. Utility Outages and Shutdown:

1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
2. Limit shutdown of utility services to 3 hours at a time, arranged at least 24 hours in advance with Owner.
3. Prevent accidental disruption of utility services to other facilities.

1.06 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 011000

SECTION 011002
SUMMARY ATTACHMENT A

PART 1 GENERAL

1.01 ASBESTOS ABATEMENT SPECIFICATION

A. The Asbestos Abatement Specification as prepared by Environmental Consulting & Management will follow this page and applies to any building areas affected by the scope of work proposed in these Contract Documents. None of the work indicated in the attached Asbestos Abatement Specification has been completed to date and it will be the Contractor's responsibility to perform any abatement work impacted by the scope of the proposed building alterations and repairs.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 011002

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Defect assessment.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 005000 - Contracting Forms and Supplements: Forms to be used.

B. Section 005200 - Agreement Form: Contract Sum, retainages, monetary values of unit prices.

C. Section 007200 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.

D. Section 012100 - Allowances: Payment procedures relating to allowances.

E. Section 012200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

F. Section 017800 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Forms filled out by hand will not be accepted.

C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization, bonds and insurance, and closeout.

E. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
   1. Prepare a draft version "pencil copy" of each application and distribute via email 5 days prior to due date for review by Architect and Owner's Representative.
   2. After making agreed revisions, individually sign and notarize and emboss with notary's official seal, all copies. Deliver to Owner's Representative for further processing and distribution.

C. Forms filled out by hand will not be accepted.

D. Execute certification by signature of authorized officer.

E. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

F. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

G. Submit three hard-copies of each Application for Payment.

H. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 013000.
   2. Construction progress schedule, revised and current as specified in Section 013000.
   3. Partial release of liens from major subcontractors and vendors.
   4. Project record documents as specified in Section 017800, for review by Owner which will be returned to the Contractor.
   5. Affidavits attesting to off-site stored products.

I. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.

B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change . Contractor shall prepare and submit a fixed price quotation within 7 days.

E. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 016000.

F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

J. Promptly enter changes in Project Record Documents.

1.06 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, the Architect will direct an appropriate remedy or adjust payment.

C. The defective Work may remain, but the unit sum will be adjusted to a new sum at the discretion of the Architect.

D. The defective Work will be partially repaired to the instructions of the Architect, and the unit sum will be adjusted to a new sum at the discretion of the Architect.

E. The individual Specification Sections may modify these options or may identify a specific formula or percentage sum reduction.

F. The authority of the Architect to assess the defect and identify a payment adjustment, is final.

G. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected products.

1.07 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 017000.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid..
   3. AIA Document G706, "Contractor's Affidavit of Payment and Debts and Claims"..
   4. AIA Document G706A, "Contractor's Affidavit of Release of Liens"..
   5. AIA Document G707, "Consent of Surety to Final Payment"..
   6. Evidence that claims have been settled.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012000

SECTION 012100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Unit-cost allowances.

B. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

A. Section 012000 - Price and Payment Procedures: Additional payment and modification procedures.

B. Section 012200 - Unit Prices: Procedures for using unit prices.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts and including taxes, freight, and delivery to project site.

B. Costs Not Included in Cash Allowances: Product handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing.

C. Differences in costs will be adjusted by Change Order.

D. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
   1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.04 ALLOWANCES SCHEDULE

A. Section 073213: Include the stipulated sum of $20,000.00 for purchase, delivery, and installation of additional clay roof tile repair or replacement not otherwise identified on the contract drawings..

B. Division 04: Include the stipulated sum of $50,000.00 for purchase, delivery, and installation of additional stone and masonry repair or replacement work not otherwise identified on the contract drawings..

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012100

SECTION 012200
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 RELATED REQUIREMENTS

A. Section 012000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves the use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to the Contractor.

D. Assist by providing necessary equipment, workers, and survey personnel as required.

E. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

F. Measurement by Area: Measured by square dimension using mean length and width or radius.

G. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

H. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

1.06 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

1.07 SCHEDULE OF UNIT PRICES

A. Unit Price #1: Patching / repair of existing stone masonry (Unit of measurement = 1 square foot).

B. Unit Price #2: Replacement of existing stone masonry (Unit of measurement = 1 typical existing stone unit - verify exact size of typical stone unit in field).

C. Unit Price #3: Repointing of masonry units (Unit of measurement = 5 square feet).

D. Unit Price #4: Repair / replacement of existing clay roofing (Unit of measurement = 1 typical existing tile - verify exact size and shape of typical unit in field)

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012200

SECTION 012300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

1.02 RELATED REQUIREMENTS

A. Document 005200 - Agreement Form: Incorporating monetary value of accepted Alternates.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - Seal all exterior stone masonry as described in Section 071900 - Water Repellents.:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012300

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 012100 - Allowances, for cash allowances affecting this section.

B. Section 012200 - Unit Prices, for additional unit price requirements.

C. Section 012300 - Alternates, for product alternatives affecting this section.

D. Section 013000 - Administrative Requirements: Submittal procedures, coordination.

E. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
      c. Unavailability of required warranty terms..
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.04 REFERENCE STANDARDS

A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

D. Limit each request to a single proposed substitution item.

1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Form (before award of contract):
   1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Owner will consider requests for substitutions only if submitted at least 7 days prior to the date for receipt of bids.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
   1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

C. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record.

END OF SECTION 012500

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Progress meetings.

C. Construction progress schedule.

D. Submittals for review, information, and project closeout.

E. Number of copies of submittals.

F. Requests for Information (RFI) procedures.

G. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 013216 - Construction Progress Schedule: Form, content, and administration of schedules.

B. Section 016000 - Product Requirements: General product requirements.

C. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

A. AIA G716 - Request for Information; 2004.

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Conform to requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Information (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at regular intervals as agreed to by all parties.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Special consultants as required.
   5. Contractor's superintendent.

6. Major subcontractors.

C. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to work.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 013216

3.03 REQUESTS FOR INFORMATION(RFI)

A. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
2. Prepare in a format and with content acceptable to Owner.
   a. Use AIA G716 - Request for Information .
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

B. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Improper RFIs: Requests not prepared in conformance to requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.

C. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Architect's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

D. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

E. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.

2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.

F. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

G. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.04 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Coordinate with Contractor's construction schedule and schedule of values.
2. Format schedule to allow tracking of status of submittals throughout duration of construction.
3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.05 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.06 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.

4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in conformance to requirements of Section 017800 - Closeout Submittals:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

A. General Requirements:
1. Use a single transmittal for related items.
2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
7. Schedule submittals to expedite the Project, and coordinate submission of related items.
   a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
   b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
9. Provide space for Contractor and Architect review stamps.
10. When revised for resubmission, identify all changes made since previous submission.
11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.

13. Submittals not requested will not be recognized or processed.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
2. Do not reproduce the Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.10 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
   a. "Approved", or language with same legal meaning.
   b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
   c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
2. Not Authorizing fabrication, delivery, and installation:
   a. "Revise and Resubmit".
      1) Resubmit revised item, with review notations acknowledged and incorporated.
   b. "Rejected".
      1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
   a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
   a. "Reviewed" - no further action is required from Contractor.

END OF SECTION 013000

SECTION 013216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

1.02 SUBMITTALS

A. Within 30 days after date established in Notice to Proceed, submit preliminary schedule.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Submit updated schedule at monthly intervals to reflect actual construction progress and activities. Issue schedule 3 days before each regularly scheduled progress meeting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart (Gantt Chart).

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

D. Provide legend for symbols and abbreviations used.

3.03 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 3 days.

3.04 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.05 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION 013216

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.
B. Quality assurance.
C. References and standards.
D. Testing and inspection agencies and services.
E. Control of installation.
F. Mock-ups.
G. Tolerances.
H. Manufacturers' field services.
I. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 003100 - Available Project Information: Soil investigation data.
B. Document 007200 - General Conditions: Inspections and approvals required by public authorities.
C. Section 013000 - Administrative Requirements: Submittal procedures.
D. Section 016000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Design Data: Submit for Architect's knowledge and action as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
   1. Include required product data and shop drawings.
C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.
D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.06 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

A. As indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform specified testing and inspection. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of with additional qualifications as specified in individual sections and _____.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to conform to the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

G. Obtain Architect and Owner's approval of mock-ups before starting work, fabrication, or construction.
   1. Make corrections as necessary until Architect's approval is issued.

H. Accepted mock-ups shall be a comparison standard for the remaining Work.

I. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace work or portions of the work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION 014000

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Project identification sign.

I. Field offices.

1.02 TEMPORARY UTILITIES

A. Owner will provide the following:
   1. Electrical power, consisting of connection to existing facilities. Exercise measures to conserve energy.
      a. Complement the existing power service capacity and characteristics as required for construction operations.
   2. Water supply, consisting of connection to existing facilities.
      a. Extend and supplement with temporary devices as needed to maintain the specified conditions for construction operations.
      b. Extend branch piping with outlets located so that water is available by hoses with threaded connections. Provide temporary pipe insulation if needed to prevent freezing.

1.03 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for cell phone service to the field supervisor at the time of project mobilization.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities is not permitted.

C. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

A. Construction: Contractor's option.

B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.07 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.09 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.10 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Existing on-site roads may be used for construction traffic.

E. Existing parking areas may be used for construction parking.

1.11 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site weekly.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 PROJECT IDENTIFICATION

A. Provide project identification sign of design, construction, and location approved by Owner.

B. No other signs are allowed without Owner permission except those required by law.

1.13 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.

C. Locate offices a minimum distance of 30 feet (10 m) from existing structures.

1.14 DUST CONTROL

A. Execute the Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into the atmosphere.

1.15 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent the contamination of soil, water, and the atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.16 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise produced by the construction operations.

1.17 PEST CONTROL

A. Provide methods, means, and facilities to prevent pests and insects from damaging the Work, or entering the facility.

1.18 RODENT CONTROL

A. Provide methods, means, and facilities to prevent rodents from accessing or invading the premises.

1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

F. Restore any temporary exterior laydown or storage areas to the original condition. After each use, regrade and reseed as required to meet this requirement.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 015000

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 012500 - Substitution Procedures: Substitutions made during and after the Bidding/Negotiation Phase.

B. Section 014000 - Quality Requirements: Product quality monitoring.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. DO NOT USE products having any of the following characteristics:
   1. Made using or containing CFC's or HCFC's.
   2. Containing lead, cadmium, asbestos.

C. Where all other criteria are met, Contractor shall give preference to products that:
   1. Have longer documented life span under normal use.
   2. Result in less construction waste.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 012500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 016000

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Cleaning and protection.

F. Demonstration and instruction of Owner personnel.

G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 013000 - Administrative Requirements: Submittals procedures.

C. Section 014000 - Quality Requirements: Testing and inspection procedures.

D. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 015000 - Temporary Facilities and Controls: Temporary interior partitions.

F. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

G. Section 024100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.05 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

H. Clean existing systems and equipment.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-conforming work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site weekly and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.10 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

1. Provide copies to Architect and Owner.

B. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

C. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

D. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

E. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

F. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

G. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.13 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 017000

SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.
   3. Provide electronically in PDF format.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3.05 WARRANTIES AND BONDS

A. Warranty period shall commence at date of substantial completion.

B. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

C. Verify that documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Retain warranties and bonds until time specified for submittal.

F. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION 017800

SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 011000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

E. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

F. Section 011002 - Summary Attachment A: Other hazardous material remediation and abatement.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Remove items indicated on the project drawings as required to complete the full scope of work shown. Reference ALL project documents to determine complete scope of work intended.

B. Remove other items indicated, for salvage and refurbishment or reuse as shown.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Provide, erect, and maintain temporary barriers and security devices.
   3. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permit.
   6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 .

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024100

SECTION 030130

MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of deteriorated concrete and subsequent replacement and patching.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

B. Samples: Cured samples for each exposed product and for each color and texture specified, in manufacturer's standard size appropriate for each type of work.

C. Samples for Initial Selection: Cured samples for each exposed product and for each color and texture specified.
   1. Include sets of patching-material Samples in the form of briquettes, at least 3 inches long by 1-1/2 inches wide representative of the range of concrete colors on the building. Document each Sample with product, mix, and or other information necessary to replicate it.
   2. Have each set of Samples contain a close color range of at least three Samples of different mixes of materials that match the variations in existing, adjacent concrete when cured and dry.

1.04 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type of portland cement supplied for mixing or adding to products at Project site.

B. Product Test Reports: For each manufactured bonding agent, cementitious patching mortar, joint-filler, and crack injection adhesive, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer to apply packaged patching-mortar materials and epoxy crack injection materials.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.

B. Store cementitious materials off the ground, under cover, and in a dry location.

C. Store aggregates covered and in a dry location; maintain grading and other required characteristics and prevent contamination.

1.07 FIELD CONDITIONS

A. Environmental Limitations for Epoxies: Do not apply when air and substrate temperatures are outside limits permitted by manufacturer. During hot weather, cool epoxy components before mixing, store mixed products in shade, and cool unused mixed products to retard setting. Do not apply to wet substrates unless approved by manufacturer.
   1. Use only Class A epoxies when substrate temperatures are below or are expected to go below 40 deg F within 8 hours.
   2. Use only Class A or B epoxies when substrate temperatures are below or are expected to go below 60 deg F within 8 hours.

3. Use only Class C epoxies when substrate temperatures are above and are expected to stay above 60 deg F for 8 hours.

B. Cold-Weather Requirements for Cementitious Materials: Do not apply unless concrete-surface and air temperatures are above 40 deg F and will remain so for at least 48 hours after completion of Work.

C. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 deg F and above.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Source Limitations: Obtain each color, grade, finish, type, and variety of product from single source with resources to provide products of consistent quality in appearance and physical properties.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

2.02 BONDING AGENTS

A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Manufactured product that consists of water-insensitive epoxy adhesive, portland cement, and water-based solution of corrosion-inhibiting chemicals that forms a protective film on steel reinforcement.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Corp. - Construction Chemicals; MasterEmaco P124 (Pre-2014: Emaco P24).
      b. Dayton Superior; Pro-Poxy Cembond.
      c. Sika Corporation; Armatec 110 EpoCem.
      d. Sto Corp.

B. Epoxy Bonding Agent: ASTM C 881/C 881M, Type II and free of VOCs.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Corp. - Construction Chemicals.
      b. Euclid Chemical Company (The): an RPM company.
      c. Sika Corporation.
      d. Sto Corp.

C. Latex Bonding Agent: ASTM C 1059/C 1059M, Type II.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Latex Bonding Agent, Type II (Non-Redispersible):
         1) Sto Corp.
         2) Sika Corporation.
         3) Euclid Chemical Company (The), an RPM company
         4) Kaufman Products, Inc.; Surebond.
         5) US SPEC, Division of US MIX Products Company; US Spec Acrylcoat.
         6) W. R. Meadows, Inc.; Sealtight Acry-Lok.

D. Mortar Scrub Coat: Mix consisting of 1 part portland cement and 1 part fine aggregate complying with ASTM C 144 except 100 percent passing a No. 16 sieve.

2.03 PATCHING MORTAR

A. Patching Mortar, General:
   1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.

2. Color and Aggregate Texture: Provide patching mortar and aggregates of colors and sizes necessary to produce patching mortar that matches existing, adjacent, exposed concrete. Blend several aggregates if necessary to achieve suitable matches.

B. Polymer-Modified, Cementitious Patching Mortar: Packaged, dry mix for repair of concrete and that contains a non-redispersible latex additive as either a dry powder or a separate liquid that is added during mixing.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Construction Chemicals - Building Systems.
      b. Cortec Corporation.
      c. Euclid Chemical Company (The); an RPM company.
      d. Sika Corporation; Construction Product Division.
      e. Sto Corp.; Concrete Restoration Division.
   2. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.04 EPOXY CRACK-INJECTION MATERIALS

A. Epoxy Crack-Injection Adhesive: ASTM C 881/C 881M, Type IV, free of VOCs.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Construction Chemicals - Building Systems.
      b. Euclid Chemical Company (The); an RPM company.
      c. Sika Corporation; Construction Product Division.
      d. Sto Corp.; Concrete Restoration Division.
   2. Capping Adhesive: Product manufactured for use with crack injection adhesive by same manufacturer.
   3. Color: Provide epoxy crack-injection adhesive and capping adhesive that will blend with existing, adjacent concrete and will not stain concrete surface.

2.05 OTHER MATERIALS

A. Portland Cement: ASTM C 150, Type I, II, or III unless otherwise indicated.

2.06 MIXES

A. General: Mix products, in clean containers, according to manufacturer's written instructions.
   1. Do not add water, thinners, or additives unless recommended by manufacturer.
   2. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
   3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.

B. Dry-Pack Mortar: Mix patching-mortar dry ingredients with just enough liquid to form damp cohesive mixture that can be squeezed by hand into a ball but is not plastic.

C. Concrete: Comply with Section 033053 "Miscellaneous Cast-in-Place Concrete."

D. Grout for Use with Preplaced Aggregate: Proportion according to ASTM C 938. Add grout fluidifier to mixing water followed by portland cement, pozzolan, and fine aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Perform surveys as the Work progresses to detect hazards resulting from concrete-maintenance work.

3.02 PREPARATION

A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.

B. Preparation for Removal of Deteriorated Concrete: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.
   1. Inventory and record the condition of items to be removed for reinstallation or salvage.
   2. Provide and maintain shoring, bracing, and temporary structural supports as required to preserve stability and prevent unexpected or uncontrolled movement, settlement, or collapse of construction being demolished and construction and finishes to remain.

C. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.
   1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
   2. Use only proven protection methods appropriate to each area and surface being protected.
   3. Provide barricades, barriers, and temporary directional signage to exclude public from areas where concrete maintenance work is being performed.
   4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of concrete maintenance work.
   5. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
   6. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
   7. Protect floors and other surfaces along haul routes from damage, wear, and staining.
   8. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
   9. Dispose of debris and runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

D. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.
   1. Prevent solids such as aggregate or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance work.
   2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

E. Concrete Removal:
   1. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch. Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.
   2. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.
   3. Remove additional concrete if necessary to provide a depth of removal of at least 1/2 inch over entire removal area.
   4. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.
   5. Provide surfaces with a fractured profile of at least 1/8 inch that are approximately perpendicular or parallel to original concrete surfaces. At columns and walls, make top and bottom surfaces level unless otherwise directed.

6. Thoroughly clean removal areas of loose concrete, dust, and debris.

3.03 APPLICATION

A. General: Comply with manufacturer's written instructions and recommendations for application of products, including surface preparation.

B. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Apply to reinforcing bars and concrete by stiff brush or hopper spray according to manufacturer's written instructions. Apply to reinforcing bars in two coats, allowing first coat to dry two to three hours before applying second coat. Allow to dry before placing patching mortar or concrete.

C. Placing Patching Mortar: Place as follows unless otherwise recommended in writing by manufacturer:
   1. Provide forms where necessary to confine patch to required shape.
   2. Wet substrate and forms thoroughly and then remove standing water.
   3. Pretreatment: Apply specified bonding agent.
   4. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.
   5. Vertical Patching: Place material in lifts of not more than 2 inches nor less than 1/4 inch. Do not feather edge.
   6. Overhead Patching: Place material in lifts of not more than 2 inches nor less than 1/4 inch. Do not feather edge.
   7. Consolidation: After each lift is placed, consolidate material and screed surface.
   8. Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.
   9. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a surface matching adjacent concrete.
   10. Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

D. Dry-Pack Mortar: Use for deep cavities. Place as follows unless otherwise recommended in writing by manufacturer:
   1. Provide forms where necessary to confine patch to required shape.
   2. Wet substrate and forms thoroughly and then remove standing water.
   3. Pretreatment: Apply specified bonding agent.
   4. Place dry-pack mortar into cavity by hand, and compact tightly into place. Do not place more material at a time than can be properly compacted. Continue placing and compacting until patch is approximately level with surrounding surface.
   5. After cavity is filled and patch is compacted, trowel surface to match profile and finish of surrounding concrete. A thin coat of patching mortar may be troweled into the surface of patch to help obtain required finish.
   6. Wet-cure patch for not less than seven days by water-fog spray or water-saturated absorptive cover.

E. Concrete: Place according to Section 033053 "Miscellaneous Cast-in-Place Concrete" and as follows:
   1. Pretreatment: Apply epoxy-modified, cementitious bonding and anticorrosion agent to reinforcement and concrete substrate.
   2. Standard Placement:
      a. Use vibrators to consolidate concrete as it is placed.
      b. At unformed surfaces, screed concrete to produce a surface that when finished with patching mortar will match required profile and surrounding concrete.

3. Wet-cure concrete for not less than seven days by leaving forms in place or keeping surfaces continuously wet by water-fog spray or water-saturated absorptive cover.
4. Fill placement cavities with dry-pack mortar and repair voids with patching mortar. Finish to match surrounding concrete.

F. Epoxy Crack Injection:
1. Clean areas to receive capping adhesive of oil, dirt, and other substances that would interfere with bond, and clean cracks with oil-free compressed air or low-pressure water to remove loose particles.
2. Place injection ports as recommended by epoxy manufacturer, spacing no farther apart than thickness of member being injected. Seal injection ports in place with capping adhesive.
3. Seal cracks at exposed surfaces with a ribbon of capping adhesive at least 1/4 inch thick by 1 inch wider than crack.
4. Inject cracks wider than 0.003 inch to a depth of 8 inches.
5. Inject epoxy adhesive, beginning at widest part of crack and working toward narrower parts. Inject adhesive into ports to refusal, capping adjacent ports when they extrude epoxy. Cap injected ports and inject through adjacent ports until crack is filled.
6. After epoxy adhesive has set, remove injection ports and grind surfaces smooth.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:
1. Packaged, Cementitious Patching Mortar: 3 randomly selected sets of samples for each type of mortar required, tested according to ASTM C 928.
2. Concrete: As specified in Section 033053 "Miscellaneous Cast-in-Place Concrete"
3. Epoxy Crack Injection: Core-drilled samples to verify proper installation.
   a. Testing Frequency: 1 sample for each 100 feet of crack injected.
   b. Where samples are taken, refill holes with epoxy mortar.

C. Product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 030130

SECTION 033053

MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cast-in-place concrete including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: Cured samples for each exposed product and for each color and texture specified, in manufacturer's standard size appropriate for each type of work.

1.04 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Comply with the following sections of ACI 301, unless modified by requirements in the Contract Documents:
   1. "General Requirements."
   2. "Formwork and Formwork Accessories."
   3. "Reinforcement and Reinforcement Supports."
   4. "Concrete Mixtures."
   5. "Handling, Placing, and Constructing."

C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 PRODUCTS

2.01 FORMWORK

A. Furnish formwork and formwork accessories according to ACI 301.

2.02 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:

B. Normal-Weight Aggregate: ASTM C 33, graded, 1-1/2-inch nominal maximum aggregate size.

C. Water: ASTM C 94/C 94M.

2.04 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

B. Water: Potable.

2.05 CONCRETE MIXTURES

A. Comply with ACI 301 requirements for concrete mixtures.

B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
   1. Minimum Compressive Strength: 4000 psi at 28 days.
   2. Slump Limit: 4 inches, plus or minus 1 inch.

2.06 CONCRETE MIXING

A. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..

PART 3 EXECUTION

3.01 FORMWORK

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.03 STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.04 CONCRETE PLACEMENT

A. Comply with ACI 301 for placing concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. Consolidate concrete with mechanical vibrating equipment.

3.05 FINISHING FORMED SURFACES

A. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.06 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
   1. Do not further disturb surfaces before starting finishing operations.

3.07 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

C. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

3.08 REPAIRS

A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION 033053

SECTION 040120
MAINTENANCE OF UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Maintenance of unit masonry consisting of miscellaneous brick masonry repair as follows:
   1. Repairing unit masonry, including replacing units.
   2. Repointing joints.
   3. Preliminary cleaning, including removing plant growth and biological staining.
   4. Cleaning exposed unit masonry surfaces.

B. Related Sections:
   1. Section 040140 "Maintenance of Stone Assemblies."
   2. Section 076200 "Sheet Metal Flashing and Trim" for metal flashing installed in or on restored masonry.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi.

B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

E. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

B. Samples for Initial Selection: For the following:
   1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
      a. Have each set contain a close color range of at least six Samples of different mixes of colored sands and cements that produce a mortar matching the cleaned masonry when cured and dry.
      b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
   2. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.
      a. Have each set contain a close color range of at least six Samples of different mixes of patching compound that matches the variations in existing masonry when cured and dry.
   3. Include similar Samples of accessories involving color selection.

C. Samples for Verification for the following:
   1. Each type of masonry unit to be used for replacing or repairing existing units. Include sets of samples as necessary to show the full range of shape, color, and texture to be expected.
      a. For each masonry unit type, provide straps or panels of sufficient quantity to show typical range or variety in consistency.

2. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
   a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
3. Sealant Materials: See Section 079200 "Joint Sealants."
4. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

B. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

C. MOCK-UP
   1. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
   2. Locate as directed by Architect or Owner.
   3. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work
   4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.

B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

B. Repair masonry units and repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
   1. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.

D. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair

materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

F. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.08 COORDINATION

A. Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns, parking lot and active roadway.. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.09 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Order sand for pointing mortar immediately after approval of Samples. Take delivery of and store at Project site a sufficient quantity to complete Project.

C. Perform masonry restoration work in the following sequence:
   1. Remove plant growth or other organic matter.
   2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
   3. Clean masonry surfaces.
   4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
   5. Repair masonry, including replacing existing masonry with new masonry materials.
   6. Rake out mortar from joints to be repointed.
   7. Point mortar joints.
   8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
   9. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
   10. Clean masonry surfaces.

D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

PART 2 PRODUCTS

2.01 MASONRY MATERIALS

A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.
   1. Provide units with colors, color variation within units, surface texture, size, and shape to match existing brickwork and with physical properties within 10 percent of those determined from preconstruction testing of selected existing units.
      a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.
   2. Special Shapes:
      a. Provide specially molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position and where shapes produced by sawing would result in sawed surfaces being exposed to view.
      b. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are not acceptable procedures for fabricating special shapes.
   3. Tolerances as Fabricated: Comply with tolerance requirements in ASTM C 216, Type FBS.

2.02 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both where required for color matching of exposed mortar.
   1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Sand: ASTM C 144 unless otherwise indicated.
   1. Color: Provide natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
   2. For pointing mortar, provide sand with rounded edges.
   3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

D. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

E. Water: Potable.

2.03 MANUFACTURED REPAIR MATERIALS

A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cathedral Stone Products, Inc; Jahn M100 Terra Cotta and Brick Repair Mortar.
      b. Conproco Corporation
      c. Edison Coatings, Inc.
   2. Use formulation that is vapor- and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
   3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
   4. Formulate patching compound used for patching brick in colors and textures to match each masonry unit being patched. Provide not less than three colors to enable matching the color, texture, and variation of each unit.

2.04 CLEANING MATERIALS

A. Water: Potable.

2.05 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. American Building Restoration Products, Inc; Rubber Mask.
      b. Price Research, Ltd; Price Mask.
      c. PROSOCO, Inc; Sure Klean Strippable Masking.

B. Setting Buttons: Resilient plastic buttons, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.

C. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.

D. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:
   1. Previous effectiveness in performing the work involved.

2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:
   a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
   b. Leave a residue on surfaces.

2.06 MORTAR MIXES

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.

B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mortar Proportions: Mix mortar materials in the following proportions:
   1. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts sand.
      a. Add mortar pigments to produce mortar colors required.
   2. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type O unless otherwise indicated; with cementitious material limited to portland cement and lime.

PART 3 EXECUTION

3.01 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
   1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Prevent mortar from staining face of surrounding masonry and other surfaces.
   1. Cover sills, ledges, and projections to protect from mortar droppings.
   2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
   3. Immediately remove mortar in contact with exposed masonry and other surfaces.
   4. Clean mortar splatters from scaffolding at end of each day.

3.02 BRICK REMOVAL AND REPLACEMENT

A. At required locations, remove bricks that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
   1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

D. Remove in an undamaged condition as many whole bricks as possible.
   1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
   2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
   3. Store brick for reuse. Store off ground, on skids, and protected from weather.

E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Replace removed damaged brick with other removed brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.

G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
   1. Maintain joint width for replacement units to match existing joints.
   2. Use setting buttons or shims to set units accurately spaced with uniform joints.

H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
   1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
   2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
   3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.03 MASONRY UNIT PATCHING

A. Patch the following masonry units unless another type of replacement or repair is indicated:
   1. Units indicated to be patched.
   2. Units with holes.
   3. Units with chipped edges or corners.
   4. Units with small areas of deep deterioration.

B. Remove and replace existing patches unless otherwise indicated or approved by Architect.

C. Patching Bricks:
   1. Remove loose material from masonry surface. Carefully remove additional material so patch will not have feathered edges but will have square or slightly undercut edges on area to be patched and will be at least 1/4 inch thick, but not less than recommended by patching compound manufacturer.
   2. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of masonry unit.
   3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
   4. Rinse surface to be patched and leave damp, but without standing water.
   5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
   6. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
   7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the masonry unit. Shape and finish surface before or after curing, as determined by testing, to best match existing masonry unit.
   8. Keep each layer damp for 72 hours or until patching compound has set.

3.04 CLEANING MASONRY, GENERAL

A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
   a. Equip units with pressure gages.
3. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

D. Water Application Methods:
1. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

F. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.05 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.

3.06 CLEANING BRICKWORK

A. Cold-Water Wash: Use cold water applied by medium-pressure spray.

3.07 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:
1. All joints in areas indicated.
2. Joints where mortar is missing or where they contain holes.
3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
4. Cracked joints where cracks are 1/16 inch or more in width and of any depth.
5. Joints where they sound hollow when tapped by metal object.
6. Joints where they are worn back 1/4 inch or more from surface.
7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
8. Joints where they have been filled with substances other than mortar.
9. Joints indicated as sealant-filled joints.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of 2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, unweathered mortar.
2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
   a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:
1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing applications so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.
   a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
   b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.08 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other nonmasonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

END OF SECTION 040120

SECTION 040140
MAINTENANCE OF STONE ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes maintenance of stone assemblies consisting of stone restoration and cleaning as follows:
   1. Repairing stone masonry, including replacing whole and partial units.
   2. Repointing joints.
   3. Preliminary cleaning, including removing plant growth.
   4. Cleaning exposed stone surfaces.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi.

B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

E. Stone Terminology: ASTM C 119.

F. Face Bedding: Setting of stone with the natural bedding planes (strata) vertical and parallel to the wall plane rather than horizontal or "naturally bedded," which holds bedding planes together by gravity.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

B. Samples for Initial Selection: For the following:
   1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
      a. Have each set contain a close color range of at least six Samples of different mixes of colored sands and cements that produce a mortar matching the cleaned stone when cured and dry.
      b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
   2. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of stone representative of the range of stone colors on the building.
      a. Have each set contain a close color range of at least six Samples of different mixes of patching compound that matches the variations in existing stone when cured and dry.
   3. Include similar Samples of accessories involving color selection.

C. Samples for Verification: For the following:
   1. Each type of replacement stone. Include sets of Samples as necessary to show full range of color, texture, grain, veining, and finish to be expected. Provide sets of at least three 12-by-12-inch Samples for each type, but no fewer than necessary to indicate full range and the proportion of variations within range.
   2. Each type of sand used for pointing mortar; minimum 1 lb of each in plastic screw-top jars.
      a. For blended sands, provide Samples of each component and blend.
      b. Identify sources, both supplier and quarry, of each type of sand.
   3. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.05 QUALITY ASSURANCE

A. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

B. Source Limitations: Obtain each type of material for stone restoration (stone, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

C. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

D. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
   1. Stone Repair: Prepare sample areas for each type of stone indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
      a. Replacement: Four stone units replaced.
      b. Partial Stone Replacement: Two partial stone replacements (dutchman repairs).
      c. Stone Plug Repair: Two stone plug repairs for each type of stone indicated to be plugged.
      d. Crack Injection: Apply crack injection in 2 separate areas, each approximately 36 inches long.
      e. Patching: Three small holes at least 1 inch in diameter.
   2. Repointing: Rake out joints in 2 separate areas, each approximately 36 inches high by 48 inches wide for each type of repointing required and repoint one of the areas.
   3. Cleaning: Clean an area approximately 25 sq. ft. for each type of stone and surface condition.
      a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.
      b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
   4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver stone units to Project site strapped together in suitable packs or pallets or in heavy-duty crates.

B. Deliver each piece of stone with code mark or setting number on unexposed face, corresponding to Shop Drawings, using nonstaining paint.

C. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit stone restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

B. Repair stone units and repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for stone repair and mortar-joint pointing unless otherwise indicated:
   1. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.

D. Hot-Weather Requirements: Protect stone repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

F. Clean stone surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.08 COORDINATION

A. Coordinate stone restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns, parking lots, and active roadways. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.09 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Order sand and gray portland cement for pointing mortar immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.

C. Perform stone restoration work in the following sequence:
   1. Remove plant growth.
   2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
   3. Clean stone surfaces.
   4. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
   5. Repair stonework, including replacing existing stone with new stone.
   6. Rake out mortar from joints to be repointed.
   7. Point mortar joints.
   8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
   9. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
   10. Clean stone surfaces.

D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in stone to comply with "Stone Patching" Article. Patch holes in mortar joints to comply with "Repointing Stonework" Article.

PART 2 PRODUCTS

2.01 STONE MATERIALS

A. Stone: Provide natural building stone of variety, color, texture, grain, veining, finish, size, and shape to match existing stone and with physical properties within 10 percent of those determined from preconstruction testing of selected existing stone.
   1. For existing stone that exhibits a range of colors, texture, grain, veining, finishes, sizes, or shapes, provide stone that proportionally matches that range rather than stone that matches an individual color, texture, grain, veining, finish, size, or shape within that range.

B. Quarrying New Stone: Have quarry clearly label the direction of bedding planes when rough stone is quarried, to facilitate cutting stones so that natural bedding planes will be as required in "Cutting New Stone" Paragraph.

C. Cutting New Stone: Regardless of how existing stone was cut and set, cut each new stone so that, when it is set in final position, natural bedding planes are essentially horizontal.

2.02 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both where required for color matching of exposed mortar.
   1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Sand: ASTM C 144 unless otherwise indicated.
   1. Color: Provide natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
   2. For pointing mortar, provide sand with rounded edges.
   3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

D. Water: Potable.

2.03 MANUFACTURED REPAIR MATERIALS

A. Stone Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching stone.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cathedral Stone Products, Inc.
      b. Conproco Corporation
      c. Edison Coatings, Inc.
      d. KEIM Mineral Coatings of America; KEIM Restauro.
   2. Use formulation that is vapor- and water permeable (equal to or more than the stone), exhibits low shrinkage, has lower modulus of elasticity than the stone units being repaired, and develops high bond strength to all types of stone.
   3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
   4. Formulate patching compound in colors, textures, and grain to match stone being patched. Provide not less than three colors to enable matching each piece of stone.

B. Cementitious Crack Filler: An ultrafine superplasticized grout that can be injected into cracks, is suitable for application to wet or dry cracks, exhibits low shrinkage, and develops high bond strength to all types of stone.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cathedral Stone Products, Inc; Jahn Injection Grout.
      b. Conproco Corporation; Terra Cotta Finish.
      c. Edison Coatings, Inc; Pump-X 53-Series.

C. Stone-to-Stone Adhesive: 2-part polyester or epoxy-resin stone adhesive with a 15- to 45-minute cure at 70 deg F, recommended by adhesive manufacturer for type of stone repair indicated, and matching stone color.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Two-Part Polyester or Epoxy-Resin Stone Adhesive:
         1) Akemi North America
         2) Bonstone Materials Corporation; Fast Set 41.
         3) Edison Coatings, Inc; Flexi-Weld 520T.

2.04 CLEANING MATERIALS

A. Water: Potable.

B. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gal. of solution required.

C. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

D. One-Part Limestone Cleaner: Manufacturer's standard one-part acidic formulation for cleaning limestone.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. American Building Restoration Products, Inc; X-190 Limestone & Concrete Cleaner.
      b. Hydroclean; Hydrochemical Techniques, Inc; Hydroclean Limestone and Marble Cleaner and Brightener (HT-907).
      c. Price Research, Ltd; Price Limestone Restorer.
      d. PROSOCO, Inc; Sure Klean Limestone Restorer.

2.05 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. American Building Restoration Products, Inc; Rubber Mask.
      b. Price Research, Ltd; Price Mask.
      c. PROSOCO, Inc; Sure Klean Strippable Masking.

B. Setting Buttons: Resilient plastic buttons, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.

C. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.

D. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:
   1. Previous effectiveness in performing the work involved.
   2. Little possibility of damaging exposed surfaces.
   3. Consistency of each application.
   4. Uniformity of the resulting overall appearance.
   5. Do not use products or tools that could do the following:
      a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
      b. Leave a residue on surfaces.

2.06 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mortar Proportions: Mix mortar materials in the following proportions:
   1. Pointing Mortar for Stone: 1 part white portland cement, 2 parts lime, and 6 parts sand.
   2. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type N unless otherwise indicated, with cementitious material limited to portland cement and lime.

2.07 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

PART 3 EXECUTION

3.01 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from stone restoration work.
   1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Prevent mortar from staining face of surrounding stone and other surfaces.
   1. Cover sills, ledges, and projections to protect from mortar droppings.
   2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
   3. Immediately remove mortar in contact with exposed stone and other surfaces.
   4. Clean mortar splatters from scaffolding at end of each day.

3.02 STONE REMOVAL AND REPLACEMENT KEYNOTE A4

A. At locations indicated, remove stone that has deteriorated or is damaged beyond repair. Carefully demolish or remove entire units from joint to joint, without damaging surrounding stone, in a manner that permits replacement with full-size units.

B. Support and protect remaining stonework that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing stone or unit masonry backup, rotted wood, rusted metal, and other deteriorated items.

D. Remove in an undamaged condition as many whole stone units as possible.
   1. Remove mortar, loose particles, and soil from stone by cleaning with hand chisels, brushes, and water.
   2. Remove sealants by cutting close to stone with utility knife and cleaning with solvents.
   3. Store stone for reuse. Store off ground, on skids, and protected from weather.
   4. Deliver cleaned stone not required for reuse to Owner unless otherwise indicated.

E. Clean stone surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Replace removed damaged stone with other removed stone in good quality, where possible, or with new stone matching existing stone, including size. Do not use broken units unless they can be cut to usable size.

G. Do not allow face bedding of stone. Before setting, inspect to verify that each stone has been cut so that, when it is set in final position, natural bedding planes are essentially horizontal.

Reject and replace stone with vertical bedding planes except as required for arches, lintels, and copings.

H. Install replacement stone into bonding and coursing pattern of existing stone. If cutting is required, use a motor-driven saw designed to cut stone with clean, sharp, unchipped edges. Finish edges to blend with appearance of edges of existing stone.
   1. Maintain joint width for replacement stone to match existing joints.
   2. Use setting buttons or shims to set stone accurately spaced with uniform joints.

I. Set replacement stone with completely filled bed, head, and collar joints. Butter vertical joints for full width before setting and set units in full bed of mortar unless otherwise indicated. Replace existing anchors with new anchors of size and type indicated.
   1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing stonework.
   2. Rake out mortar used for laying stone before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing stone, and at same time as repointing of surrounding area.
   3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.03 PARTIAL STONE REPLACEMENT KEYNOTE A1 & A4

A. Remove defective portion of existing stone unit (backing stone). Carefully remove defective portion of stone by making vertical and horizontal saw cuts at face of backing stone and demolishing defective material to depth required for fitting partial replacement (dutchman).
   1. Make edges of backing stone at cuts smooth and square to each other and to finished surface; essentially rectangular. Make back of removal area flat and parallel to stone face.
   2. Do not overcut at corners and intersections. Hand trim to produce clean sharp corners with no rounding and no damage to existing work to remain.
   3. If existing stone that is to remain becomes damaged, remove damaged area and enlarge partial replacement as required.

B. Remove mortar from joints that abut area of stone removal to same depth as stone was removed. Remove loose mortar particles and other debris from surfaces to be bonded and surfaces of adjacent stone units that will receive mortar by cleaning with stiff-fiber brush.

C. Cut and trim partial replacement to accurately fit area where material was removed from backing stone. Fabricate to size required to produce joints between partial replacement and backing stone of no more than 1/16 inch in width, and joints between partial replacement and other stones that match existing joints between stones. Cut partial replacement so that, when it is set in final position, natural bedding planes will match the orientation of bedding planes of the backing stone unless otherwise indicated.

D. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of backing stone and partial replacement, completely filling all crevices and voids.

E. Apply partial replacement while adhesive is still tacky and hold securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of partial replacement with face of backing stone.

F. Clean adhesive residue from exposed surfaces and patch chipped areas as specified in "Stone Patching" Article.

3.04 STONE PLUG REPAIR KEYNOTES A2 & A3

A. Remove cylindrical piece of damaged stone by core-drilling perpendicular to stone surface.

B. Prepare a replacement plug by core-drilling replacement stone. Use a drill sized to produce a core that will fit into hole drilled in damaged stone with only minimum gap necessary for adhesive. Cut and install plug so that, when it is set in final position, natural bedding planes will match the orientation of bedding planes of the backing stone unless otherwise indicated.

C. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of existing stone and plug, completely filling all crevices and voids.

D. Apply plug while adhesive is still tacky and hold securely in place until adhesive has cured.

E. Clean adhesive residue from exposed surfaces.

3.05 STONE-FRAGMENT REPAIR KEYNOTES A1 & A2

A. Carefully remove cracked or fallen stone fragment indicated to be repaired. Reuse only stone fragment that is in sound condition.

B. Remove soil, loose particles, mortar, and other debris or foreign material, from fragment surfaces to be bonded and from parent stone where fragment had broken off, by cleaning with stiff-fiber brush.

C. Apply stone-to-stone adhesive to comply with adhesive manufacturer's written instructions. Coat bonding surfaces of fragment and parent stone, completely filling all crevices and voids.

D. Fit stone fragment onto parent stone while adhesive is still tacky and hold fragment securely in place until adhesive has cured. Use shims, clamps, wedges, or other devices as necessary to align face of fragment with face of parent stone.

E. Clean adhesive residue from exposed surfaces and patch chipped areas as specified in "Stone Patching" Article.

3.06 CRACK INJECTION KEYNOTE A2

A. General: Comply with cementitious crack-filler manufacturer's written instructions.

B. Drill 1/4-inch-diameter injection holes as follows:
   1. Transverse Cracks Less Than 3/8 inch Wide: Drill holes through center of crack at 12 to 18 inches o.c.
   2. Transverse Cracks More Than 3/8 inch Wide: Drill holes through center of crack at 18 to 36 inches o.c.
   3. Delaminations: Drill holes at approximately 18 inches o.c. both vertically and horizontally.
   4. Drill holes 2 inches deep. Where possible drill holes in mortar joints.

C. Clean out drill holes and cracks with compressed air and water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.

D. Place plastic injection ports in drilled holes and seal face of cracks between injection ports with clay or other nonstaining, removable plugging material. Leave openings at upper ends of cracks for air release.

E. Inject cementitious crack filler through ports sequentially, beginning at one end of area and working to opposite end; where possible, begin at lower end of injection area and work upward. Inject filler until it extrudes from adjacent ports. After port has been injected, plug with clay or other suitable material and begin injecting filler at adjacent port, repeating process until all ports have been injected.

F. Clean cementitious crack filler from face of stone before it sets by scrubbing with water.

G. After cementitious crack filler has set, remove injection ports, plugging material, and excess filler. Patch injection holes and surface of cracks as specified in "Stone Patching" Article.

3.07 STONE PATCHING KEYNOTE A1

A. Patch the following stone units unless another type of replacement or repair is indicated:
   1. Units indicated to be patched.
   2. Units with holes.
   3. Units with chipped edges or corners.
   4. Units with small areas of deep deterioration.

B. Remove and replace existing patches unless otherwise indicated or approved by Architect.

C. Remove deteriorated material and remove adjacent material that has begun to deteriorate. Carefully remove additional material so patch will not have feathered edges but will have square

or slightly undercut edges on area to be patched and will be at least 1/4 inch thick, but not less than recommended by patching compound manufacturer.

D. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of stone unit.

E. Mix patching compound in individual batches to match each stone unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.

F. Brush-coat stone surfaces with slurry coat of patching compound according to manufacturer's written instructions.

G. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
   1. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the stone. Shape and finish surface before or after curing, as determined by testing, to best match existing stone.
   2. Build patch up 1/4 inch above surrounding stone and carve surface to match adjoining stone after patching compound has hardened.

H. Keep each layer damp for 72 hours or until patching compound has set.

I. Remove and replace patches with hairline cracks or that show separation from stone at edges, and those that do not match adjoining stone in color or texture.

3.08 CLEANING STONE, GENERAL

A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each stone material and location.
   1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
   2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage stone.
      a. Equip units with pressure gages.
   3. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging stone surfaces.

D. Water Application Methods:
   1. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of stone and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Chemical-Cleaner Application Methods: Apply chemical cleaners to stone surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
   1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

G. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.09 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from stone surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil or debris from open joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
   1. Carefully remove heavy accumulations of material from surface of stone with sharp chisel. Do not scratch or chip stone surface.

3.10 CLEANING STONEWORK KEYNOTE B

A. Cold-Water Wash: Use cold water applied by medium-pressure spray.

B. Mold, Mildew, and Algae Removal:
   1. Wet stone with cold water applied by low-pressure spray.
   2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
   3. Scrub stone with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that stone surface remains wet.
   4. Rinse with cold water applied by medium-pressure spray to remove mold, mildew, and algae remover and soil.
   5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

C. One-Part Limestone Chemical Cleaning:
   1. Wet stone with cold water applied by low-pressure spray.
   2. Apply cleaner to stone by brush or low-pressure spray. Let cleaner remain on surface for period recommended by chemical-cleaner manufacturer.
   3. Immediately repeat application of one-part limestone cleaner as indicated above over the same area.
   4. Rinse with cold water applied by medium-pressure spray to remove chemicals and soil.

3.11 REPOINTING STONEWORK KEYNOTE C

A. Rake out and repoint joints to the following extent:
   1. All joints in areas indicated.
   2. Joints where mortar is missing or where they contain holes.
   3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
   4. Cracked joints where cracks are 1/8 inch or more in width and of any depth.
   5. Joints where they sound hollow when tapped by metal object.
   6. Joints where they are worn back 1/4 inch or more from surface.
   7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
   8. Joints where they have been filled with substances other than mortar.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:
   1. Remove mortar from joints to depth of 2 times joint width, but not less than 1/2 inch or not less than that required to expose sound, unweathered mortar.
   2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
   3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Architect.

a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:
1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing applications so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
   a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
   b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days before beginning cleaning work.

3.12 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other nonstone surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

END OF SECTION 040140

SECTION 040200
ARCHITECTURAL TERRA COTTA

PART I GENERAL

1.01 SECTION INCLUDES:

A. Provide new Terra Cotta as indicated on Drawings.

B. Detail, furnish, and install support, anchorage, and connection devices and coordinate size and configuration with other elements of the work.

C. Related Sections:
   1. Section 013000 - Administrative Requirements
   2. Section 040220 - Terra Cotta Restoration

1.02 REFERENCES

A. ASTM C212 - Standard Specification for Structural Clay Facing Tile.

B. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.

C. ASTM C67 - Standard Methods of Sampling and Testing Brick and Structural Clay Tile.

1.03 QUALITY ASSURANCE

A. Contractor Qualifications:
   1. All work shall be performed by mechanics experienced in the handling and setting of the material having not less than five (5) years satisfactory experience in comparable installation of new Terra Cotta including work on at least two (2) projects similar in scope and scale to this Project. Submit references with name of contact person and telephone number for the two (2) submitted similar projects.

B. Manufacturer's Qualifications:
   1. All Terra Cotta work shall be by a manufacturing firm normally in business of producing work of the type indicated and shall be capable of submitting proof to the Architect/Engineer as follows:
      a. Length of Time in this Kind of Manufacturing: Five (5) years.
      b. Photographs and Job Description: At least three (3) previous jobs.

C. Installer's Qualifications:
   1. All Terra Cotta work shall be installed by a firm normally in business of installing work of the type indicated and shall be capable of submitting proof to the Architect / Owner as follows:
      a. Length of Time in this kind of Installation: Ten (10) years.
      b. Photographs and Job Description: At least two (2) previous jobs.

1.04 SUBMITTALS

A. Submit under provision of Section 013000.

B. Shop and Setting Drawings:
   1. The Contractor shall furnish the Terra Cotta manufacturer with all drawings, details and information necessary for the manufacture of Terra Cotta units, including drawings of all classes of work with which the Terra Cotta engages, proposed method of installation and elevations showing location of the units to be replaced.
   2. Submit shop, fabrication and setting drawings for approval by the Architect prior to production of any material. Contractor shall be responsible for all field dimension verification.
   3. Shop drawings shall show sections, dimensions and connection with other work. These drawings must conform as nearly as practicable to the architect's drawing, but shall be in accordance with good Terra Cotta structural practice.
   4. Anchorage: Terra Cotta unit anchorage shall be coordinated with the Terra Cotta manufacturer and submitted to the Architect/Engineer for approval. The attachment design will withstand loads from wind, earthquake, gravity, building movement, and thermally

induce movement according to the requirements of the governing Building Code and good engineering practice. The Terra Cotta manufacturer shall provide [1] digital copies of the complete set of scale shop drawings to be used for setting and showing the piece numbering of the Terra Cotta. The size of the joints to be used for setting the various portions of the work shall be clearly indicated. These drawings shall be designated as the setting drawings.

C. Samples:
   1. Whenever Terra Cotta is required to match existing terra cotta in contour, color finish and surface treatment, as for example in connection with alterations to existing work, the Terra Cotta manufacturer shall be furnished with the required profiles and samples of the original work and other needed information by the Contractor.
   2. Preliminary Color Sample Approval: Submit two 6” x 6” x 5/8” samples showing typical color range and finish for preliminary acceptance.
   3. Final Approval: After approval of the preliminary color sample, submit two (2) final samples at minimum 12” x 12” x 3/4” which when inspected and approved become the standard for quality, color range, texture and color finish. All materials shall conform to the approved samples within the range, subject to normal ceramic variation. Submit manufacturer’s specifications and other product data for each manufactured product including instructions for storage, handling and use.

D. Contractor to submit details and procedures for incremental protection of completed work. At a minimum, install protection after installation of each eight feet height of completed Terra Cotta wall.

E. Material Testing:
   1. Test in accordance with ASTM C67 to determine compressive strength and absorption. Use a certified lab for testing. Manufacturer to supply current test data.

1.05 PRODUCT DELIVER, STORAGE AND HANDLING

A. Packing and crating of the architectural Terra Cotta shall be done by the manufacturer to prevent damage to the units in transit by normal handling methods. Delivery shall be made to correspond to priority sequencing as directed by the Contractor.

B. The Contractor becomes responsible for the product at the time it is received.

1.06 JOB CONDITIONS

A. Cold Weather: Perform work in accordance with ACI 530.1 current edition.

B. Hot Weather: Perform work in accordance with ACI 530.1 current edition.

C. At end of the working day, or during rainy weather, cover masonry work exposed to weather with waterproof coverage and securely anchor as necessary.

D. Protection: Adequately protect and do not damage existing construction to remain.

PART 2 - PRODUCTS

2.01 TERRA COTTA AND ACCESSORIES

A. Terra Cotta units shall be provided to match existing units to remain with respect to finish appearance, size, and profile
   1. Manufacture all pieces for particular installation conditions to minimize any cutting in the field. Contractor to adjust individual pieces to accommodate setting sequence. (In concrete or steel frame building, the veneer or facing material should be fully and continuously supported, at each floor level on shelf supports, of adequate strength and stiffness, rigidly connected to the structural frame, steel shelf angles or supports, in all cases, should be located in mortar joints. The strength of the Terra Cotta should not be unnecessarily reduced by cutting the webs to receive the steel.)
   2. Adjust Terra Cotta to accommodate relieving angles, vents, weeps, expansion joints, etc.
      a. Proper provision should be made for expansion joints, at shelf supports, over column cases, etc., to prevent the development of disruptive stresses cause by deflection, wind pressure, temperature changes, settlement and like forces.

b. Properly constructed flashing should be provided as required.

B. Install by anchored method as required by referenced standards and as described on approved shop drawings.
   1. All anchors, hangers, bolts, clips, straps, rods and pins for securing Terra Cotta shall be of stainless steel or galvanized steel.

C. Quality control:
   1. Terra Cotta units shall conform to the physical requirements listed below as preformed in accordance with ASTM Specifications.
      a. Compressive Strength - ASTM C67
      b. Absorption (5hour boil) - ASTM C67
      c. Saturation Coefficient - ASTM C67
      d. Crazing - ASTM C126
   2. Face Dimension Tolerances: The face dimensions (length and width) of sized/cut Terra Cotta units shall not vary more than 1/16 inch over or under the dimensions specified on the shop drawings. Handmade Tolerance - Table II and III, C126: Exposed face shall not vary from shop drawing dimensions by more than 1/8 inch plus or minus per linear foot.
   3. Warpage Tolerances: The exposed face of hand made Terra Cotta shall not vary from a true plane more than the existing original material. Warpage Tolerances - The exposed face of machine extruded ceramic veneer shall not vary from a true plane by more than 0.005 inch per inch of length.
   4. Finished faces that will be exposed when installed shall be free from chips, blisters or other imperfections detracting from the appearance of the finished wall when viewed from a normal viewing distance or of a minimum of 15 feet.

D. Terra Cotta Specifications (Test Average based on 10 samples / Method):
   1. Compressive Strength - 6000 psi / ASTM C67 (Criteria: ASTM C126)
   2. Absorption (5 hour boil) 11.5% / ASTM C67
   3. Absorption (24 hour soak) 7.5% / ASTM C67
   4. Saturation Coefficient - .69 / ASTM C67
   5. Craze Resistance / ASTM C126
   6. Glaze absorption - .15% / ASTM C67
   7. Freeze/thaw resistance / ASTM C67 (Criteria: 300)
   8. Cycles without degradation

2.02 MORTAR AND GROUT MATERIALS

A. Mortars shall comply with ASTM C270

B. Grouts shall comply with ASTM C476

C. Cementitious Materials:
   1. Portland Cement: ASTM C150, Type I or II; low-alkali per ASTM C150, Table 2
   2. Hydrated Lime: ASTM C207, Type S

D. Aggregates:
   1. Sand: Clean, washed natural or manufactured silica sand grated according to ASTM C144, shall contain no more than 50 parts per million of chloride ions, and shall be free or organic contaminants.
   2. Coarse Aggregates: ASTM C404 with a maximum size of 3/8” diameter. Aggregate shall contain no more than 50 parts per million of chloride ions and shall be free of organic contaminants.
   3. Water: Potable, clean and free from injurious amount of oil, alkali, organic matter or other deleterious material.

2.03 FABRICATION

A. All joints shall be straight and true. All Terra Cotta shall be laid out at the factor to check for uniformity of joint widths and over-all dimensions. Where necessary to secure accurate dimensions and uniform joint widths, the material shall be sized straight and true.

PART 3 EXECUTION

3.01 PREPARATION BY INSTALLER

A. Establish lines, levels, and coursing. Protect from disturbance.

B. Clean new unit prior to setting, leaving edges and surfaces free of dirt or foreign material. Do not use wire brushes or implements that mark or damage exposed surfaces.
   1. Soak units in a vat or box of clean water for one hour or more just prior to installation. Units shall be noticeably damp at the time of setting. Units shall be drained sufficiently to eliminate surface water.
   2. At the beginning of setting each day, soak all walls to be faced with clean water applied by a hose and spray nozzle. Soak again with water not more than one hour before setting of unit.

3.02 INSTALLATION: GENERAL

A. General Contractor to evaluate existing construction and furnish and install appropriate anchors, etc. to install replacement Terra Cotta units in existing wall construction.

B. All other loose anchors, such as clamps, hangers, clips, straps, and pins shall be furnished and installed by the Terra Cotta Installation Contractor and coordinated by the General Contractor as required.

C. Proper care should be exercised to prevent the corrosion of all steel supports,ties, etc. Where such protection cannot be permanently secured through encasement with mortar or concrete, or through the use of corrosion resistant metallic coating, non-corrosive metals should be employed.

D. Exposed free-standing construction, subject to the absorption of water through mortar joints and liable to injury from subsequent freezing, or the expansion of improper filling material, should generally be left unfilled and should be ventilated by means of small, inconspicuously placed weep-holes as required.

E. Maintain uniform joint widths to match existing.

F. Erection Tolerances:
   1. Variation from Plumb: In accordance with ACI 530.1 current edition.
   2. Variation from Level: In accordance with ACI 530.1 current edition
   3. Variation from True Plane: In accordance with ACI 530.1 current edition.

3.03 MIXING, MORTAR AND GROUT

A. Mix and proportion cementitious materials for site-made setting beds and grout:
   1. Setting Mortar:
      a. Use Type N mortar; in accordance with ASTM C270 with the following material mix proportion by volume:
         1) Portland Cement: 1 part
         2) Hydrated Lime: 1 part
         3) Sand: 6 parts
      b. Color of mortar shall match building’s existing cleaned mortar.
      c. Use colored sand to obtain desired mortar color.
   2. Pointing Mortar:
      a. Use setting mortar for new construction. If new construction is adjacent to existing, match color of mortar. If new Terra Cotta is to replace existing refer to Section 040220 Terra Cotta Restoration,
      b. Mortar for Terra Cotta Pointing
         1) TYPE N: (Harder compression strength)
            (a) Portland Cement: 1 part
            (b) Hydrated Lime: 1 part
            (c) Sand: 6 parts
         2) TYPE O: (Softer compression strength)
            (a) Portland Cement: 1 part

(b) Hydrated Lime: 2 part
(c) Sand: 9 parts

3. Color of mortar shall match building's existing cleaned mortar.
4. Use colored sand to obtain desired mortar color.

3.04 SETTING FOR TERRA COTTA NON-CAVITY WALL

A. Just prior to commencement of setting, brush a coat of neat Portland Cement and water onto a limited area of the wall and the entire back of the piece of soaked Terra Cotta unit to be set.

B. Immediately thereafter spread half of the setting mortar coat on a limited area of the wall and the other half over the back of the Terra Cotta unit.

C. Screed the setting mortar trawled on the back of Terra Cotta unit to a uniform thickness as measured from the face of the Terra Cotta. Screed the other half of the setting mortar applied to the wall surface to a true and plumb level.

D. The total thickness of the setting mortar coat shall average 3/4 inch, but use sufficient mortar to create a slight excess, which will be forced out at the joints at the edge of the unit when tapped into place.

E. Firmly place the unit against the wall by repeated tapping with a rubber mallet to eliminate all voids in the setting bed.

F. Completely fill all voids and joints with appropriate mortar grout and make watertight. Rake out the face joints of each unit 1/2 inch to allow for pointing.

G. Anchorage and reinforcement shall be located in bed joints and/or interior webs as indicated on approved shop drawings. Clean and degrease anchors prior to setting in expoxied holes. Follow manufacturer's instructions for proper cure of epoxy prior to setting.

H. Remove any Terra Cotta unit tipped away from the wall for readjustment or improperly set for any reason. Remove and clean away all mortar from units and wall surface, and reset in accordance with the above procedure.

I. Support each Terra Cotta unit, in addition to the usual centers and Teflon or plastic wedges, with suitable bent vertical wooden shores exerting a constant upward pressure until the mortar coat is set for several days.

J. After setting, but prior to pointing, clean all exposed surfaces with natural fiber brushes, non-ionic mild soap powder or detergent, and clean water.

3.05 POINT JOINTS

A. Pointing
1. Refer to ACI 530.1 current edition for Hot and Cold Weather Construction.
2. Wet joint thoroughly and repeatedly prior to pointing and between pointing lifts. Allow water to soak in so that no freestanding water is visible.
3. Point in two lifts: pack joints to within 3/8 inch of surface on first lift, allow first lift to set prior to pointing second lift.
4. As soon as mortar has taken its initial set, tool joint surfaces to be slightly concave, or to match existing sound mortar joint surfaces. Do not allow mortar to extend over edges of Terra Cotta units.
   a. After initial 24 hour set, moisten until cured. Allow mortar to cure completely prior to cleaning operations, minimum 30 days.
   b. Clean up after pointing operations are complete. Remove mortar stains, excess mortar, etc., from all surrounding surfaces. Do not use acids; rinse thoroughly after clean up operations.

B. Re-pointing - See Section 040220 - Terra Cotta Restoration
1. General: Do not re-point in temperatures over 90° F. or under 40° F. Provide cover so that re-pointing may be accomplished without direct sunlight on the joints for up to eight (8) hours after re-pointing.

2. Clean up after re-pointing operations are complete. Remove mortar stains, excess mortar, etc., from all surrounding surfaces. Do not use acids; rinse thoroughly after clean-up operations.

3.06 CUTTING AND FITTING

A. Cutting and fitting of the Terra Cotta that may be required at the building, including all fitting around anchors, steel and ironwork and reinforced concrete, shall be done by the contractor for setting Terra Cotta. Do not impair appearance or strength of Terra Cotta.

B. All necessary face cutting of Terra Cotta at the job site shall be done with a saw using a water-cooled diamond blade. Face cutting shall not disturb the glaze.

3.07 CLEANING

A. Remove excess mortar from all surrounding surfaces upon completion of setting to prevent stains.

B. Clean area of work as specified.

3.08 PROTECTION

A. Protect and do not damage existing adjacent work to remain.

B. Protect new work from damage or staining due to construction operations.
   1. All uncompleted walls including Terra Cotta and backing shall be protected by waterproof covering at night and at any time when liable to injury from storms or freezing.

C. On completion of construction, remove all temporary protection.

3.09 ACCEPTANCE

A. The completed installation shall have the acceptance of the Architect/Engineer /Owner. Remove and replace units that are chipped, cracked, or otherwise damaged which do not conform to the Specification Requirements.

3.10 CLEAN-UP

A. Upon completion of Terra Cotta replacement operations, remove tools, equipment, and other unnecessary materials from site. Return adjacent area to the clean condition, which existed prior to the start of work.

B. Remove and legally dispose off-site all debris, rubbish, and other materials resulting from Terra Cotta installation.

END OF SECTION 040200

SECTION 040220
TERRA COTTA RESTORATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extent of terra cotta restoration work is as shown on the Drawings and as specified herein.
   1. The drawings endeavor to show the extent of masonry restoration work required. The contractor shall review the Drawings and make a Pre-bid field visit to verify all work whether shown or not shown on the Drawings.
   2. The work includes, but is not limited to:
      a. Repairing hairline cracks, microscopic cracks, cracks and voids in terra cotta construction.
      b. Patching clay masonry structures.
      c. Repairing glaze spalls.
      d. Repointing mortar joints.
      e. Reglazing of terra cotta.
   3. Related work described elsewhere:
      a. Section 040200 - Architectural Terra Cotta

1.02 QUALITY ASSURANCE

A. Restoration Specialist: 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.
   1. 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.
   2. One skilled journeyman mason, trained and Certified by the specified terra cotta repair system manufacturer, shall be present at all times during masonry restoration and shall personally direct the work.
   3. Contractor MUST have significant, demonstrated, experience in historic masonry restoration similar in size and nature to the work described herein including repair and replacement of Terra Cotta units. Contractors that cannot meet this requirement Will Not be accepted for the work in this project.

B. Field -Construction Mock-ups: Prior to start of general masonry restoration, prepare the following sample panels and sample areas on building where directed by Architect. Obtain Architect's acceptance of visual qualities before proceeding with the work. Retain acceptable panels in undisturbed condition, suitably marked, during restoration as a standard for judging completed work.
   1. Cleaning: Demonstrate materials and methods to be used for cleaning for each type of masonry surface and condition on sample panels each approximately 25 sq. ft. in area. Allow waiting period of duration not less than 7 calendar days after completion of sample panels for negative reactions.
   2. Crack Repair: Prepare a sample area for each type of crack repair required (i.e. hairline cracks, microscopic cracks, cracks and voids larger than 1/8"). Repair shall demonstrate methods and quality of workmanship expected for crack repair.
   3. Patching: Prepare on-building sample of each type of stone and masonry construction to be patched, rebuilt and/or replaced. Patching and castings (if applicable) shall demonstrate methods and quality of workmanship expected of repair work.
   4. Masonry Repair: Prepare sample panels of min. 9 sq. ft. in size for each type of masonry material indicated to be patched, rebuilt or replaced. Erect mock-up panels in-place at areas indicated to be restored/repaired, in exact locations as directed by Architect, to demonstrate quality of materials and workmanship.
   5. Repointing: Prepare 2 separate sample areas of approximately 5' high by 5' wide for each type of repointing required, one for demonstrating methods and quality of workmanship expected in removal of mortar from joints and the other for demonstrating quality of

materials and workmanship expected in pointing mortar joints. Sample areas shall be located in an inconspicuous yet readily accessible place.

C. Patching, Repointing, glazing and coating work: The samples of each type of repair work shall be done in an area that will be exposed to the same weathering conditions as the building. Allow samples to cure at least three days before obtaining acceptance of color, texture and detailing match. Samples shall be viewed from an approved distance.

D. Source of Materials: Obtain materials for Patching, coating, sealing, crack repair and repointing from a single manufacturer source to ensure match quality, color, texture and detailing.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each product specified including recommendations for their application and use. Include test data and certifications substantiating that products comply with requirements.

B. Submit the following items in time to prevent delay of the work and to allow adequate time for review and resubmittals, if needed. Do not order materials or start work before receiving the written approval:
   1. Written certificates from the patching materials manufacturer should be submitted stating that all installers of the patching material have successfully completed a training workshop for installation of the patching material, or have met alternative workmanship qualifications acceptable to the manufacturer, or provide written certification from the manufacturer that on-site training services have been contracted for.
   2. Samples of all specified materials and Material Safety Data Sheets (MSDS) as appropriate.
   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 patch samples fabricated on pieces of appropriate masonry from or on the building using the specified repair mortar as required.
   5. Written verification that all specified items will be used. Provided purchase orders, shipping tickets, receipts, etc. to prove that the specified materials were ordered and received.

C. 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.

D. Substitutions:
   1. If alternative methods and materials to those indicated are proposed for any phase of restoration work, provide written description, including evidence of at least 10 years' successful use on other, comparable projects, and program of testing to demonstrate effectiveness for use on this project.
   2. Substitutions: Section 016000 - Product Requirements

1.04 DELIVERY, STORAGE AND HANDLING:

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

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

C. 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.

D. Protect grout, 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.

E. Comply with the manufacturer's written specifications and recommendations for mixing, application, and curing of grouts and patching materials.

1.05 PROTECTION / SITE CONDITIONS

A. Protect persons, motor vehicles, building site and surrounding buildings from injury resulting from masonry restoration work.

B. Clean masonry surfaces only when air temperatures are above 40 degrees F (4 deg. C) and will remain so until masonry has dried out, but for not less than 7 days after completion of cleaning.

C. Do not perform any masonry patching unless air temperatures are between 50 degrees Fahrenheit (10 deg. C) and 90 degrees Fahrenheit (32deg. C) and will remain so for at least 48 hours after completion of work.

D. Prevent masonry patching materials from staining the face of masonry or other surfaces to be left exposed. Immediately remove all patching materials that come in contact with such surfaces.

E. Cover partially completed work when work is not in progress.

F. Protect sills, ledges and projections from droppings.

1.06 SEQUENCING / SCHEDULING:

A. Perform masonry restoration work in the following sequence:
   1. Remove paint, stains, biologic, and plant material from all masonry surfaces.
   2. Rake-out existing mortar from joints of masonry indicated to be restored.
   3. Repoint existing mortar joints of masonry indicated to be repointed.
   4. Pressure-wash building areas of restoration.
   5. Patch and repair existing stone structures as indicated.

PART 2 - PRODUCTS

2.01 REPOINTING MORTAR MATERIALS:

A. Repointing mortar shall be a pre-mixed, pre-colored cement-lime based mixture formulated to comply with the requirements of ASTM C-270 Type N mortar.
   1. Products: The following shall be assumed to meet the quality and performance requirements specified:
      a. "SPEC-JOINT 46", by Edison Coatings, Inc., Plainville, CT, (800)697-8055, or approved equal.
         1) Substitutions: Section 016000 - Product Requirements

2.02 CRACK REPAIR MATERIALS

A. Flexible epoxy crack sealant for use on cracks from 1/32 inch to 1/8 inch shall be a 100% solids two- component epoxy-urethane-acrylate paste with minimum 10% elongation, 300 psi direct tensile bond strength and 10,000 psi tensile strength. Product shall be applicable to metals, masonry, concrete and other substrates as required, and shall be appropriate for use at ambient temperatures from zero degrees to 100 degrees Fahrenheit (-18 to 38 degrees Centigrade).
   1. Products: The following shall be assumed to meet the quality and performance requirements specified:
      a. FLEXI-WELD 530, as manufactured by Edison Coatings, Inc., Plainville, CT, Phone (800) 697-8055.
      b. Substitutions: Section 016000 - Product Requirements

B. Cementitious void filler shall be an ultra-fine, superplasticized, polymer- modified injection grout. Cementitious grout shall be suitable for application in wet or dry cracks, shall develop direct tensile bond strength of 100 psi minimum, shall exhibit less than 0.06% drying shrinkage, and shall have a linear coefficient of thermal expansion of 0.000004 to 0.000008 inches/inch per degree Fahrenheit.
   1. Products: The following shall be assumed to meet the quality and performance requirements specified:
      a. PUMP-X 53i, as manufactured by Edison Coatings, Inc., Plainville, CT, Phone (800) 697-8055.
      b. Substitutions: Section 016000 - Product Requirements

2.03 PATCHING MATERIALS:

A. Patching materials shall be premixed, two-component cementitious materials with self-cross linking acrylic latex-modifier, formulated to match the color and texture of the existing materials. Materials must be vapor permeable, frost and salt resistant, shall develop direct tensile bond strength of 150 psi minimum, shall exhibit less than 0.06% drying shrinkage, and shall have a linear coefficient of thermal expansion of 0.000004 to 0.000007 inches/inch per degree Fahrenheit. Materials shall be compatible with substrate, including but not limited to porosity, tensile, and compressive strength. Modulus of elasticity shall be 65,000 to 100,000 psi. Non-latex mortars shall be unacceptable. Material shall have a minimum 10-year successful performance history for similar projects.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Deep repairs to terra cotta bisque: "Custom System 45" by Edison Coatings, Inc., (800) 697-8055.
      b. Thin-section glaze-spall repair and surface profiling of deep repairs: “Thin Fill 55” by Edison Coatings, Inc., (800) 697-8055.
      c. Substitutions: Section 016000 - Product Requirements

2.04 RUST INHIBITIVE COATING/PRIMER

A. Rust inhibitor/primer for steel anchors shall be a pre-packaged, 2-component, acrylic latex modified silica fume-cement mortar.
   1. Products: Subject to compliance with requirements, provide the following:
      a. "SYSTEM 49 CPBA", by Edison Coatings, Inc., Plainville, CT, (800)697-8055.
      b. Substitutions: Section 016000 - Product Requirements

2.05 REINFORCING MATERIALS

A. Pins / Threaded rods: Type and size are specified herein and as indicated on the Contract Drawings, if not indicated, as per patching materials manufacturer's recommendation.

B. Anchors and dowels shall be fabricated from ANSI Type 302/304 stainless steel.

C. Mechanical anchors and dowels (for deep repairs and overhanging repairs):

D. Adhesive: Adhesive shall be a two component, flexibilized epoxy gel, with minimum 4% elongation, 300 psi direct tensile bond strength, 10,000 psi tensile strength. Product shall be applicable to metals, masonry, concrete and other substrates as required, and shall be appropriate for use at ambient temperatures from zero degrees to 100 degrees Fahrenheit (-18 to 38 degrees Centigrade).
   1. Products: Subject to compliance with requirements, provide the following:
      a. FLEXI-WELD 520T, as manufactured by Edison Coatings, Inc., Plainville, CT (800) 697-8055.
      b. Substitutions: Section 016000 - Product Requirements

2.06 GLAZE REPLACEMENT

A. Breathable Matte-Finish Coating: Breathable matte-finish coating shall be a one-component, internally plasticized acrylic elastomer, with min. 160% elongation at 75 degrees Fahrenheit and 80% elongation at 0 degrees Fahrenheit. Minimum solids content shall be 70%. Glass transition temperature shall be a maximum of 15 degrees below zero Fahrenheit.
   1. Products: Subject to compliance with requirements, provide the following:
      a. ELASTOWALL 351, as manufactured by Edison Coatings, Inc., Plainville, CT (800) 697-8055.
      b. Substitutions: Section 016000 - Product Requirements

B. Terra Cotta Glaze Replacement: Glaze replacement shall be a breathable, one component, self-cross linking aliphatic polyurethane emulsion with minimum 50% elongation, 5000 psi tensile strength, 48 Sward hardness and minimum 1500 hours UV stability (Fadeometer).
   1. Products: Subject to compliance with requirements, provide the following:
      a. AQUATHANE UA-210E, as manufactured by Edison Coatings, Inc., Plainville, CT (800) 697- 8055.

1) Clear glaze applications: Clear Aquathane UA210E with Type G bonding additive
2) Pigmented glaze applications: Pigmented Aquathane UA210E with Primer #240.

b. Substitutions: Section 016000 - Product Requirements

PART 3 - EXECUTION

3.01 WORKMANSHIP OF PATCHING MATERIAL:

A. Patching material workmanship shall comply with all applicable recommendations of material manufacturer's written specifications and requirements and/or as modified in this and following sections.

B. Mixing of patching material: Mix the patching material in accordance with Manufacturer's printed instructions.

C. Do not use any additives, such as bonding agents, accelerators, or retarders, in the patching material without prior written approval from the Manufacturer.

3.02 SURFACE PREPARATION: (FOR ALL PATCHING WORK)

A. Patching and repair work for spalled terra cotta shall be accomplished with the approved patching material, according to manufacturer's printed instructions and as specified herein.

B. At areas to receive patches, remove all loose, spalled and deteriorating materials. If required cut away an additional 1/4 to ½ inch of the substrate that may be in the process of deteriorating and to ensure the surface to be patched is solid and stable. "Sound" substrate with a hammer to verify its integrity.

C. Remove any soil, mortar, dust, salts and other foreign material from areas to receive patching compound.

D. Once the deteriorated material in a spalled area has been removed, rust on any exposed anchors must be removed by wire brush or local sandblasting. Remove material around stell anchor to provide a minimum of ½ inch clearance. Apply approved rust-inhibitive bonding agent to cleaned reinforcement.

E. Remove anchors that are severely corroded, loose or are of no structural value. Removal shall be done upon evaluation of the field condition and approval by the Architect or Engineer. Repair damage to substrate resulting from removal by patching with the approved patching material.

F. Cut out sections shall be squared off at the edges. Do not over cut corners of the patch; stop short of corner and chip out remainder by hand without damaging surrounding masonry. Do not allow any feathered edges in the patch areas.

G. For very dry or porous surfaces, pre-wet the substrate ahead of time to prevent the substrate from drawing moisture out of the patch too quickly. Re-wet the surface just before applying the patching material.

3.03 DEEP/BISQUE PATCHING REPAIR WORK:

A. Prepare and mix Patching material in accordance with manufacturer's directions. Prepare and mix a slurry coat consisting of 2 parts patching material dry component and one part liquid component. Apply to prepared and pre-dampened cavity by brush, working slurry into corners, edges and surface depressions. Apply as a thin coating only, avoiding heavy build-up or filling of surface depressions.

B. B .Patching material shall be applied by trowel, casting-in-place or other techniques recommended by approved materials manufacturer for each specific field condition.

C. Air, surface and product temperature must all be above minimum temperature of 50 deg F (10 deg C) at time of application and must be maintained above minimum until product has dried thoroughly.

D. When patching by hand, apply patching material while slurry coat is still soft and damp. Apply patching material in one layer or several layers according to the depth of the repairs.

E. Comply with manufacturer's instructions when applying multiple layers for thickness of each layer, setting-up time for each layer, surface preparation between layers, etc., to ensure sound adhesion between layers.

F. For repairs not subject to subsequent application of reprofiling mortar, final application of repair mortar shall be at the desired surface level and shall be tooled, shaped or carved as required to achieve proper surface profile and texture. Surfaces shall be tooled to replicate the texture, and detailing of the original surface. Do not sponge float the patch. Keep tools clean by frequent washing in clean water, but remove excess water to avoid introducing water into patch surfaces.

G. Under hot conditions, as directed by Manufacturer, cover and cure repaired areas in accordance with manufacturer's directions. Keep patches moist and out of direct sun for at least the first day.

H. To avoid rapid evaporation, do not patch in direct sunlight. If necessary, cover work with tarpaulin or wet burlap.

3.04 PATCHING FOR OVERHANGING REPAIR:

A. At areas of large, deep and overhanging repairs the installation of mechanical keying or anchoring is required. The decision whether to anchor and how frequently to provide anchors shall be based on structural requirements, the conditions of the substrate, patch dimensions and weight, and the extent to which patch integrity will rely on adhesion alone. Typical procedures are outlined in this section and shall be modified as recommended.

B. Drill 1/4" to ½" diameter holes at various angles, spaced 4 to 6 inches apart in staggered rows. Clean holes using compressed, oil-free air.

C. Insert threaded stainless steel rods into drilled holes. At least 3/4" of patching material is to be placed over the rods, which are to be secured into the holes with the specified adhesive.

D. Prepare and mix patching material in accordance with manufacturer's directions. Comply with all safety precautions, environmental limitations and work time limitations.

E. Dampen patch area immediately prior to application of patching material to create a good bond. Using a masonry brush, apply bondcoat to patch area, working into corners, edges and profile. Apply bond coat only to area of patch that can be covered with patch material mix before bond coat dries. Work bond coat into pieces of the substrate and under and around mechanical anchors. Do not apply excess bond coat. Do not allow bond coat material to run down onto surfaces which will not be repaired.

F. Apply patching material to deep sections by building up in a series of multiple lifts. Comply with manufacturer's instructions for thickness of each layer, setting-up time for each layer, and surface preparation between layers to ensure sound restoration. Work patching material into all corners of repair area and under and around mechanical anchors; including the existing coated reinforcements.

G. For repairs not subject to subsequent application of reprofiling mortar, final application of repair mortar shall be at the desired surface level and shall be tooled, shaped or carved as required to achieve proper surface profile and texture. Surfaces shall be tooled to replicate the texture, and detailing of the original surface. Do not sponge float the patch. Keep tools clean by frequent washing in clean water, but remove excess water to avoid introducing water into patch surfaces. To re-create original ornamentation, if applicable, apply an extra-thick patch. Then after the patch is partially cured the patching material shall be carved, using molding profiles and/or straight edges to restore original ornamentation. In all cases, finish patch so that it is as indistinguishable as possible from adjacent surfaces.

H. Clean any patching material residue from area surrounding the patch by sponging as many times as necessary with clean water. This should be done before patching material sets.

I. Moisten, cover and cure repaired areas in accordance with manufacturer's directions.

3.05 RE-PROFILING MORTAR APPLICATION

A. For thin glaze-spalls over sound bisque, reprofiling mortar may be applied directly to prepared bisque surfaces. After sounding with a wooden mallet to identify all glaze delaminations, scrape

or grind to remove unsound glaze materials. Chip at least ¼” beyond the area of delamination to assure that marginally-adhered glaze is removed.

B. For reprofiling mortar applications over bisque repair mortar, the deep repairs should be finished with a rough, shaved profile 1/8 to ¼ inch below the final profile.

C. Dampen patch area immediately prior to application of patching material to create a good bond. Prepare and mix patching material in accordance with manufacturer's directions. Apply and compact reprofiling mortar, slightly over-building the surface.

D. Sand patches level after initial set. Using #60 grit non-burnishing sanding media, remove all ridges and trowel marks.

E. For fluted or striated finishes, tool surfaces immediately after coarse sanding.

F. For smooth finishes, perform a second surface sanding using #220 grit non-burnishing sanding media.

3.06 REPAIRING CRACKS AND VOIDS

A. Prepare cracked area in accordance to manufacturer's written instructions. Typical procedures are outlined in this section and shall be modified according to approved materials manufacturer.

B. Crack repair for microscopic cracks:
   1. Coat all designated areas exhibiting microscopic cracking and crazing using the specified glaze replacement coating.

C. Crack repair for cracks wider that 1/32" and less than 1/8”:
   1. Using a Dremel tool and narrow cutting blade, slightly enlarge the surface of the crack to a 1/8” wide x ¼ inch deep groove.
   2. Mix and apply flexible epoxy sealant, tooling into the face of the crack and forcing the material into the cavity to achieve complete fill. Adjacent surfaces should be masked if required to prevent any smears from bonding to masonry surfaces.
   3. Once the sealant has reached initial cure, slice off excess sealant, leaving a repair that is clean and flush with adjacent surfaces.

D. Cracks wider that 1/8" mm:
   1. Remove loose and spalling materials, cut into crack to a minimum depth of ½ inch and a width of
   2. ¼ inch. If embedded reinforcements are rusted then cut-material deep enough to expose the rusting reinforcements and remove material around reinforcement to provide a minimum of 3/4 inch clearance for patch material.
   3. Clean and coat exposed reinforcements at patch work with an approved rust- preventative agent.
   4. Fill enlarged areas of crack repair with patching material, following repair procedures outlined in this section under Part 3.

E. Injection of Voids:
   1. Inject cementitious crack repair material into designated voids and cracks, using syringes, grout pumps, or other types of injection apparatus suitable for size of crack, distance crack repair material must travel and viscosity of material used. Seal surfaces as required to prevent crack injection material from leaking out and to facilitate pumping. Take caution not to stain the face of adjacent surfaces. Immediately wipe spills off surfaces with clean rag and compatible solvent.

3.07 GLAZE REPLACEMENT COATING

A. Prior to the application of glaze replacement coating all surfaces must be prepared in accordance with this section of the specifications. The result of this preparation shall render a surface clean, meaning having complete exposure of sound surface without any deposits of contaminants, coatings, compounds, laitance or foreign matter which could affect the bond between the surface and glaze replacement coating materials.

B. Surfaces to receive glaze replacement coating must be surface-dry prior to coating.

C. All caulking, patching, crack repair materials and joint sealants should be installed prior to application of the glaze replacement coating. New reprofiling mortars shall have through-dried before coating application. Deep patching materials shall have cured a minimum of 3-5 days prior to application, or longer, as required to through-dry.

D. Apply the primer and/or coatings selected for use in accordance with manufacturer's instructions.
   1. If primer has been selected for use, apply primer at specified coverage rate to clean, dry or damp surfaces using brush, roller or airless spray. Allow primer to through-dry to a tack-free, tough film prior to top coating.
   2. Matte-finish coatings shall be applied to dry surfaces by phenolic core roller or airless spray at a rate of 100-125 sq. ft. per gallon. Product shall be applied as evenly as possible at 14 - 16 mils wet film thickness.
   3. Terra cotta glaze coatings shall be applied by roller, brush or airless spray as required to achieve appearance matching original glazes. On applications extending onto existing terra cotta glaze follow instructions for incorporation of bonding additive into the coating, and discard any unused coating mixed with bonding additive that is not applied within 8 hours.
   4. Allow the first coat to dry-through completely prior to second coat application. Through-dry coating will be seen as tough, firm, tack-free material which does not extrude or appear to be "skinned over".
   5. Protect all uncured surfaces from rain, dirt, traffic and wind-blown debris for at least 2 - 4 hours after application. For horizontal/traffic bearing surfaces, coating should be tack- free and through-cured before subjecting to traffic or immersion. Cure rate is affected by temperature and other application parameters.

3.08 FINAL INSPECTION & CLEANING

A. All patches shall be inspected for soundness and finish prior to coating. Unacceptable patches are defined as those with hairline cracks or showing separation from repair edges, or on which "hollow spots" can be detected by light impact. Remove unsound patches and refill to provide patches free of those defects.

B. Final Cleaning: No steam cleaning or additional pressure cleaning shall be performed within 28 days of patch installation. No acid or alkali cleaning agents shall be used except as directed by the repair system manufacturer.

END OF SECTION 040220

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 042000 - Unit Masonry: Placement of anchors in masonry.

C. Section 099113 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013, with Editorial Revision.

E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

F. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, accessories, and finishes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Handrails and Railings:
      a. C.R. Laurence Company, Inc; CRL Welded Post Railing Systems (WRS): www.crl-arch.com/sle.
      b. Kee Safety, Inc; Kee Klamp (steel): www.keesafety.com.
      c. KaneSterling; ____: www.sterlingdula.com.
      d. The Wagner Companies; ____: www.wagnercompanies.com.
      e. Substitutions: See Section 016000 - Product Requirements.

2.02 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot (1095 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches (38 mm) diameter, round.
   2. Intermediate Rails: 1-1/2 inches (38 mm) diameter, round.
   3. Posts: 1-1/2 inches (38 mm) diameter, round.
   4. Balusters: 1/2 inch (12 mm) square solid bar.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.03 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: No exposed bolts or screws.

E. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.04 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by continuous welds.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.05 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Shop-Painted Finish: Comply with Section 099113 "Exterior Painting."
   1. Color: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

B. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION 055213

SECTION 062000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood door frames, glazed frames.

C. Wood casings and moldings.

D. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 085200 - Wood Windows and Door Restoration.

B. Section 099113 - Exterior Painting: Painting and finishing of finish carpentry items.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Exterior Woodwork Items:
   1. Window Casings and Moldings: Softwood; prepare for paint finish.
   2. Soffits and Fascias: Prepare for paint finish.
   3. Exposed porch roof framing and lattice: Softwood; prepare for paint finish..
   4. Portico Ceiling: Softwood; prepare for paint finish..

B. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Match existing species and finish where required.
   2. Window Sills: Rebuild and refinish to match existing where required to perform window repair / replacement and restoration work.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Fasteners: Of size and type to suit application.

2.04 ACCESSORIES

A. Lumber for Shimming and Blocking: Softwood lumber of similar to existing species.

B. Primer: As specified in Section 099113.

C. Wood Filler: Solvent base, tinted to match surface finish color.

2.05 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 099113.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION 062000

SECTION 070150.19
PREPARATION FOR RE-ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of existing roofing system in preparation for a new roof membrane system.

1.02 RELATED REQUIREMENTS

A. Section 075400: Thermoplastic Membrane Roofing.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012100 - Allowances, for cash allowances affecting this section.

B. See Section 012200 - Unit Prices, for additional unit price requirements.

C. Repair Existing Wood Deck (Assumed - Verify deck material and condition upon removal and report finidings to Architect and Owner):
   1. Basis of Measurement: By the square foot (meter).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

B. Schedule work to coincide with commencement of installation of new roofing system. Coordinate work with adjacent or associated envelope renovation efforts as required.

1.05 FIELD CONDITIONS

A. Do not remove existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.

B. Maintain continuous temporary protection prior to and during installation of new roofing system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Temporary Protection: Sheet polyethylene; provide weights to retain sheeting in position.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing roof surface is clear and ready for work of this section.

3.02 PREPARATION

A. Sweep roof surface clean of loose matter.

B. Remove loose refuse and dispose off site.

3.03 MATERIAL REMOVAL

A. Remove only existing roofing materials that can be replaced with new materials as the weather will permit.

B. Remove metal counter flashings.

C. Remove roofing membrane, perimeter base flashings, flashings around roof protrusions, pitch pans and pockets.

D. Remove insulation and fasteners, cant strips, blocking.

E. Remove vapor retarder.

F. Repair existing wood deck surface to provide smooth working surface for new roof system.

3.04 FIELD QUALITY CONTROL

A. The drawings identify the exact limits to material removal.

3.05 PROTECTION

A. Provide temporary protective sheeting over uncovered deck surfaces.

B. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights.

C. Provide for surface drainage from sheeting to existing drainage facilities.

D. Do not permit traffic over unprotected or repaired deck surface.

END OF SECTION 070150.19

SECTION 071900
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water repellents applied to exterior masonry surfaces.

1.02 RELATED REQUIREMENTS

A. Section 040120 - Maintenance of Unit Masonry

B. Section 040140 - Maintenance of Stone Assemblies

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

D. Installer's qualification statement.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Water Repellent Material: 5 gallons (20 liters) of type installed.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience

B. Owner reserves the right to provide continuous independent inspection of surface preparation and application of water repellent.

1.06 MOCK-UP

A. Prepare a representative surface 36 inch by 36 inch (0.91 m by 0.91 m) in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. Locate where directed in coordination with Architect and Owner.

C. Mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

A. Protect liquid materials from freezing.

B. Do not apply water repellent when ambient temperature is lower than 50 degrees F (10 degrees C) or higher than 100 degrees F (38 degrees C).

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a three year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
   1. BASF Construction Chemicals: www.buildingsystems.basf.com.
   2. Pecora Corporation: www.pecora.com.
   3. PROSOCO, Inc: www.prosoco.com.
   4. Tnemec Company, Inc: www.tnemec.com.

2.02 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
   2. Number of Coats: Two unless otherwise recommended by manufacturer.
   3. Maintains dry appearance when wetted.
   4. Products: Water-based siloxane, silane, or blend that reacts chemically with concrete and masonry; minimum 20 percent nonvolatile content.
      a. Basis of design: PROSOCO, Inc; Sure Klean Weather Seal H40.
      b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

A. Protection of Adjacent Work:
   1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
   2. Protect adjacent surfaces not intended to receive water repellent.

B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

D. Remove loose particles and foreign matter.

E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.

F. Scrub and rinse surfaces with water and let dry.

G. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.

B. Apply at rate recommended by manufacturer, continuously over entire surface.

C. Apply two coats, minimum.

D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION 071900

SECTION 073113
ASPHALT SHINGLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt shingle roofing.

1.02 RELATED REQUIREMENTS

A. Section 076200 - Sheet Metal Flashing and Trim: Edge and cap flashings.

B. Section 077100 - Roof Specialties: Manufacturered roof specialties and cornices.

1.03 REFERENCE STANDARDS

A. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2016a.

B. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules; 2016.

C. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2017.

D. NRCA (RM) - The NRCA Roofing Manual; 2018.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating material characteristics.

C. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection to match existing shingled roofing to remain.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Asphalt Shingles:
   1. Atlas Roofing Corporation; _____: www.atlasroofing.com/#sle.
   2. GAF; Timberline HD Reflector Series: www.gaf.com/#sle.
   3. IKO Industries Inc; Armourshake: www.iko.com/#sle.
   4. Owens Corning Corp; ____: www.owenscorning.com.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 ASPHALT SHINGLES

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, conforming to ASTM D3462/D3462M.
   1. Fire Resistance: Class A, conforming to ASTM E108.
   2. Wind Resistance: Class A, when tested in accordance with ASTM D3161/D3161M.
   3. Self-sealing type.
   4. Color: To match existing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that roof deck is of sufficient thickness to accept fasteners.

C. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

A. Seal roof deck joints wider than 1/16 inch (1.5 mm) as recommended by shingle manufacturer.

B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.

C. Broom clean deck surfaces before installing underlayment or eave protection.

D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches (50 mm) and seal with plastic cement, and secure with flange nails.

3.03 INSTALLATION - SHINGLES

A. Install shingles in accordance with manufacturer's instructions manufacturer's instructions and NRCA (RM) applicable requirements.
   1. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
   2. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.

B. Place shingles in straight coursing pattern with 5 inch (125 mm) weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.

C. Project first course of shingles 3/4 inch (19 mm) beyond fascia boards.

D. Extend shingles 1/2 inch (13 mm) beyond face of gable edge fascia boards.

E. Complete installation to provide weather tight service.

3.04 PROTECTION

A. Do not permit traffic over finished roof surface.

END OF SECTION 073113

SECTION 073213
CLAY ROOF TILES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Repair or replacement of clay roof tiles.

1.02 RELATED REQUIREMENTS

A. Section 076200 - Sheet Metal Flashing and Trim: Roof flashing.

B. Section 077100 - Roof Specialties: Manufactured roof specialties and cornices.

1.03 REFERENCE STANDARDS

A. ASTM C1167 - Standard Specification for Clay Roof Tiles; 2011.

B. NRCA (RM) - The NRCA Roofing Manual; 2018.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on tile and underlayment, indicating material characteristics, installation instructions, and limitations and precautions.

C. Selection Samples: Submit color chips representing manufacturer's full range of available tile colors and finishes.

D. Verification Samples: Set of tiles representing actual product in color, finish, and style, including special shapes and fittings.

E. Manufacturer’s Certificates: Certify that tiles supplied for the project meet or exceed specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF TILES

A. Existing Clay Roof Tiles: Salvage and reuse intact and serviceable existing clay tiles wherever possible.

B. Clay Roof Tiles:
   1. Match existing tile as closely as possible.
   2. Conform to requirements of ASTM C1167, Grade 1 tile; with nail holes made before firing.
   3. Tile Size: Matching approved sample.
   4. Color and Finish: Match existing..

C. Special Shapes and Fittings: Supply special shapes and fittings of same material and finish as adjacent tile, factory-formed before firing, as indicated on drawings or as required for specific project conditions, including but not limited to hip caps, ridge caps, rake edges, eave edges, and termination caps.

2.02 METAL FLASHING MATERIALS

A. Provide metal roof flashing as specified in Section 076200.

2.03 FASTENERS

A. Provide fasteners as required upon examination of existing tile roof condition that are suitable for intended materials and application. Match existing material and fastening pattern wherever possible.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine structural roof deck for compliance with specified requirements, and verify that roof penetrations and roof openings are correctly installed in proper locations.

B. Do not begin installation of tile roofing until substrates have been properly prepared, and if substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install clay tile roofing system in accordance with manufacturers recommendations and NRCA (RM) applicable requirements.

B. Sheet Metal Flashing: Install flashing at other locations as indicated and as required by project conditions.
   1. Install flashing at each location where clay roof tiles intersect other roofs, walls, parapets, chimneys, ventilators, and similar projections.
   2. Install drip edge flashing at eaves prior to installing underlayment.
   3. Install drip edge flashing on downslope roof edges after installation of underlayment.

C. Elastomeric Membrane Flashing: Apply self-adhering membrane flashing in concealed locations where metal flashing would be difficult to apply effectively.

D. Clay Tile:
   1. Install first row of tile at eaves with minimum projection of 1 inch (25 mm).
   2. Lay tile square with building lines and parallel with roof slope, and install filler, closure, and mitered pieces as required.
   3. Unless otherwise indicated or recommended by tile manufacturer, install tile with minimum of 3 inch (75 mm) headlaps.
   4. Cut and fit tiles neatly around vents, pipes, and other projections.
   5. Install accessories in accordance with manufacturer's details and recommendations.

3.03 PROTECTION

A. Minimize traffic over finished roof surface; where walking on roof is absolutely necessary, wear soft-soled shoes and walk on abutting tiles to avoid breakage.

B. Remove and replace damaged or broken tile before Date of Substantial Completion.

END OF SECTION 073213

SECTION 075400

THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Adhered TPO membrane roofing system.

1.02 RELATED REQUIREMENTS

A. Section 070150.19 - Preparation for Re-Roofing.

B. Section 076200 - Sheet Metal Flashing and Trim: Counterflashings, reglets and manufactured gutters and downspouts.

1.03 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

B. Insurance Requirements: Coordinate requirements with owner for compliance with their respective insurance carrier prior to start of work.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For the following products:
   1. Sheet roofing, of color specified.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of compliance with performance requirements.

E. Research/evaluation reports.

F. Field quality-control reports.

G. Maintenance data.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product.

B. Source Limitations: Obtain components including roof insulation, fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

D. Preinstallation Roofing Conference: Conduct conference at Project site.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible fabric backed TPO sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlisle SynTec Incorporated.
   b. Firestone Building Products Company.
   c. GAF Materials Corporation.
   d. GenFlex Roofing Systems.
   e. Johns Manville.
   f. Stevens Roofing Systems; Division of JPS Elastomerics.
2. Thickness: 60 mils (1.5 mm), nominal.

2.02 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
   2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Plastic Foam Adhesives: 50 g/L.
      b. Gypsum Board and Panel Adhesives: 50 g/L.
      c. Multipurpose Construction Adhesives: 70 g/L.
      d. Fiberglass Adhesives: 80 g/L.
      e. Contact Adhesive: 80 g/L.
      f. Other Adhesives: 250 g/L.
      g. Single-Ply Roof Membrane Sealants: 450 g/L.
      h. Nonmembrane Roof Sealants: 300 g/L.
      i. Sealant Primers for Nonporous Substrates: 250 g/L.
      j. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

I. Vapor Barrier: 6 mil polyethylene.

2.03 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.
   1. Verify existing roof drain location in field prior to start of reroofing work. Provide tapered insulation as required to pitch to existing drain(s). Coordinate with Architect and field conditions as required.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes as required for sloping to drain. Fabricate to slopes indicated.

2.04 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

B. Insulation Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

2.05 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 312, Type III or Type IV.

B. Asphalt Primer: ASTM D 41.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 VAPOR BARRIER

A. Install vapor barrier with long joints perpendicular to roof slopes with end joints staggered.
   1. Vapor barrier shall be loose laid with all joints taped.

3.03 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

E. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   2. Set each subsequent layer of insulation in adhesive, firmly pressing and maintaining insulation in place.

3.04 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

F. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
   2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

3.05 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.06 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

END OF SECTION 075400

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 040120 - Maintenance of Unit Masonry: Metal flashings embedded in masonry.

B. Section 040140 - Maintenance of Stone Assemblies: Metal flashings embedded in stone.

C. Section 073113 - Asphalt Shingles: Non-metallic flashings associated with shingle roofing.

D. Section 073213 - Clay Roof Tiles: Non-metallic flashings associated with clay roofing tiles.

E. Section 077100 - Roof Specialties: Manufactured copings, flashings, and expansion joint covers.

F. Section 079200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).

H. CDA A4050 - Copper in Architecture - Handbook; current edition.

I. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples of adequate size to illustrate metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim Manufacturers:
   1. Fairview Architectural LLC; VitraEdge _____: www.fairview-na.com/#sle.
   2. OMG Roofing Products; _____: www.omgroofing.com/#sle.
   3. Petersen Aluminum Corporation; _____: www.pac-clad.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239 inch) (0.61 mm) thick base metal.

B. Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) (0.81 mm) thick; anodized finish of color as selected.
   1. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils (0.018 mm) thick.

C. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) (0.81 mm) thick; plain finish shop pre-coated with modified silicone coating.
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's full colors.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters and Downspouts: Size and profile to match existing as applicable.

B. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

C. Downspout Extenders: Same material and finish as downspouts.

D. Seal metal joints.

2.05 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

E. Secure gutters and downspouts in place with concealed fasteners.

F. Slope gutters 1/4 inch per 10 feet (2.1 mm per m), minimum.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 SCHEDULE

A. Fascia and Cornices:

B. Gutters and Downspouts:

C. Coping, Cap, Parapet, Sill and Ledge Flashings:

D. Flashings Associated with Shingle Roofing, including Valley, Hip, Ridge, Eave, Gutter Edge, Gable Edge, Chimney:

E. Counterflashings at Roofing Terminations (over roofing base flashings):

F. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports:

END OF SECTION 076200

SECTION 077100
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, gravel stops, and vents.

B. Factory fabricated cornices.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. NRCA (RM) - The NRCA Roofing Manual; 2018.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Samples: Submit two appropriately sized samples of coping, gravel stop, and cornice illustrating component shape, finish, and color.

E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. Architectural Products Co; _____: www.archprod.com.
   2. ATAS International, Inc; Rapid-Lok Fascia: www.atas.com/#sle.
   3. Metal-Era Inc; _____: www.metalera.com.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Factory Fabricated Cornices:
   1. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc; _____: www.saf.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

C. Counterflashings:
   1. ATAS International, Inc; ____: www.atas.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
   1. Configuration: Fascia, cant, and edge securement for roof membrane.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
   3. Material: Formed aluminum sheet, 0.050 inch (1.3 mm) thick, minimum.
   4. Material: Extruded aluminum, 0.08 inch (2.0 mm) thick, minimum.

5. Finish: 70 percent polyvinylidene fluoride.
6. Color: To be selected by Architect from manufacturer's full range.

B. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Material: Formed aluminum sheet, 0.050 inch (1.3 mm) thick, minimum.
4. Finish: 70 percent polyvinylidene fluoride.
5. Color: To be selected by Architect from manufacturer's full range.

C. Factory Fabricated Cornices: Factory fabricated, assembled, and finished sheet metal architectural details, including profiles, returns, mitered corners, end caps, rakes, gables, etc; finished unit mechanically fastened to structural support.
1. Material: Aluminum sheet, ASTM B209, alloy 3003 or 5005.
2. Aluminum Finish: Manufacturer's standard factory applied PVDF coating.
3. Color: To be selected by Architect from manufacturer's full range.
4. Manufacturers:
a. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc; _____: www.saf.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

2.03 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.04 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

F. Coordinate installation of flashing flanges into reglets.

END OF SECTION 077100

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Nonsag gunnable joint sealants.
   2. Self-leveling pourable joint sealants.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.05 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.06 WARRANTY

A. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.02 JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, available manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow Corning Corporation
   b. GE Construction Sealants
   c. Pecora Corporation
   d. Sika Corporation
   e. Tremco Incorporated

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
   1. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
   2. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion
   3. Products: Subject to compliance with requirements, available manufacturers wirh products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation
      b. Sika Corporation
      c. Tremco Incorporated
      d. GE Construction Sealants

2.03 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed cell material with a surface skin, Type B (bicellular material with surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Stone.
   3. Remove laitance and form-release agents from concrete.

3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Do not seal the following types of joints.
   1. Intentional weepholes in masonry.
   2. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   3. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   4. Joints where installation of sealant is specified in another section.
   5. Joints between suspended panel ceilings/grid and walls.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

3.04 FIELD QUALITY CONTROL

A. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.06 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal surfaces.

B. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 085200
WOOD WINDOW AND DOOR RESTORATION

PART 1 GENERAL

1.01 SUMMARY

A. Wood window and door restoration may include, but is not limited to, the following:
   1. Restore damaged and inoperable wood window sash while maintaining current profiles.
   2. Restore existing and provide new window balance hardware at all operable sash to accommodate use.
   3. Replace all broken and unsound sash cord.
   4. Restore existing window and door hardware and provide new in kind hardware where existing hardware is missing or is too damaged or deteriorated to be restorable.
   5. Restore all window and door trim disturbed for work of this Section to sound condition and existing appearance.
   6. Paint and finish all wood elements as necessary to match original finishes.
   7. Replace cracked, broken or missing glass.
   8. Remove all deteriorated putty and replace with new.
   9. Consolidate and repair deteriorated wood sills, framing members and sash rails and stiles.
   10. Replace all broken or deteriorated parting strips.
   11. Chemically strip all paint from wood doors, prime, and paint including edges. Paint must be dry before items are shipped.
   12. Window and Door frames are to be restored in place. Window and Door Frames are not to be removed from the building.
   13. Reinstall repaired window sash.
   14. Clean all glass.

B. Intent: It is the specific intent of this Section that repairs will maximize the retention of historic fabric while making the windows and doors weather resistant for long-term use and serviceable for cyclical maintenance.

1.02 RELATED REQUIREMENTS

A. Section 003100 - Available Project Information: Hazardous material survey.

B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 099113 - Exterior Painting: Site finishing wood surfaces.

1.03 GENERAL REQUIREMENTS

A. General: Provide all labor, materials, equipment, and services required to complete wood window and door restoration as specified herein, and required by existing conditions and authorities having jurisdiction.

B. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.04 QUALITY ASSURANCE

A. Craftspeople: Wood window and door restoration shall be carried out by a steady crew of skilled craftspeople who are thoroughly experienced with materials and methods specified.

B. Laws, Codes, and Regulations: All work of this Section shall comply with all applicable federal, state, and local laws, codes, and regulations.

C. Knowledge of Site: Bidders shall visit site prior to bid and carefully examine Project scope and conditions that may affect proper execution of work of this Section and determine or verify dimensions and quantities. Contractor's submission of bid shall be acknowledgment that s/he is thoroughly familiar with Project scope and site conditions.

D. Access for Inspection, Documentation and Approvals: Provide access as / if requested to all locations on which mockups are being carried out, on which work is ongoing, and where work

has been completed to allow for inspections, documentation and approvals. Provide means of access and safety precautions required to facilitate inspections and approvals.

1.05 SUBMITTALS

A. General: Submit the following in compliance with the requirements of the Conditions of the Contract. Revise and resubmit each item as required to obtain Preservation Manager's approval.

B. Product Literature: Manufacturer's published technical data for each product to be used in work of this Section including recommendations for application and use, test reports and certificates verifying that product complies with specified requirements, and Material Safety Data Sheets (MSDS).

C. Documentation: Documentation in the form of high-resolution (1 megabyte minimum) JPEG images on CDROM showing the existing condition of all elements of windows and doors to be removed for work of this Section, all elements adjacent to elements that are to be removed, and all other window and door elements that will be in any way affected by work of this Section. Show overall trim and details of all damage or deterioration that might be attributed to damage resulting from work of this Section.

D. Wood Treatment Data: Chemical treatment manufacturer's instructions for handling, storage, installation, and finishing treated materials if applicable.

1.06 CONTRACTOR RESPONSIBILITY

A. Bidders shall visit the site beforehand to make themselves familiar with specific conditions relating to this Section.

B. Comply with relevant ASTM standards for all materials.

C. All Subcontractors are bound by the same requirements as the Contractor. Subcontractors shall not begin work unless approved by the Preservation Manager.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle all products and materials to prevent damage, deterioration, or degradation and intrusion of foreign material.

B. Discard and remove from site deteriorated or contaminated materials and products that have exceeded their expiration dates. Replace with fresh materials.

1.08 PROJECT CONDITIONS

A. Protection of Persons: Take all necessary precautions to protect all persons, whether engaged in work of this Section or not, from all hazards of any kind associated with the work of this Section.

B. Protection of Window and Door Opening: After removal of components, all openings shall be closed with plywood or acrylic panels fitted to each individual opening and secured by non-destructive anchoring system. The panel shall be adequately weathertight and not permit any moisture to enter the building.

C. Protection of Building: Protect building elements and finishes from damage or deterioration caused by work of this Section. Repair any damage to materials or finishes to Architect's and Owner's satisfaction at no additional cost.
   1. Take all necessary precautions to prevent fire and spread of fire.
   2. Take all necessary precautions to protect building elements and finishes from damage by precipitation during work of this Section. Protect openings at all times. Repair or replace to Architect's and Owner's satisfaction all building elements and materials damaged by weather resulting from window and door openings that did not sufficiently exclude weather at no additional cost.

D. Coordination: Coordinate work of this Section with work specified in other sections to ensure proper completion of the Work.

1.09 ENVIRONMENTAL CONDITIONS

A. General: Perform work only when temperature of products being used, temperatures of existing and new materials, and air temperature and humidity comply with product manufacturer's requirements and requirements of this Section. In case of conflict, the most stringent requirements shall govern.

B. Use of Epoxy Resins: Mix and apply epoxy resins only when temperatures are between 50 deg F and 80 deg F.

1.10 LEAD-CONTAINING PAINT (LCP)

A. General: Perform all work that disturbs lead-containing paint (LCP), handle all material that involves lead-containing paint, and transport and dispose of all lead-containing paint and residue in compliance with all applicable federal, state, and local laws and regulations for identification, removal, labeling, handling, containerization, transportation, and disposal of lead-containing material including, but not limited to, those referenced herein.

B. U.S. Department of Labor OSHA Regulations: Including but not limited to: Title 29, Code of Federal Regulations (CFR) Section 1926.62: "Lead Exposure in Construction" and Title 29, CFR Section 1910.1200: "Hazard Communication Standard."

C. U.S. Environmental Protection Agency (USEPA) Regulations: Including but not limited to: Title 40 CFR Part 262: "Standards Applicable to Generators of Hazardous Waste" and Part 263: "Standards Applicable to Transporters of Hazardous Waste."

D. U.S. Department of Transportation (USDOT) Regulations: Including but not limited to: 49 CFR Parts 172, 173, 174, 175, 177, 178, 179, and 180.

PART 2: PRODUCTS

2.01 MATERIALS, GENERAL

A. Grade and Quality: Materials shall conform to requirements of this Section and shall be new, free from defects, and of recent manufacture.

B. Manufacturer's Instructions: Comply with material manufacturers' instructions for use of products (including surface preparation, mixing, applying, drying, etc.). In case of conflict with requirements of this Section, the more stringent requirements shall govern.

2.02 WOOD

A. Lumber shall be of sound stock, solid wood without finger joints or other joints within members, thoroughly seasoned, and kiln-dried to a moisture content not exceeding 8 percent.

B. Wood shall be free from defects or blemishes on surfaces exposed to view that will show after paints and finishes have been applied. Materials that do not comply with specifications for quality and grade, are in any way defective, or are otherwise not in proper condition will be rejected.

C. Wood for New Sash as necessary, Other New Elements, and Repairs of Existing Elements shall match profile and grade of existing windows in species, quality, cut, and grain pattern in kind.

D. Preservative treatment shall be used for new wood after machining.

2.03 ADHESIVES

A. Adhesive for Dutchman Repairs, Member Replacement, and Fabrication of New Sash: Epoxy resin glue designed for use with wood. Provide West System as manufactured by Gougeon Brothers, Inc., 706 Martin Street, Bay City, Michigan 48706 or approved equivalent. Provide the following materials: 105 Resin and 206 Slow Hardener or approved equivalent.

2.04 FASTENERS FOR CONSTRUCTION OF WOOD SASH

A. General: All fasteners for construction of new sash shall be stainless steel or nonferrous metal of appropriate size and configuration for use intended.

2.05 HARDWARE AND ACCESSORIES

A. General: Provide each restored window and door with full complement of hardware and fasteners matching that on original. Use salvaged, restored existing hardware insofar as possible and new hardware to match existing hardware where hardware is missing or existing hardware is damaged or deteriorated so as to be unrestorable.
   1. Restored Existing Hardware: Restore all existing hardware to be reused following requirements of Article 3.11 “Restoration of Existing Historic Hardware,” below.
   2. New Hardware: Provide new hardware and fasteners to match existing hardware and fasteners in all respects.

B. Sash Lifts: Restore any existing sash lifts insofar as possible and new sash lifts to match existing sash lifts in material, configuration, size, and finish where existing sash lifts are missing or damaged so as to be non-restorable.

C. Sash Locks: Restore any existing sash locks insofar as possible and new sash locks to match existing sash locks in material, configuration, size, and finish where existing sash locks are missing or damaged so as to be non-restorable.

D. Sash Pulleys: Clean, lubricate and reuse sash pulleys. Replace sash pulleys if necessary to operate the windows with sash chains.

E. Sash Cord: Replace all sash cords with minimum breaking strain capacity of 350 kg.

F. Sash Weights: Ensure that sash weights allow full operation of each sash and allow sash to be balanced at any position in which it is placed. Add weights to existing sash weights or replace existing sash weights with new heavier weights to balance heavier sash if necessary.

G. Screws for Attaching Restored Existing Hardware: Clean, salvage existing screws insofar as possible. Where screws are missing or damaged so as to be unsalvageable, provide new screws to match existing screws in material, size, and configuration.

H. Screws for Attaching Replacement Hardware: New screws matching screws in existing hardware.

2.06 PAINTING AND FINISHING MATERIALS

A. General: Paint shall be of premium quality and match existing color exactly unless otherwise specified and shall comply with requirements of contract document. Primer shall be either oil-based or 100% acrylic and finish paint shall be 100% acrylic.

B. Glazing Putty: Putty is to be best quality pure linseed or soybean oil.

2.07 HARDWARE RESTORATION MATERIALS

A. Non-metallic Cleaning Pads: Scotch-Brite pads, extra fine, manufactured by 3M Co., or approved equal.

B. Wadding Cloth: “Never-Dull Magic Wadding Polish,” manufactured by The George Basch Co., Inc., 19 Hanse Avenue, P.O. Box 188, Freeport, NY 11520, or approved equal.

C. Paste Wax for Cold Application: White or clear paste wax, mixtures of microcrystalline wax, carnuba wax, and mild solvent, in paste form, such as Trewax clear, or Butcher’s Bowling Alley Paste Wax available from White Diamond Co., Marlboro, MA. Do not use emulsion-type waxes or amber-tinted waxes.

D. Thinner: Mineral spirits or turpentine.

E. Lacquer: Clear, non-yellowing, acrylic emulsion, water-based coating, formulated with corrosion inhibitor benzotriazole, such as #11650 Eco-Borne clear lacquer as manufactured by G.J. Nikolas & Co., Inc., 2800 Washington Blvd., Bellwood, IL 60104 (708) 544-0320, or approved equal.

2.08 FABRICATION OF NEW SASH

A. Coordinate dimensions with actual measurements of window openings and adjacent construction to match in kind.

B. Fabricate components to match originals in kind.

C. Join moldings to match construction of original sash exactly.

D. Machine sash elements to receive glazing panels. Machine sash elements of movable sash to receive weatherstripping, if appropriate, and hardware.

PART 3: EXECUTION

3.01 SAFETY

A. Protection: Protect people, adjoining building surfaces, collections and landscape elements, et al from injury resulting from window restoration work. Use drop cloths or other coverings as necessary to protect interior finishes, floor and collections and exterior landscape material from dust and debris, etc.
   1. Erect temporary protection over pedestrian walkways and at those points of entry and exit that must remain operational during restoration.

3.02 INSPECTION AND DOCUMENTATION

A. Examine the areas and conditions where window and door restoration is to be executed. Take all necessary field measurements. Notify the Architect of conditions detrimental to the proper and timely completion of Work. Do not proceed until unsatisfactory conditions are corrected.

B. General: Document all elements of windows and doors to be restored for work of this Section, all elements adjacent to elements that are to be removed, and all other window and door elements that will be in any way affected by work of this Section. Show overall window and door elements and details of all damage or deterioration that might be considered as resulting from work of this Section. Key all notes to photographs to, clearly identifying portions of existing elements included in each photograph.

C. Form of Documentation: Document existing construction with high resolution (1 megabyte minimum) JPEG images on CDROM.

3.03 REMOVALS

A. General: Remove all window and door components that require removal for restoration or for proper installation.
   1. To minimize breakage, paint lines at the edges of window stops and parting strips must be cut/scribed first with a sharp knife before moldings are removed.
   2. All nails will be removed by pulling them through the back of the moldings only.
   3. Identify and label each component that is to be removed and repaired for reinstallation with window opening designator and location in jamb. Record numbers and locations of components.
   4. Remove adjacent elements as required to modify or replace elements of window jambs, heads, and sills that must be altered to accommodate new window sash. Use all care necessary to prevent damage or deterioration of elements removed and elements remaining in place. Restore or replace all elements damaged during work of this Section to Architect and Owner's satisfaction at no additional cost.
   5. Store removed elements in a secure location safe from theft, damage, and deterioration.
   6. Protect window and door openings to prevent water entry or human intrusion.

B. Glass Removal: All glass will be removed to accommodate sash restoration.
   1. Label each pane of glass with location and orientation within the sash so that the historic glass can be returned to its original location and orientation. Use painters tape to label glass and consistently label on either interior or exterior to avoid confusion at reinstallation.
   2. Remove all face glazing compound from each window sash using steam, infrared heat or other approved method.
   3. Any replacement of glass in to be done in kind and all replaced glass is to be dated in corner under glazing for future identification.

C. Paint Removal: All paint will be removed from sash as needed in order to insure successful adhesion of new paint.
   1. All paint removal shall be executed in compliance with all applicable federal, state, and local regulations.

2. Steam or heat will be used to carefully remove the paint while limiting the damage to the wood substrate.

D. Hardware Removal: All hardware will be removed as needed in order to restore sash and hardware.
1. Scribe paint around hardware so that removal of hardware does not splinter adjacent wood.
2. Remove paint from hardware so that any screws may be loosened.
3. Tag and retain all hardware and screws.

3.04 DUTCHMAN REPAIRS

A. General: Provide dutchman repairs where wood is structurally compromised. Wood repairs will not be made for aesthetic purposes. Dutchman repairs shall provide continuous smooth surfaces matching planes and profiles of wood members being repaired. Dutchman shall match wood being repaired in specie and cut. In wood for clear finish, grain pattern of dutchman shall match grain pattern of wood into which it is inserted.

B. Preparation: Neatly cut out existing opening as required to provide a prismatic void. Wherever possible create voids that will provide mechanical attachments as in dovetails. The amount of wood removed should be minimized but the amount should include all damaged wood and extend just past damaged wood to prevent spread of any fungus contained therein. Cut away area will provide ample glue surface.

C. Dutchman: Cut dutchman to exactly fit void, with exposed portion matching original profile of woodwork and just slightly proud of original surface. Orient grain of dutchman parallel to grain of element being patched. Where deterioration or loss at end of component requires dutchman repair, use a diagonal scarf joint for end-to-end joint between dutchman and remaining portion of component.

D. Installation: Clean glue surfaces with acetone or denatured alcohol. Insert dutchman using specified adhesive and clamp in place until glue is set. Where clamping is not feasible, use small brads; remove brads and fill holes after adhesive has set.

E. Surfacing: Plane or scrape dutchman to provide smooth continuous surface coplanar with adjacent wood. Do not damage or alter profile or finish of adjacent wood.

3.05 COMPONENT REPLACEMENT

A. General: Fabricate new components for any components which are deteriorated in entirety and cannot be repaired with Dutchmen and epoxy.

B. In kind replacement: Except as specifically indicated otherwise, provide replacement elements of same specie with configurations, profiles, dimensions and joinery et al exactly matching those of existing elements.
1. Profiles: Remove coatings from profiles of existing elements before recording profiles to produce molding cutters to match existing profiles.
2. Molding Cutters: Cut custom blades as required to match original profiles and label knifes with project code.

C. Machining and Surfacing: Machine and surface all new and replacement wood elements to provide smooth even surfaces without saw marks or plane marks. Wood with surface irregularities, including but not limited to scratches, saw marks, and plane knife marks, visible after finish has been applied will be rejected and shall be replaced with properly finished wood elements at no additional cost.

3.06 SASH INSTALLATION

A. General: Install new and restored sash as per contract. At completion of installation, windows shall be complete with all components and with unblemished paint and finish coats. All operating sash shall operate smoothly over entire height, and weatherstripping, if specified, shall provide weatherproof seal.

B. Sash Balances: If specified install sash with sash chains/cords and weights properly adjusted to allow sash to close securely, open completely to top of track, and remain stationary at any position in track.

C. Sash Hardware: Install any hardware, including sash lifts and sash locks, on restored sash in the same locations as originally. Adjust sash locks for smooth easy operation and firm, secure locking.

D. Wax: Treat unpainted sides of stiles and frame with wax for ease of window operation and wood protection.

E. Weatherstripping: If specified, install weatherstripping following manufacturer's requirements to ensure smooth operation and weathertight closure.

3.07 ADJUSTING

A. General: Adjust operating sash and hardware to provide a tight fit at contact points and weatherstripping, if specified, and to provide smooth operation and a weathertight closure. Lubricate hardware and moving parts.

3.08 GLAZING

A. General: Re-glaze all window lites using approved pure linseed oil or soybean oil glazing putty. Glazing points shall be used to set glass.

B. Clean glass prior to glazing with non-ammoniated formula before reinstallation.

3.09 GLASS PRODUCTS

A. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   2. For uncoated glass, comply with requirements for Condition A.

B. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
   1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

C. Replace existing damaged glazing with clear glass in kind to match existing thickness and type as applicable.

D. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
   2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
   3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

3.10 FRAME RESTORATION

A. Preparation:
   1. Remove dirt and debris from frame, including loose dirt inside window frames accessible from jamb access panels.
   2. Remove extraneous nails, staples, bolts, hooks, etc. from wind and door frames and wood trim.

3. Protect frame and opening from weather. Dry all wood to moisture content below 1.7 percent.
4. Strip paint from exterior frame members and sills. Use care to avoid damage to wood.

B. Frame Repair Procedure: Inspect all frame components for condition. Test wood using and ice pick and moderate hand pressure to determine extend and depth of deterioration. Repair and replace wood elements as required to provide sound frame with all members having original planes and profiles.
1. Member Replacement: Disassemble frame as required to remove severly deteriorated components. Provide new wood members matching original members as specified.
2. Member Repair: Consolidate areas of members where wood is deteriorated; consolidate and patch areas where wood is missing, and fill small holes (less than 1 inch x 1 inch x 1/2 inch deep), cracks, and open joints using epoxy fillers. Provide dutchman repairs for holes equal to or greater than 1 inch x 1 inch x 1/2 inch deep.
3. Joint Repair: Tighten loose and open joints in frame using specified adhesive and finishing nails properly countersunk. Fill all joints that cannot be closed without dismantling frame with epoxy wood filler.

C. Finishing:
1. Sanding and cleaning: Chemically strip wood frame elements to wood surfaces. Dispose of chemical stripper as required by law for lead containing material.
2. Wood Preservative Treatment: Treat all unpainted exterior and concealed wood surfaces with wood preservative. Liberally apply two coats to all surfaces. Spray treat all head and jamb members. Allow 24 hours between coats and 3 days between final coat and priming.

3.11 CLEANING

A. Clean interior and exterior surfaces promptly after installation. Take care to avoid damage to historic and protective coatings and finishes.

B. Use only cleaners which do not contain ammonia. Windex, 409 and like products are not acceptable as they accelerate paint film deterioration.

3.12 PAINTING

A. General: Paint and finish new and restored elements of frames and trim to match original finishes and/or as specified by contract documents. Prime and paint sash in controlled environment according to manufacturers instructions.

B. Prepare substrates for repairs by hand sanding with 100 grit paper. The sides of the stiles (unpainted edges) of double hung windows do not need to be sanded unless special conditions require it.

C. After substrate is sanded, vacuum all surfaces and remove remaining dust with barely damp dust-free cloth. Allow surfaces to dry completely before priming.

D. Apply water repellant wood preservative to all surfaces of the sash.

E. Apply one coat of alkyd or 100% acrylic primer to all surfaces of the sash including putty beds (shellac based paint cannot be applied over glazing). On all window sash, extend primer and paint 1/16” onto glass to seal glazing. If sash is operable, it is important to paint bottom edge to prevent water intrusion.

F. Lightly sand surfaces after the primer has dried and clean of all dust.

G. Apply two topcoats of premium quality 100% acrylic paint to all surfaces. Color to match existing exactly unless otherwise specified.

H. Immediately after installation touch-up any disturbed areas of paint.

3.13 RESTORATION OF EXISTING HARDWARE

A. General: Remove historic hardware from existing window and door elements to be replaced and remove sash pulleys from jambs. Store hardware in plastic bags or containers identified with opening number to ensure that each unit of hardware is reinstalled in its original location.

B. Remove lacquer coatings with acetone or lacquer thinner.

C. Strip paint coatings by dipping in chemical paint stripper.

D. After removal of paint and other coatings, thoroughly rinse in appropriate solvent and wipe dry with soft cloths.

E. Replacement Parts: Provide replacement parts, including operating parts and fasteners, matching original parts in metal and alloy, configuration, size, and finish for all missing and damaged parts.

F. Remove scratches and buff surfaces using like metal cleaning and polishing pads and polishing compound as necessary. Do not scratch finish with abrasive pads or wire brushes.

G. Provide lacquer finish on all copper alloy elements.
   1. Preparation
      a. Clean and degrease metal using solvent and burnishing with handheld bronze wool to provide surface free of dirt, dust, grease, oil, and other contaminants. Do not damage metal finish. If a surface is handled or contaminated, repeat cleaning and degreasing process.
      b. Drying: Ensure that metal surface is completely dry.
      c. Environment: Ensure that environment is dust-free before applying lacquer.
   2. Lacquer Application: Build up coatings to produce 2-mil dry film thickness. Spray lacquer using “hot spray,” “airless spray,” or “electrostatic spray” methods.
   3. Curing: Cure lacquer coatings by “baking” in shop at elevated temperatures following manufacturer’s recommendations.
   4. Waxing: Protect baked lacquer coatings by hand application of two coats of hard paste wax.

H. Lubricate operating parts.

I. Store units in protective packaging.

J. Provide all missing fasteners for hardware. Fasteners must match all visual aspects of existing fasteners.

3.14 PROTECTION

A. Protect windows and doors from damage or deterioration until time of substantial completion

3.15 SCHEDULE

A. Refer to Project Drawings for full window and door schedules and description / scope of restoration and repair work.

END OF SECTION 085200

SECTION 089100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 076200 - Sheet Metal Flashing and Trim.

B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 099113 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
   1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Airolite Company, LLC: www.airolite.com.
   2. American Warming and Ventilating: www.awv.com/#sle.
   3. Construction Specialties, Inc: www.c-sgroup.com.
   4. Industrial Louvers, Inc: www.industriallouvers.com/#sle.
   5. NCA, a brand of Metal Industries Inc: www.ncamfg.com/#sle.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   2. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
   1. Free Area: 50 percent, minimum.
   2. Blades: Straight.
   3. Frame: 4 inches (100 mm) deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.

4. Aluminum Thickness: Frame 12 gage, 0.0808 inch (2.05 mm) minimum; blades 12 gage, 0.0808 inch (2.05 mm) minimum.
5. Aluminum Finish: Class II natural anodized; finish welded units after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.04 FINISHES

A. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils (0.01 mm) thick.

B. Color: As selected from manufacturer's standard colors.

2.05 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Fasteners and Anchors: Galvanized steel.

C. Head and Sill Flashings: See Section 076200.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Coordinate with installation of flashings by others.

C. Install louvers level and plumb.

D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION 089100

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Wood.
   2. Steel.

1.02 RELATED REQUIREMENTS

A. Section 003100 - Available Project Information: Hazardous material survey.

B. Section 055213 - Pipe and Tube Railings

C. Section 062000 - Finish Carpentry

D. Section 085200 - Wood Window and Door Restoration

E. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1.05 MOCK-UP

A. See Section 014000 - Quality Requirements, for general requirements for mock-up.

B. Where / as requested by Architect or Owner in lieu of sample(s), provide an appropriately sized painted panel or portion of work to illustrate paint color, texture, and finish.

C. Locate where directed by Architect and/ or Owner.

D. Approved mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.07 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Benjamin Moore & Co.
   2. Glidden Professional.
   3. PPG Paints.
   4. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
   5. Sherwin Williams Company (The)

2.02 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

C. Colors: To match existing as approved by Architect and Owner based on submitted representative test sample(s).

2.03 METAL PRIMERS

A. Primer, Alkyd, Anti-Corrosive for Metal:
   1. Benjamin Moore & Co.
   2. Glidden Professional.
   3. PPG Paints.
   4. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
   5. Sherwin Williams Company (The)

2.04 SOLVENT-BASED PAINTS

A. Alkyd, Quick Dry, Semi-Gloss (Gloss Level 5):
   1. Benjamin Moore & Co.
   2. Glidden Professional.
   3. PPG Paints.
   4. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
   5. Sherwin Williams Company (The)

2.05 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   3. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 EXTERIOR PAINTING SCHEDULE

A. Wood Substrates:
   1. See Section 085200 for additional requirements regarding wood doors and windows.
   2. Quick-Drying Enamel Sytem
      a. Prime Coat: Primer, either oil based or 100% acrylic, high quality, for wood.
      b. Intermediate Coat: Acrylic, quick dry, matching topcoat.
      c. Topcoat: Acrylic, quick dry, finish sheen to match existing.

B. Steel Substrates:
   1. Quick-Drying Enamel System:
      a. Prime Coat: Primer, alkyd, quick dry, for metal.
      b. Intermediate Coat: Alkyd, quick dry, matching topcoat.
      c. Topcoat: Alkyd, quick dry, semi-gloss (Gloss Level 5).

END OF SECTION 099113