

**PROJECT MANUAL  
and  
CONSTRUCTION SPECIFICATIONS**

---

**HISTORIC JEFFERSON COLLEGE  
ENVELOPE REPAIRS**

**Mississippi Department of Archives & History**

---

**REQUEST FOR QUALIFICATIONS  
FOR CONTRACTOR**

**September 30, 2022**



**SHAHER | ZAHNER | ZAHNER**  
OFFICE OF ARCHITECTURE

**510 University Drive Starkville, MS 39759 Phone (662) 323-1628**

**Project Manual and  
Construction Specifications**

Historic Jefferson College Envelope Repairs

Mississippi Department of Archives & History

**TABLE OF CONTENTS**

**DIVISION 0**

**BIDDING REQUIREMENTS, CONTRACT FORMS, AND  
CONDITIONS OF THE CONTRACT**

SECTION 00 1100	-	ADVERTISEMENT FOR BIDS
SECTION 00 2100	-	INSTRUCTIONS TO BIDDERS
SECTION 00 4200	-	PROPOSAL FORM
SECTION 00 5200	-	STANDARD FORM OF AGREEMENT BETWEEN THE OWNER AND
		THE CONTRACTOR
SECTION 00 6100	-	CONTRACT BOND
SECTION 00 6216	-	CERTIFICATE OF INSURANCE
SECTION 00 6217	-	CERTIFICATE OF INSURANCE INSTRUCTIONS
SECTION 00 6300	-	AFFIDAVIT CERTIFYING PAYMENT TO ALL SUBCONTRACTORS
SECTION 00 7200	-	GENERAL CONDITIONS
SECTION 00 7300	-	SUPPLEMENTARY CONDITIONS
SECTION 00 7339	-	MINORITY PARTICIPATION
SECTION 00 7343	-	LABOR REQUIREMENTS
SECTION 00 8000	-	SPECIAL CONDITIONS
SECTION 00 9000	-	ADDENDA

**DIVISION 1**

**GENERAL REQUIREMENTS**

SECTION 01 1000	-	SUMMARY OF WORK
SECTION 01 2100	-	ALLOWANCES
SECTION 01 2300	-	ALTERNATES
SECTION 01 2600	-	CHANGE ORDER PROCEDURES
SECTION 01 2973	-	SCHEDULE OF VALUES
SECTION 01 2976	-	APPLICATIONS FOR PAYMENT
SECTION 01 3100	-	PROJECT COORDINATION
SECTION 01 3119	-	PROJECT MEETINGS
SECTION 01 3216	-	PROGRESS SCHEDULES
SECTION 01 3217	-	NETWORK ANALYSIS SCHEDULE
SECTION 01 3323	-	SHOP DRAWINGS, PROJECT DATA, AND SAMPLES
SECTION 01 4529	-	TESTING LABORATORY SERVICES
SECTION 01 5000	-	CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
SECTION 01 6000	-	SUBSTITUTIONS AND PRODUCT OPTIONS
SECTION 01 7329	-	CUTTING AND PATCHING
SECTION 01 7400	-	CLEANING
SECTION 01 7500	-	STARTING OF SYSTEMS
SECTION 01 7700	-	CONTRACT CLOSEOUT
SECTION 01 7800	-	PROJECT RECORD DOCUMENTS
SECTION 01 8000	-	SPECIAL REQUIREMENTS

SECTION 01 8000 EXHIBIT "A" PROJECT SIGN  
SECTION 01 8000 PART 7 ADVERSE WEATHER EVALUATION

**DIVISION 2**

**SITE WORK**

- SECTION 02 10 20 - EXISTING UTILITIES
- SECTION 02 10 40 - DISPOSAL OF MATERIAL
- SECTION 02 20 00 - CONSTRUCTION SAFEGUARDS
- SECTION 02 21 00 - HISTORIC STRUCTURES GENERAL PROJECT GUIDELINES
- SECTION 02 41 19 - SELECTIVE DEMOLITION
- SECTION 02 83 00 - JOB SITE FENCING

**SECTION 3**

**CONCRETE**

**DIVISION 4**

**MASONRY**

- SECTION 04 10 00 - PREPARING LIME MORTAR FOR REPOINTING MASONRY
- SECTION 04 20 00 - REPOINTING MASONRY USING LIME MORTAR

**DIVISION 5**

**METALS**

- SECTION 05 50 00 - METAL FABRICATIONS

**DIVISION 6**

**WOOD AND PLASTICS**

- SECTION 06 10 00 - ROUGH CARPENTRY
- SECTION 06 10 73 - WOOD BLOCKING AND CURBING
- SECTION 06 15 00 - WOOD DECKING AND SHEATHING

**DIVISION 7**

**THERMAL AND MOISTURE PROTECTION**

- SECTION 07 28 00 - VAPOR RETARDERS
- SECTION 07 30 11 - ROOF UNDERLAYMENT, HIGH-TEMPERATURE
- SECTION 07 31 10 - SYNTHETIC SHINGLES
- SECTION 07 31 13 - ASPHALT SHINGLES
- SECTION 07 31 29 - WOOD SHINGLE AND SHAKE ROOFING
- SECTION 07 31 35 - SLATE ROOFING REPAIR
- SECTION 07 56 50 - PREPARATION FOR RE-ROOFING
- SECTION 07 61 01 - COPPER ROOFING
- SECTION 07 62 10 - MANUFACTURED COPPER ROOFING SPECIALTIES
- SECTION 07 62 20 - COPPER FLASHING AND TRIM
- SECTION 07 92 00 - JOINT SEALERS

**DIVISION 8**

**DOORS AND WINDOWS**

- SECTION 08 50 00 - REPAIR & RESTORATION OF HISTORIC WOOD WINDOWS

**DIVISION 9**

**FINISHES**

- SECTION 09 01 00 - PREPARATION OF HISTORIC WOOD AND METAL SURFACES FOR PAINTING
- SECTION 09 91 00 - PAINTING

<b>DIVISION 10</b>		<b>SPECIALTIES</b>
<b>DIVISION 11</b>		<b>EQUIPMENT</b>
<b>DIVISION 12</b>		<b>FURNISHINGS</b>
<b>DIVISION 13</b>		<b>SPECIAL CONSTRUCTION</b>
<b>DIVISION 14</b>		<b>CONVEYANCE EQUIPMENT</b>
<b>DIVISION 21</b>		<b>FIRE SUPPRESSION</b>
<b>DIVISION 22</b>		<b>PLUMBING</b>
<b>DIVISION 23</b>		<b>HEATING VENTILATION AND AIR CONDITIONING</b>
<b>DIVISION 26</b>		<b>ELECTRICAL</b>
<b>DIVISION 27</b>		<b>COMMUNICATIONS</b>
<b>DIVISION 28</b>		<b>ELECTRONIC SAFETY AND SECURITY</b>
<b>DIVISION 31</b>		<b>EARTHWORK</b>
<b>DIVISION 32</b>		<b>EXTERIOR IMPROVEMENTS</b>
SECTION 32 92 00	-	LAWNS AND GRASSES
<b>DIVISION 33</b>		<b>UTILITIES</b>
<b>APPENDIX</b>		
APPENDIX 1	-	COPPER IN ARCHITECTURE HANDBOOK
APPENDIX 2	-	1976 MILLWORK DRAWINGS
APPENDIX 3	-	2015 RPA PLANS – STRUCTURAL REPAIRS AND DRAINAGE

## SECTION 02 10 20

### EXISTING UTILITIES

#### PART 1 – GENERAL

##### 1.01 EXISTING UTILITIES

- A. The Contractor shall be solely responsible for making all arrangements for the location of all utility services on site. These arrangements are to be made with all utility and service providers, the state's "One Call" service, and the owner (to ensure that no owner installed or provided utilities or services exist that may not be recorded by the service providers). The Contractor shall be fully responsible for the preservation of existing utilities during the project.
- B. The Contractor shall be solely responsible for the scheduling for location of utility lines by the various utilities whenever trenching or boring. The Contractor is also solely responsible for the scheduling for location of utilities and services during demolition or any other destructive activity. The Contractor shall be solely responsible for the scheduling/coordinates of the necessary extension of the any existing electrical, mechanical or plumbing features required for the completion of this project and notifying the service provider.
- C. Local power company(s) are to relocate existing poles (or services) that conflict with the construction. All other service relocation is to be either performed by the service provider or relocated by the Contractor with the permission and at the direction of the service provider. All costs associated with these relocation(s) shall be borne by the Contractor.
- D. The Contractor shall schedule/coordinate any interruptions (required by himself, subcontractors, service providers, etc.) in any utility service with the Owner and the Architect's office. The Contractor shall allow ample time for the Owner to make all necessary accommodations so that the utility interruption does not adversely affect the building or site occupants.

#### PART 2 – PRODUCTS

#### PART 3 – EXECUTION

END OF SECTION

SECTION 02 10 40  
DISPOSAL OF MATERIAL

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Disposal of Material from project site(s).

PART 2 - PRODUCTS

PART 3 – EXECUTION

3.01

- A. Removal and disposal of materials shall be done in a manner acceptable to the Architect, Engineer and Owner.
- B. All applicable federal, state, city, and county rules, regulations or ordinances covering handling, transporting, moving, re-establishing, demolition or disposal of structures or appurtenances shall be complied with.
- C. If hazardous materials or suspected hazardous materials are encountered, the Contractor shall immediately contact the Owner and Architect.

END OF SECTION

SECTION 02 20 00  
CONSTRUCTION SAFEGUARDS

PART 1 - GENERAL

1.1. SCOPE OF WORK

- A. Preparation of the construction site and adjacent areas to protect construction, site, the public, etc. from construction activities.

1.2. PRE-INSTALLATION CONFERENCE

- A. Refer to Project Meeting Division 0 and Division 1 sections for additional requirements. At a minimum, coordinate meetings with the Owner and the Authorities Having Jurisdiction (AHJ) to verify the level of protections required based on the specific site conditions and the code requirements.
- B. Review installation procedures, locations and coordination required with the owner and Authorities Having Jurisdiction prior to any demolition or construction activities.

1.3. SCHEDULING

- A. Schedule work to coincide with commencement of demolition and construction activities and as required by the Owner and Authorities Having Jurisdiction (AHJ's) based on the Owner's scheduling requirements.

PART 2 - EXECUTION

2.1 CONSTRUCTION SAFEGUARDS

Construction safeguards: all construction safety, site protection, protection of the public and employees, protection of existing construction and adjacent construction, adherence to O.S.H.A. all applicable codes, etc. Are solely the responsibility of the contractor. This note is not a complete listing of all construction safeguards that the contractor is responsible for. The contractor is responsible for being familiar with all requirements from all governing authorities and abiding by all requirements.

References:

international existing building code (IEBC) current addition  
International building code, current addition  
International fire code (IFC), chapter 33

Some of the requirement listed in the above referenced codes are listed below. However, the contractor responsibility to be aware of and adhere to all applicable codes, ordinances and regulations. Additionally, the contractor must abide by all local requirements and the authority having jurisdiction (A.H.J.) for each and every one of the governing authorities. All questions that the contractor has regarding interpretation and/or the applicability of any and all construction safeguards should be directed to authority having jurisdiction for the particular governing authority responsible for the requirement in question.

**IFC, chapter 13 requires:** a fire watch is to be conducted in accordance with the intentional fire code and as approved by the local authority having jurisdiction.

- **when required** - a fire watch shall be provided during hot work activities and shall continue for not less than 30 minutes after the conclusion of the work (unless longer is required by the local A.H.J.) the fire code official, or responsible manager under a hot work program, is authorized (and allowed) to extend the fire watch based on the hazards or work being performed.
- **location** - the fire watch shall include the entire hot work area. Hot work conducted in areas with vertical or horizontal fire exposures that are not observable by a single individual shall have additional personnel assigned to fire watches to ensure that exposed areas are monitored.
- **duties** - individuals designated to fire watch duty shall have fire-extinguishing equipment readily available and shall be trained in the use of such equipment. Individuals assigned to fire watch duty shall be responsible for extinguishing spot fires and communicating an alarm.
- **fire training** - the individuals responsible for performing the hot work and individuals responsible for providing the fire watch shall be trained in the use of portable fire extinguishers.
- **fire hoses** - where fire hoses are required, they shall be connected, charged and ready for use.
- **fire extinguisher** - not less than one portable fire extinguisher complying with section 906 (IFC) and with a minimum 2-a:20-b:c rating shall be readily accessible within 30 feet of the location where hot work is performed.
- **pre-hot-work check** - a pre-hot-work check shall be conducted prior to work to ensure that all equipment is safe and hazards are recognized and protected. A report of the check shall be kept at the work site during the work and available upon request. The pre-hot-work check shall determine all of the following:
  1. Hot work equipment to be used shall be in satisfactory operating condition and in good repair.
  2. Hot work site is clear of combustibles or combustibles are protected.
  3. Exposed construction is of noncombustible materials or, if combustible, then protected.
  4. Openings are protected.
  5. Floors (deck) is kept clean.
  6. No exposed combustibles are located on the opposite side of partitions, walls, ceilings or floors.
  7. Fire watches, where required, are assigned.
  8. Approved actions have been taken to prevent accidental activation of suppression and detection equipment.

**IEBC chapter 15, construction safeguards** sets forth requirements for protecting safety and protection of public/private properties. Although all worksite safety and protection is the responsibility of the contractor; additionally, these are some of the specific items listed in IEBC (chapter 15) that are required:

- **storage and placement** - construction equipment and materials shall be stored and placed so as not to endanger the public, the workers or adjoining property (on and off this site) for the duration of the construction project.
- **required exits**, existing structural elements, fire protection devices, and sanitary safeguards shall be maintained at all times during alterations, repairs or additions to any building or structure. Exceptions: 1. When such required elements or devices are being altered or repaired, adequate substitute provisions shall be made. (as approved by the A.H.J.) 2. When the existing building is not occupied.
- **manner of removal** - waste materials shall be removed in a manner that prevents injury or damage to persons, adjoining properties (on and off of this site) and public rights-of-way.
- **fire safety during construction** - fire safety during construction shall comply with the applicable requirements for the international building code and the applicable provisions of chapter 33 of the international fire code.
- **protection of pedestrians** - pedestrians shall be protected during construction and demolition activities as required by (the barricade, walkways, railings, barriers, covered walkways, etc.) Requirements of IEBC, chapter 15). Signs shall be provided to direct pedestrian traffic.
- **walkways** - a walkway shall be provided for pedestrian travel in front of every construction and demolition site unless the applicable governing authority authorizes the sidewalk to be fenced or closed. Walkways shall be of sufficient width to accommodate that pedestrian traffic, but in no case shall they be less than 4 feet in width. Walkways shall be accessible in accordance with



chapter 11 of the international building code and shall be designed to support all imposed loads and in no case shall the design live load be less than 150 pounds per square foot.

·**directional barricades** - pedestrian traffic shall be protected by a directional barricade where the walkway extends into the street. The directional barricade shall be of sufficient size and construction to direct vehicular traffic away from the pedestrian path.

·**construction railings** - construction railings shall be at least 42 inches in height and shall be sufficient to direct the pedestrians around construction areas.

·**barriers** - barriers shall be a minimum of 8 feet in height and shall be placed on the side of the walkway nearest the construction. Barriers shall extend the entire length of the construction site. Openings in such barriers shall be protected by doors that are normally kept closed.

·**barrier design** - barriers shall be designed to resist loads required in chapter 13 of the international building code unless constructed as follows:

...barriers shall be provided with 2x4 top and bottom plates

...the barrier material shall be a minimum of 3/4 inch boards or 1/4 inch wood structural use panels.

...wood structural use panels shall be bonded with an adhesive identical to that for exterior wood structural use panels.

...wood structural use panels 1/4 inch or 1/16 inch in thickness shall have studs spaced not more than 2 feet on center.

...wood structural use panels 3/8 inch or 1/2 inch in thickness shall have studs spaced not more than 4 feet on center. Provided a 2-inch by 4-inch stiffener is placed horizontally at the mid-height where the stud spacing exceeds 2 feet on center.

...wood structural use panels 5/8 inch or thicker shall not span over 8 feet.

·**covered walkways** - covered walkways shall have a minimum clear height of 8 feet as measured from the floor surface to the canopy overhead. Adequate lighting shall be provided at all times. Covered walkways shall be designed to support all imposed loads. In no case shall the design live load be less than 150 PSF for the entire structure.

·**exception**: roofs and supporting structures of covered walkways for new, light-framed construction not exceeding two stories above grade plane are permitted to be designed for a live load of 75 PSF or the loads imposed on them, whichever is greater. In lieu of such designs, the roof and supporting structure of a covered walkway are permitted to be constructed as follows:

...footings shall be continuous 2x6 members.

...posts not less than 4x6 shall be provided on both sides of the roof and spaces not more than 12 feet on center.

...stringers not less than 4x12 shall be placed on edge upon the posts.

...joists resting on the stringers shall be at least 2x8 and shall be spaced not more than 2 feet on center.

...the deck shall be planks at least 2 inches thick or wood structural panels with an exterior exposure durability classification at least 23/32 inch thick nailed to the joists.

...each post shall be knee braced to joists and stringers by 2x4 minimum members 4 feet long.

·see all requirements for repair, maintenance and removal of all barriers

·protection of adjoining property - adjoining public and private property shall be protected from damage during construction and demolition work protection must be provided for footings, foundations, party walls, chimneys, skylights and roofs. Provisions shall be made to control water runoff and erosion during construction and demolition activities.

·**temporary use of streets, alleys and public property**:

·**storage and handling of materials** - the temporary use of streets or public property or the storage or handling of materials or equipment required for construction demolition, and the protection provided to the public shall comply with the provisions of the applicable governing authority and this chapter (chapter 15, IEBC)

·**obstructions** - construction materials and equipment shall not be placed or stored so as to obstruct access to fire hydrants, standpipes, fire or police alarm boxes, catch basins or manholes, nor shall such material or equipment be located within 20 feet of a street intersection, or placed so as to obstruct normal observations of traffic signals or to hinder the use of public transit loading platforms.

..**utility fixtures** - building materials, fences, sheds or obstructions of any kind shall not be placed so as to obstruct free approach to any fire hydrant, fire department connection, utility pole, manhole, fire alarm box or catch basin, or as to interfere with the passage of water in the gutter. Protection against damage shall be provided to such utility fixtures during the progress of the work, but sight of items shall not be obstructed.

The contractor is responsible for being familiar with and adhering to all osha standards for scaffolding, stair towers and similar structures. Although all such structures must be properly and adequately supported, the contractor must obtain prior approval before anchoring to the building so that the method of attachment and required repair can be approved by the owner prior to installation.

END OF SECTION 02 20 00

## Historic Structures General Project Guidelines

### 1.01 SAFETY PRECAUTIONS

**PREFACE:** This standard includes general project guidelines provided to supplement specific repair procedures. Where applicable, these guidelines should be used in addition to recommendations provided by the regional historic preservation officer (RHPO).

1. The supervisor should ensure that all workers wear adequate, approved protective clothing and are provided with protective equipment during work operations and as required at other times.
2. Check manufacturer's literature for precautions and effects of products and procedures on adjacent building materials, components, and especially vegetation. Take appropriate protective measures.
3. All workers must be protected from the effects of chemicals during repair or cleaning operations.
  1. DO NOT save unused portions of stain-removal materials.
  2. DO NOT store any chemicals in unmarked containers.
  3. EXCELLENT VENTILATION MUST BE PROVIDED WHEREVER ANY SOLVENT IS USED. USE RESPIRATORS WITH SOLVENT FILTERS.  
NOTE: SOME OF THE SOLVENTS LISTED COULD BE KNOWN CARCINOGENS AND MAY BE BANNED IN SOME STATES.
  4. No use of organic solvents indoors should be allowed without substantial air movement. Use only spark-proof fans near operations involving flammable liquids.
  5. Provide adequate clothing and protective gear where the chemicals are indicated to be dangerous.
  6. Have available antidote and accident treatment chemicals where noted.
  7. Avoid skin contact and inhalation of any chemical. Rubber or plastic gloves should be worn when handling hazardous (flammable or toxic) chemicals.
    1. Follow storage and handling procedures printed on the container labels of the cleaning solutions, provide good ventilation while working, and thoroughly wash hands after completion of the work.
    2. Provide protective clothing which must be worn and protective creams for exposed skin areas.
    3. Accidental contact with unprotected skin to these materials must be treated immediately by washing with soap and water, never with solvents.
    4. Exercise care to avoid skin contact to tool cleaning solvents and to provide adequate ventilation for clean-up operations.
4. When removing bird droppings: Bird droppings may expose workers to the effects of cryptococcosis and histoplasmosis which endanger the human respiratory system. Public health authorities should be consulted for appropriate precautions.
  1. All contractor personnel must wear a National Institute for Occupational Safety and Health (NIOSH) approved full face respirator with a high efficiency particulate air (HEPA) filter for screening particles of 0.3 micron size. Dust and particle masks are not appropriate.

2. Respirators must be used in accordance with OSHA regulation, 29 CFR 1910.134 and GSA policy, PBS P 5900.2C, Chapter 3, section 8. This includes fit-testing of respirators, maintenance, training, and storage requirements.
3. All contractor personnel must wear protective coveralls, gloves, boots, and hats.
4. Prior to removal, all excrement must be saturated with water under low pressure to prevent debris from becoming airborne.
5. On historic structures, only non-metallic tools (such as plastic spatulas and brushes with natural fiber or nylon bristles, or their equivalent) must be used to remove the excrement.
6. Removed excrement must be collected in plastic bags, sealed, and disposed of by the contractor at a sanitary landfill.
7. All work must be performed from the outside of the building. Building occupants and the general public must be kept clear of the work site during all operations. It is the contractor's responsibility to provide all barricades, signage, etc. necessary for public protection.
5. When removing paint:
  1. Paint being removed most likely will contain lead. All workers must wear protective clothing (including hair), goggles and respirators with proper filters.
  2. No food or drink shall be allowed near any work station so as to prevent contamination from paint, paint chips, dust or chemical removers which contain lead and other toxic substances.
  3. Protective clothing shall be removed at the end of each day and kept at the site to prevent workers from tracking dust and paint chips to other parts of the site or to their homes.
  4. Wash hands and face often, especially before eating and at the end of the day.
  5. All waste material shall be collected at the end of each work day and disposed of in a manner consistent with local environmental regulations. It is considered Hazardous Waste.

## **1.02 HISTORIC STRUCTURES PRECAUTIONS**

1. The principal aim of any work must be to halt the process of deterioration and stabilize the item's condition. Repair is a second option which becomes necessary only where preservation is not sufficient to ensure mid- to long-term survival. Repair should always be based on the fundamental principle of 'minimal disturbance'. The following are good practices which arise from this principle:
  1. Retention of as much existing material as possible; repairing and consolidating rather than renewing.
  2. The use of additional material or structure to reinforce, strengthen, prop, tie, and/or support existing material or structure.
  3. The use of reversible processes wherever possible.
  4. The use of traditional materials and techniques. New work should be distinguishable to the trained eye, on close inspection, from the old.
  5. The item should be recorded before, during and after the work.
    1. No smoking will be allowed by personnel performing work on or about Historic Structures.
    2. RHPO's approval is required for any change, addition or removal of historic structural fabric or historic property.

3. RHPO should be notified of any visible change in the integrity of the material or component whether environmental, such as biological attack, ultraviolet degradation, freeze, thaw, etc., or structural defects, such as cracks, movement, or distortion.
4. Architectural features will be repaired rather than replaced wherever possible. Repair or replacement of missing features will be based on accurate duplications rather than on conjectural designs.
5. Work which requires existing features to be removed, cleaned and reused shall be accomplished without damage to the material itself, to adjacent materials, or the substrate.
6. Existing features removed from the building which are to be reinstalled shall be carefully labeled and stored within the building in a place where they will not be damaged or obstruct other work.
7. New or replacement materials/features will be permanently marked in an unobtrusive manner to distinguish them from original fabric. The manner of identification and location of these marks shall be recorded in permanent building records.
8. Identify the historic importance of the material or feature. The item's merit, in terms of age, uniqueness of design, materials, size, technological development, association with persons or events, exceptional workmanship or design qualities, must be understood before decisions regarding repair, maintenance and preservation can be made.
9. Statement of Non-Compliance: Wherever it is necessary to proceed with the use of products, under conditions which do not comply with the requirements (because of time schedule difficulties or other reasons which the supervisor determines that are crucial to the project), prepare a written statement for the RHPO's Record indicating the nature of the non-compliance, the reasons for proceeding, the extra or precautionary measures taken to ensure the best possible work, and the names of the individuals concurring with the decisions to proceed with the work.
10. When cleaning, avoid overcleaning. Aim for achieving 85% clean. Most damage occurs when attempting to clean the last 15%.
  1. Do not use acids or flame tools to strip paint from stone, as it will damage the surface.
  2. Do not use steel or metal spatulas or tools to scrape stone because of the likelihood of scratching, chipping, gouging, or otherwise marring the surface.

### **1.03 SUBMITTALS**

1. Product Data (when applicable):
  1. Submit to RHPO manufacturer's technical data for each product indicated including chemical analysis, recommendations for their application and use, and any other available technical data. Include test reports and certifications substantiating that products comply with requirements.
  2. MANUFACTURERS OFFERING OTHER THAN BRAND NAME ITEMS IDENTIFIED IN THE PROCEDURE SHOULD FURNISH ADEQUATE INFORMATION TO ENSURE THAT A DETERMINATION CAN BE MADE AS TO EQUALITY OF THE PRODUCT(S) OFFERED (SEE

THE CLAUSE ENTITLED BRAND NAME OR EQUAL SET FORTH IN SECTION 552.210-74 OF THE GSA ACQUISITION REGULATION).

2. Samples:
  1. Clearly labelled samples of all materials to be used on the job should be submitted to the RHPO for approval before work starts.
  2. The approved samples will become the standard materials used on the job. Substitutions will not be permitted without written approval from the RHPO.
3. Quality Control Submittals:
  1. Submit written program for each phase of process including protection of surrounding materials during operations. Describe in detail materials, methods and equipment to be used for each phase of work.
  2. If alternative methods and materials to those indicated are proposed for any phase of work, provide written description to RHPO, including evidence of successful use on other, comparable projects, and program of testing to demonstrate effectiveness for use on this project.
  3. The contractor should supply proof of work on this type of project by submitting a list of pertinent projects the subcontractor has worked on which includes the scope of work, the budget for the scope of work, and a way to
  4. contact the owner and architect of each project.
4. Design Data/Test Reports/Certificates:
  1. Routine testing of proposed materials, and of final work for compliance with the procedure will be carried out by the RHPO or his\her appointed representative.
    1. Cleaning methods should be tested prior to selecting the one for use. The simplest and least aggressive method(s) should be selected.
    2. The level of cleanliness desired also should be determined. A like-new appearance is both inappropriate and requires an overly harsh cleaning method.
    3. If test results show that performance criteria are not met, removal and repair of rejected work should be performed.

#### **1.04 QUALITY ASSURANCE**

1. Qualifications:
  1. Restoration Specialist: Work must be performed by a firm having not less than five years successful experience in comparable projects and employing personnel skilled in the processes and operations indicated. Project supervisor must have five years experience in work similar to this procedure. Additional personnel must also have experience.
  2. A supervisory craftsperson will be present when a craftsperson begins to perform the work in order to explain any procedures. Any modification of the written procedures will be made at that time.
  3. The supervisory craftsperson shall also be present during the work to instruct personnel as required.
    1. Source of Materials: Obtain materials from a single source for each type material required.
2. Regulatory Requirements:
  1. Engage an approved independent testing laboratory to examine materials prior to use and continuously inspect the work for compliance with this procedure and any related documents.

2. The required research report and manufacturer's data shall be at the site and used for reference.
3. Conform with all applicable safety guidelines.
4. For Cleaning: Comply with municipal and Federal regulations governing cleaning, chemical waste disposal, scaffolding and protection of adjacent surfaces.
3. Mock-ups: After acceptance of the list of materials and proposed method of cleaning, repair or refinishing, a representative sample area shall be cleaned, repaired or refinished as specified.
  1. Employ the method proposed and accepted for use. Obtain acceptance of the sample area from the RHPO before proceeding with remainder of the procedure.
  2. Maintain the sample area in its accepted condition until final acceptance of the completed work. Manufacturer's Representative should be present during mock-up and its inspection for approval. Sample work should be preformed in an area approved by the RHPO.
  3. A SMALLER TEST FOR EACH PRODUCT SHOULD BE DONE ON EACH MATERIAL IN AN INCONSPICUOUS AREA TO CHECK FOR ADVERSE EFFECTS AND DAMAGE TO THE MATERIAL.
4. For Cleaning:
  1. Before cleaning, all drains to be used should be tested to ensure they are functioning properly. Any clogged drains should be reported immediately.
  2. During cleaning, prevent cleaning residue from entering the drains or drain lines. Drains or drain lines that become blocked with cleaner residue must be cleaned out immediately.

#### **1.05 DELIVERY, STORAGE AND HANDLING**

1. Packing and Shipping: Deliver materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.
2. Acceptance at Site: Handle materials in accordance with project safety guidelines and manufacturer's recommendations.
3. Storage and Protection:
  1. Every effort must be made to use and reuse materials that are original to the structure. When removed from their rightful place, these materials must be stored under cover inside the building where they cannot be damaged.
  2. When pieces are to be removed, mark pieces inconspicuously in a consistent manner as to their original location. Document original position and label accordingly.
  3. If salvage material is to be used, treat it as new or original material with regard to its storage.
  4. Protect all materials during storage and construction from wetting by rain, snow or ground water, and from intermixture with earth or other types of materials.
  5. Protect materials from deterioration by moisture and temperature.
    1. Store cementitious materials off ground, under cover and in a dry location. Protect liquid components from freezing.
    2. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.
    3. Store all chemicals in metal cabinets. No cans shall be left open or out of the cabinet overnight.

#### **1.06 PROJECT/SITE CONDITIONS**

1. Environmental Requirements:
  1. Proceed with the work only when forecasted weather conditions are favorable.
  2. Wet weather: Do not attempt repairing of feature in raining or foggy weather. Do not apply primer, paint, putty, or epoxy when the relative humidity is above 80%. Do not remove exterior elements of structures when rain is in the forecast or in progress.
  3. Work in the shade when the temperature is above 75 degrees F. Work around the structure in the shade away from the sun.
  4. Do not perform exterior wet work when the air temperature is below 40 degrees F.
  5. NEVER begin cleaning, patching, etc. when there is any likelihood of frost or freezing.
  6. If cleaning is done in very hot, sunny weather, the feature/area should be shielded from excessive heat by hanging protective netting or tarpaulins around it.
  7. No cleaning shall be executed when either the air or the masonry surface temperature is below 45 degrees F, unless adequate, approved means are provided for maintaining a 45 degrees F temperature of the air and materials during, and for 48 hours subsequent to, cleaning.
  8. Perform cleaning and rinsing of the exterior masonry only during daylight hours.
  9. Hot weather maximum application temperatures:
    1. paint - 85 degrees F
    2. putty - 80 degrees F
    3. epoxy - 80 degrees F
  10. Cold weather minimum application temperatures:
    1. paint - 50 degrees F
    2. putty - 50 degrees F
    3. epoxy - 55 degrees F
2. Existing Conditions: Check manufacturer's literature for precautions and effects of products and procedures on adjacent building materials, components, and especially vegetation.

#### **1.07 SEQUENCING AND SCHEDULING**

1. Preventive Maintenance and Repair activities should be scheduled during appropriate environmental conditions to avoid weather related failures.
2. Submit a work schedule indicating the proposed timing and extent of the work.
3. Co-ordinate the work schedule with that of other trades on site.
4. When cyclical maintenance work requires the use of high ladders and other access equipment, perform as many work items as possible.

#### **1.08 PROTECTION**

1. Do not change sources or brands of materials during the course of the work.
2. All necessary precautions shall be taken to protect all parts of the building not being cleaned or repaired from effects of the work, including excessive amounts of water that should not be allowed to pond in any area. Also provide protection as required to prevent damage to adjacent property.
3. Provide protection against the spread of dust, debris and water at or beyond the work area by suitable enclosures of sheeting and tarpaulins.
4. Provide masking or covering on adjacent surfaces and permanent equipment. Secure coverings without the use of adhesive type tape or nails. Impervious sheeting which produces condensation should not be used.



5. Prevent the entry of dust, debris and water into the building by sealing all openings.
6. Provide protection from water damage to building, structure, or building contents as required.
7. Protect all landscape work adjacent to or within maintenance work areas:
  1. Provide plank barriers to protect tree trunks. Bind spreading shrubs.
  2. Covering should allow plants to breathe and should be removed at the end of each work day. Do not cover plant material with a waterproof membrane for more than 8 hours at one time.
  3. Set scaffolding and ladder legs away from plants. Pruning requests should be directed to the RHPO.
8. Test all drains and other water removal systems to assure that drains and systems are functioning properly prior to performing any cleaning operations. Notify Contracting Officer or designated representative immediately of any and all drains or systems that are found to be stopped or blocked. Contractor shall repair drains if so directed by the Contracting Officer or designated representative. Do not begin work of this Section until the drains are in working order.
9. Provide a method to prevent solids such as stone or mortar residue from entering the drains or drain lines. Contractor shall be responsible for cleaning out drains and drain lines that become blocked or filled by sand or any other solids because of work performed under this Contract.
10. Scaffolding, ladders and working platforms, required for the execution of this work should be provided. These items should not be attached to the building.

## SECTION 02 41 19

### SELECTIVE DEMOLITION

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. This section requires the selective removal and subsequent offsite disposal of the following:
  - 1. Portions of existing building indicated on drawings and/or as required to accommodate new construction.
  - 2. Removal and protection of existing fixtures, materials, and equipment items indicated, intended to be reused and/or as directed by the Owner.

##### 1.03. SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Schedule indicating proposed sequence of operations for selective demolition work to Owner's Representative for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.
  - 1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
  - 2. As necessary coordinate with Owner's continuing occupation of portions of existing building and with Owner's partial occupancy of completed new addition.

##### 1.04 JOB CONDITIONS

- A. Occupancy: Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations on adjacent portions of the property. Provide minimum advance notice as required by Owner to Owner of demolition activities which will severely impact owner's normal operations. Any work that will have an effect on the operations of the Owner must be coordinated with and approved by the Owner prior to being scheduled.
- B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.
  - 1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.

- C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Owner may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
  - 1. Storage or sale of removed items on site will not be permitted.
- D. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.
  - 1. If required provide protective measures as required, and in a manner, form acceptable to the Owner, to provide free and safe passage of Owner's personnel and general public to and from occupied portions of the building.
  - 2. Erect temporary covered passageways as required by authorities having jurisdiction.
  - 3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
  - 4. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
  - 5. Protect floors with suitable coverings when necessary.
  - 6. Construct temporary insulated dustproof partitions where indicated or as required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks.
  - 7. Provide temporary weather protections during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
  - 8. Remove protections at completion of work.
- E. Damages: Promptly repair damages caused to adjacent facilities by demolition work.
- F. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, drives, walks, and other adjacent occupied or used facilities. Coordinate all of these activities with the Owner.
  - 1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- G. Flame Cutting: Any work involving an open flame must first be coordinated and approved with the Owner. Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.
- H. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
  - 1. Do not interrupt utilities serving occupied or used facilities, except, when authorized in writing by the owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
  - 2. Maintain fire protection services during selective demolition operations.

- I. Environmental controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
  - 1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution or when it would damage materials (or portions of the building) that are to remain

## PART 2 – PRODUCTS (Not Applicable)

## PART 3 – EXECUTION

### 3.01 PREPARATION

- A. General: Provide interior and shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.
  - 1. Cease operations and notify Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
- B. Cover and protect furniture, equipment, and fixtures that are to remain from soilage or damage when demolition work is performed in areas where such items have not been removed.
  - 1. Provide weatherproof closures for exterior openings resulting from demolition work.
- C. Erect and maintain dustproof partitions and closures to prevent spread of dust or fumes to occupied portions of the building.
  - 1. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dustproof partitions of minimum 4" studs, 5/8" drywall (joints taped) on occupied side, 1/2" fire-retardant plywood on demolition side, and fill partition cavity with sound deadening insulation.
  - 2. Provide weatherproof closures for exterior openings resulting from demolition work.
- D. Locate, identify, stub off, and disconnect utility services that are not indicated to remain. Perform this work in accordance with accepted standards and in a manner acceptable to the owner.
  - 1. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shut down of service is necessary during changeover.

### 3.02 DEMOLITION

- A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
  2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.
  3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
  4. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
  5. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel, or sand, free of trash and debris, stones over 6 inches in diameter, roots, or other organic material.
- B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

### 3.03 SALVAGED MATERIALS

- A. Salvaged Items: Where items are indicated on Drawings, or requested by Owner, to be salvaged and returned to the Owner, carefully remove items, clean, store, and store on site as directed by Owner.
1. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance, remain property of Owner. Notify Owner's Representative of such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.
  2. Carefully remove, clean, and deliver to Owner the items indicated on the drawings.

### 3.04 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from building site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose off site.
1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
  2. Burning of removed materials is not permitted on project site.

### 3.05 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02 41 19

## SECTION 02 83 00

### JOB SITE FENCING

#### PART 1 GENERAL

- A. In general, fencing is to enclose the job site, lay-out area(s), staging area(s) and protect the pedestrians and owner's employees. Verify that fence layout meets the Owner's requirements and all code requirements. Receive approval for exact layout from owner before final assembly. Overall layout dimensions to enclose the job site (limit of work) as necessary. See Site Plan. Allow for the proposed work to continue unhindered. The fence location and access gate(s) are to be installed as shown on the site diagram or as directed by the Owner or Professional. The requirements listed in this specification section are the minimum requirements necessary. Fence location, configuration and dimensions must also comply with all code requirements necessary to meet the construction safeguard requirements of applicable codes even if such requirements are more stringent than those listed in this specification section. At job completion remove and repair any materials/surfaces as required.

#### 1.1 SUMMARY

- A. Section Includes:
1. Fence framework, fabric, and accessories.
  2. Excavation for posts.
  3. Concrete post foundations.
  4. Gates and hardware.
  5. Privacy screen.

#### 1.2 REFERENCES

- A. ASTM International (ASTM):
1. A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
  2. A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot- Dip Galvanized Coatings.
  3. C94 - Standard Specification for Ready-Mixed Concrete.
  4. F567 - Standard Practice for Installation of Chain Link Fence.
  5. F626 - Standard Specification for Fence Fittings.
  6. F900 - Standard Specification for Industrial and Commercial Swing Gates.
  7. F1043 - Standard Specification for Strength and Protective Coatings of Metal Industrial Chain Link Fence Framework.
  8. F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- B. Chain Link Fence Manufacturers Institute (CLFMI) - Product Manual.

#### 1.3 SYSTEM DESCRIPTION

- A. Fence: 8 feet high; Layout as indicated on Drawings.
- B. Gates: Locations as indicated on Drawings or as directed by the Owner/Professional.

## PART 2 PRODUCTS

#### 2.1 MATERIALS

- A. Materials and Components: Conform to CLFMI Product Manual.
- B. Chain Link Fabric:
  - 1. Zinc-coated steel fabric: ASTM A392, hot dipped galvanized before or after weaving, Class 1 - 1.2 ounces per square foot.
  - 2. Fabric selvage:
    - a. Mesh size - 2 inches:
      - 1) Knuckle finish one end, twist finish opposite end.
  - 3. Wire gage: minimum 11.
  - 4. Mesh size: Conform to CLFMI Product Manual for allowable size per gauge.
- C. Framework (Fixed – as indicated on drawings or as directed by Owner/Architect):
  - 1. Round steel pipe and rail, ASTM F1043, Group IA - Heavy Industrial Fence Framework, Schedule 40 galvanized pipe per ASTM F1083.
  - 2. Grade: Regular.
  - 3. Finish: Exterior zinc coating Type A, interior zinc coating Type A.
  - 4. Sizes:
    - a. Line posts: minimum 2-3/8 inch OD.
    - b. End, corner, pull posts: 2-7/8 inch – 4 inch OD.
    - c. Top, brace, bottom, and intermediate rails, 1.660 inches OD.
- D. Framework (Removable – as indicated on drawings or as directed by Owner/Architect): Same as Typical except as noted below.
  - 1. Temporary Fence Panels: Stand-alone panels constructed of typical framework.
  - 2. Temporary Fence Panel Stands: 2-3/8 inch OD (minimum) welded in rectangle base (approx. 16 inch x 36 inch) with welded uprights sized to receive typical line, end, or corner posts.
- E. Tension Wire: Metallic coated steel marcelled tension wire: 7 gage, ASTM A824, Type II - Zinc-Coated Class 1 - 0.80 ounces per square foot.
- F. Fittings:
  - 1. Tension and brace bands: Pressed galvanized steel, ASTM F626, minimum 12 gage, minimum 3/4 inch width, minimum zinc coating of 1.20 ounces per square foot, with 5/16 3/8 inch galvanized steel carriage bolts.
  - 2. Terminal post caps, line post loop tops, rail and brace ends, boulevard clamps, and rail sleeves: ASTM F626, pressed steel galvanized after fabrication, a minimum zinc coating of 1.20 ounces per square foot.
  - 3. Truss rod assembly: ASTM F626, 3/8 inch diameter steel truss rod with pressed steel tightener, minimum zinc coating of 1.2 ounces per square foot, capable of withstanding 2000 pound tension.
  - 4. Tension bars: ASTM F626, galvanized steel, single piece length 2 inches less than fabric height, minimum zinc coating thickness of 1.2 ounces per square foot.
    - a. Bars for 2 and 1-3/4 inch mesh: Minimum cross section of 3/16 x 3/4 inch.
    - b. Bars for 1 inch mesh: Minimum cross section of 1/4 x 3/8 inch.
    - c. Bars for 3/8, 1/2, and 5/8 inch mesh: Attached to terminal post using galvanized steel strap having minimum cross section of 2 x 3/16 inch with holes spaced 15 inches on center to accommodate 5/16 inch carriage bolts.
- G. Tie Wire and Hog Rings: ASTM F626, minimum zinc coating of 1.20 ounces per square foot, 12.5 gage galvanized steel wire.
- H. Swing Gates:
  - 1. ASTM F900, galvanized steel, welded fabrication, 1.900 inch OD frame members, ASTM F1043, Group IA, ASTM F1083 Schedule 40 pipe, spaced maximum 8 feet apart vertically and horizontally.

2. Welded joints protected with zinc-rich paint in accordance with ASTM A780.
  3. Positive locking gate latch fabricated from 5/16 inch thick x 1-3/4 inch pressed steel galvanized after fabrication.
  4. Galvanized malleable iron or heavy gage pressed steel post and frame hinges.
  5. Fabric to match fencing.
  6. Gate posts: ASTM F1043, Group IA, ASTM F1083 Schedule 40 pipe, 4 inch OD.
- I. Concrete: ASTM C94; 2500 psi 28 day strength, 2 to 3 inch slump.
- J. Privacy Screen:
1. Material Composition: Knitted (HDPE) high density polyethylene.
  2. Coverage: Continuous full-height panels along fence fabric at straight runs and gates.
  3. Shade Percentage: 88%.
  4. Color: Green.
  5. Edges: 2 inch polypropylene webbing reinforcement with 3/8 inch grommets at 24 inch on center.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Framework (**Fixed – as indicated on drawings or as directed by Owner/Architect**):
1. Drill post holes into undisturbed or compacted soil.
  2. Set posts in concrete footings in accordance with ASTM F567.
  3. Minimum footing depth: 24 inches plus an additional 3 inches for each 1 foot increase in fence height over 4 feet.
  4. Minimum footing diameter: Four times largest cross section of post up to 4.000 inches and three times largest cross section of posts greater than 4.000 inches.
  5. Gate post footings: Comply with minimum requirements listed in ASTM F567.
  6. Place concrete around posts in continuous pour, tamp and dome top away from post. Check for vertical and top alignment; brace posts until concrete has set.
  7. Locate top of footing at grade.
  8. Install line posts at maximum 8 feet on center.
  9. Top rail: Install 21 foot lengths continuous through line post. Splice rail using minimum 6 inch long sleeves. Secure rail to terminal posts with brace band and rail end.
  10. Field cut bottom rail and secure to line posts with boulevard bands or rail ends and brace bands.
  11. Brace and truss end, corner, pull and gate posts for fence 6 feet and higher and fences 5 feet and higher without top rail in accordance with ASTM F567.
  12. Install bottom rail; attach to posts with clamp type fittings.
  13. Tension wire:
    - a. Install tension wire 4 inches up from bottom of fabric.
    - b. Stretch wire taut, independently and prior to fabric, between terminal posts and secure to terminal post using brace band.
    - c. Secure wire to chain link fabric with 9 gage hog rings spaced maximum 18 inches on center and to each line post with tie wire.
- B. Framework (**Removable – as indicated on drawings or as directed by Owner/Architect**):
1. Provide temporary fence panels in sizes conforming to Typical fence height and Typical line post spacing.
  2. Provide panel stands at maximum 8 feet on center.
  3. Brace and truss end, corner, pull and gate posts for fence 6 feet and higher and fences 5 feet and higher without top rail in accordance with ASTM F567.
  4. Install continuous top and bottom rail supports to splice temporary fence panels; attach to posts with clamp type fittings.
  5. Tension wire:
    - a. Install tension wire 4 inches up from bottom of fabric.



- b. Stretch wire taut, independently and prior to fabric, between terminal posts and secure to terminal post using brace band.
  - c. Secure wire to chain link fabric with 9 gage hog rings spaced maximum 18 inches on center and to each line post with tie wire.
- C. Fabric:
  - 1. Install fabric to outside of framework.
  - 2. Attach fabric to terminal post by threading tension bar through fabric; secure tension bar to terminal post with tension bands and 5/16 inch carriage bolts spaced maximum 12 inches on center.
  - 3. Stretch fabric taut, without sag. Secure fabric to line posts with tie wires spaced maximum 12 inches on center and to rails at maximum 18 inches on center.
  - 4. Secure fabric to tension wire with hog rings spaced maximum 18 inches on center.
  - 5. Wrap tie 360 degrees around post or rail and twist ends twisted together three full turns. Cut off excess wire and bend over.
  - 6. Installed fabric ground clearance: Maximum 2 inches.
- D. Swing Gates:
  - 1. Install in accordance with ASTM F567, with gates plumb in closed position and having 3 inch bottom clearance, grade permitting.
  - 2. Maximum hinge and latch offset opening space from gate frame to post: 3 inches in closed position.
  - 3. Set double leaf gate drop bar receivers in concrete footing minimum 6 inch diameter x 24 inches deep.
  - 4. Install gate leaf holdbacks for double leaf gates.
- E. Privacy Screen:
  - 1. Install in accordance with screen manufacturer's recommendations.
  - 2. **Do not cut slits or holes in privacy screen.**

### 3.2 INSTALLATION TOLERANCES

- A. Maximum Variation from Plumb: 1 inch in 10 feet.
- B. Maximum Offset from True Position: 1 inch.

END OF SECTION

## Preparing Lime Mortar For Repointing Masonry

### PART 1---GENERAL

#### 1.01 SUMMARY

- A. This standard includes guidance on preparing lime mortars for repointing masonry.
- B. Lime mortars are preferable to Portland cement mortars for repointing historic masonry:
  - I. Lime mortars are more permeable by water. Water passing through lime mortar will dissolve a small portion of the lime and then will deposit it in hairline cracks as the water evaporates.
  - II. Lime mortars expand slightly during setting, and resists shrinkage which causes cracking.
  - III. Lime mortars are more durable than generally recognized.
- a. See 01100-07-S for general project guidelines to be reviewed along with this procedure. These guidelines cover the following sections:
  - 1. Safety Precautions
  - 2. Historic Structures Precautions
  - 3. Submittals
  - 4. Quality Assurance
  - 5. Delivery, Storage and Handling
  - 6. Project/Site Conditions
  - 7. Sequencing and Scheduling
  - 8. General Protection (Surface and Surrounding)

These guidelines should be reviewed prior to performing this procedure and should be followed, when applicable, along with recommendations from the Regional Historic Preservation Officer (RHPO).

#### 1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)  
<http://www.astm.com/>

#### 1.03 DELIVERY, STORAGE AND HANDLING

- A. Storage and Protection: Lime and cement must be protected from rainwater and ground moisture, as water vapor in the air can begin the setting process. Other materials also should be protected from contamination.
- B. **PART 2---PRODUCTS**

#### 2.01 MATERIALS

NOTE: The use of standard specifications for materials, such as those developed by the ASTM, provides an easily referenced level of quality.

- A. Lime: Should conform to ASTM C207, Type S, high plasticity, Hydrated Lime for Masonry Purposes.
  - 1. Lime which meets this standard will "work" well, resists drying during curing, and is sufficiently strong for the purpose of repointing.
  - 2. Lime expands as it hydrates, making high lime mortars more resistant to crack formation.
- B. Cement: Should conform to ASTM C150, Type I, White. It should not have more than 0.60% alkali nor more than 0.15% water soluble alkali. Use gray Portland cement ONLY if a dark mortar is to be matched.
  - 1. Cement meeting this standard should increase the workability of the mortar, accelerate the setting time and slightly increase the strength of the mortar.
  - 2. The low alkali content will prevent efflorescence.
- C. Sand: Free of impurities and conforming to ASTM C144.
  - 1. Sand color, size, and texture should match the original as closely as possible. Provide a sample of the sand for comparison to the original, and have it approved by the RHPO before beginning repointing work.
  - 2. When possible, use bar sand or beach sand rather than crushed sand for the repointing mortar.

**NOTE: BAR SAND OR BEACH SAND SHOULD BE WASHED TO REMOVE THE SALTS BEFORE USING.**

- D. Crushed sand has sharp edges, which makes it more "sticky" and difficult to work into the joints.
- E. Bar sand, on the other hand, has rounded edges and flows easily during the mortar application.
- F. The working characteristics of mortar made with crushed sand may be improved by adding a slight amount of Portland cement. The amount of cement should be determined by experimentation, but should not exceed 20% of the total lime/cement binder. 20% OR LESS OF CEMENT HAS MINIMAL EFFECT ON THE HARDNESS OF THE MORTAR. CEMENT CONTENT ABOVE 20% WILL MAKE THE MORTAR TOO HARD.
- D. Clean, potable water: If the water must be transported or stored in a container, the container must not impart any chemicals to the water.
- E. Stone dust finely ground from the same stone as that to be repointed.
- F. Additives: NO antifreeze compounds or other admixture shall be used.
- G. NOTE: Do not use anti-freeze compounds. These compounds are designed for use with cement mortars, and their effectiveness with high lime mortars is questionable. Furthermore, the compounds contain salts which can lead to serious problems in the masonry at a later time.

NOTE: Air entraining agents are not recommended. These agents are designed for use with cement rather than lime, and they result in decreased bonding of the mortar and the masonry. Air entraining is not necessary with high lime mortars because of the natural ability of these mortars to flex with temperature changes.

## **2.02 EQUIPMENT**

A. Surface temperature thermometer - can be either mechanical (less expensive but must be calibrated often) or digital electronic

B. Wooden mortar boxes

C. Hoe

D. Mesh screen

E. Hawks: Plywood or steel hawk (mortar board)

## 2. 03 MIXES

B. Some factors to consider when mixing lime mortar include durability, color and texture, and workability.

1. Durability: Repointing mortar should be softer than the masonry units and the original mortar to reduce stresses at the edge of the masonry and, in the case of lime mortar, to reduce shrinkage which can cause cracks in the mortar.
  - a. If the new mortar is harder than the masonry or the original mortar, it can cause serious stresses within the wall during thermal expansion and contraction, which can lead to deterioration of the masonry units rather than the mortar.
  - b. If the mortar is softer, any deterioration which occurs will take place in the mortar, which is easier to replace than the units themselves.
2. The repointing mortar should allow the passage of water, both liquid and vapor. If the mortar does not allow water to pass freely through it, the water can become trapped inside the wall, freeze and cause serious deterioration to the masonry.
3. Color and texture: The repointing mortar should match the original mortar in color, texture and physical characteristics.
  - a. Obtaining an accurate color match is best achieved by selecting an appropriate sand.
    1. Use sand which is similar to the original in color and gradation. Sand from more than one source may be required.
    2. For repointing of natural stones, use finely ground stone "dust" in the mortar to match the joints as closely as possible to the stone.
  - b. If the original mortar was tinted, or if it is impossible to obtain a color match through the use of sand, it may be necessary to use a special mortar pigment.

CAUTION: Pigments may react with other ingredients in the mortar to form efflorescence. They may also weather at a different rate than natural coloring and cause a color variation in the mortar.

4. NOTE: IF PIGMENTS MUST BE USED, PURE MINERAL OXIDES SHOULD BE USED BECAUSE THEY DO NOT FADE OR LEACH OUT OF THE MORTAR. AMOUNT OF PIGMENT SHOULD NOT EXCEED 2% OF THE MORTAR MIX BY WEIGHT.
  - a. Many mortars used before the twentieth century have small lumps of incompletely burned or ground lime, or other impurities. To match the original appearance of the masonry, these impurities must be included in the new repointing mortar. Use identical materials, such as ground oyster shells (obtained at feed stores) or lumps of lime, to duplicate original lumps.
5. Workability: The workability or plasticity of the mortar is a direct result of the selection of materials.

**C. Mortar Mix:**

1. Have the existing mortar completely analyzed to insure that the repointing mortar will not be less permeable/harder than the masonry units or the original mortar. IT IS BETTER TO HAVE MORTAR THAT IS MORE PERMEABLE THAN LESS.
  2. Measure all ingredients by cubic volume using a pre-established uniform measure, such as a small bucket, rather than a less uniform measure such as a shovel.
  3. For historic masonry set in lime mortar, use the following mortar mix:
- D. 1 part portland cement  
3 parts lime  
8-12 parts sand (To match existing mortar as closely as possible.)

NOTE: The exact mix required will relate to the grain size and sharpness of the sand and will vary depending on the supply.

-OR-

For historic masonry set in standard mortar, use the following mortar mix (ASTM C270 Type "0") as a starting point:

1 part portland cement  
2 parts lime or lime putty  
6 to 9 parts sand and stone dust (To match existing mortar as closely as possible.)

-OR-

For Limestone (ASTM C270 Type "N"):

1 part portland cement  
1 parts lime  
4-6 parts aggregate  
Enough water to form a workable consistency

-OR-

For Granite (ASTM C270 Type "S"):

2 parts portland cement

1 part lime

7-9 parts aggregate

Enough water to form a workable consistency

NOTE: For deteriorated granite or granite walls indicating movement, use astm c270 type "n" as listed above for limestone.

1. Mix a final "job-size" batch once the correct sand color, cement content, etc. have been determined through small tests to ensure the on-site mixing conditions will result in the same final product.

### **PART 3---EXECUTION**

#### **3.01 ERECTION, INSTALLATION, APPLICATION**

E. Mix Hydrated Lime:

1. Add dry bagged hydrated lime to water. Stir and hoe the mass to form a thick cream.
2. Allow to stand at least 24 hours before use.

F. Prepare Roughage Premix (for later use):

1. Accurately proportion the sand and lime using measuring boxes constructed to contain the exact volume of each ingredient required to make on batch.
2. Mix sand and lime thoroughly for about ten minutes. Store in plastic-lined drums and seal until required.

G. NOTE: THIS COMPOUND MAY BE STORED INDEFINITELY IF KEPT SEALED FROM AIR AND KEPT FROM FREEZING.

1. When required for use, add and mix the correct portion of gauging cement as specified and use immediately. ACCURATE PORTIONING IS VERY IMPORTANT.

H. Add cements to lime and aggregate mixes immediately before the use of the mortar.

1. Perform all batching with wooden boxes or plastic pails of known volume to ensure standardization and conformity of measurement; SHOVEL MEASUREMENT OF MATERIALS IS NOT PERMITTED.
2. Use box sizes that are sufficient for producing a batch size equal to one mixer load.

NOTE: MIX DRY INGREDIENTS THOROUGHLY BEFORE ADDING ANY WATER (APPROXIMATELY FIVE MINUTES).

- I. Add a small amount of water so that the mortar is just wet enough to hang on a trowel.

NOTE: EXCESS WATER WILL CAUSE SHRINKAGE AND TOO LITTLE WATER WILL RETARD CARBONATION. RECORD THE AMOUNT OF WATER ADDED SO THAT IT MAY BE USED AS A GUIDE FOR FUTURE BATCHES.

- J. Mix mortars at least 10 minutes before using to improve workability and ensure thorough mixing.

NOTE: AUTOMATIC MIXERS SHOULD HAVE RUBBER BLADES. CLEAN MIXING BOARDS AND MIXING MACHINES THOROUGHLY AFTER EACH USE TO PREVENT HARDENED LUMPS OF MORTAR FROM CONTAMINATING THE NEXT BATCH OF MORTAR.

- 1. Repointing mortars may sit 1-2 hours after initial mixing and then may be remixed to a workable consistency. This is done to reduce shrinkage.
  - 2. Test the mix by holding a trowel with mortar on it upside down and shaking it once.
    - a. If the mortar falls off without shaking, it has too much sand.
    - b. If more than one shake is required, the mortar is too sticky or "plastic" and the lime content must be decreased.
- K. Coloring Mortars:
  - 1. Take samples of freshly-broken mortar from the original masonry pointing. Note color of aggregate for color-matching. DO NOT TRY TO MATCH THE COLOR OF THE BINDER.  
NOTE: USE UNWEATHERED, UNSOILED SAMPLES ONLY.
  - 2. Prepare test patties of mortar approximating the inner color of the sample and set aside to dry for at least 72 hours. Drying time may be accelerated by placing the patty sample in an oven or over a hot-plate.
  - 3. Break the sample test patties and compare the inner portions to the original.
  - 4. See Section 2.03 above for additional information on coloring mortars.
- L. Use repointing mortar within approximately 1-2 hours of final mixing. Retemper the mortar as necessary to maintain workability.

NOTE: Re-tempering is permitted to maintain workability. Remixing is not permitted. Add water at the mortar-board using a spray bottle to replace only water lost through evaporation.

NOTE: use all mortar within two hours of gauging; throw out left over mortar; do not re-temper or remix mortars after this time has elapsed.

NOTE: this time limit may vary depending upon the outside temperature (longer on cooler days and shorter on warmer days).

- M. For guidance on repointing, see 04520-02-R.

## **04 20 00 Repointing Masonry Using Lime Mortar**

### **PART 1---GENERAL**

#### **1.01 SUMMARY**

- A. This procedure includes guidance on repointing stone masonry using lime mortar.
- B. Repointing is the process of removing deteriorated mortar from a masonry joint and replacing old mortar with new, sound mortar.
- C. This process is sometimes referred to as "tuck pointing", though "tuck pointing", is actually a decorative treatment rather than a method of repair. True tuck pointing is the process of adding a finish layer of mortar, occasionally tinted, to the outer portion of a newly laid joint.
- D. Major reasons for mortar joint failures include:
  - 1. Weathering action
  - 2. Settling
  - 3. Temperature cycles
  - 4. Poor original design and materials
  - 5. Lack of exterior maintenance
- E. See other sections for general project guidelines to be reviewed along with this procedure. These guidelines cover the following sections:
  - 1. Safety Precautions
  - 2. Historic Structures Precautions
  - 3. Submittals
  - 4. Quality Assurance
  - 5. Delivery, Storage and Handling
  - 6. Project/Site Conditions
  - 7. Sequencing and Scheduling
  - 8. General Protection (Surface and Surrounding)These guidelines should be reviewed prior to performing this procedure and should be followed, when applicable, along with recommendations from the Regional Historic Preservation Officer (RHPO).

#### **1.02 SUBMITTALS**

- A. Manufacturers' literature describing packaged items.
- B. Source and screen analysis of bulk aggregate.
- C. Mortar sample: Submit, for verification and approval, a sample of each type of mortar used, in form of 6" long by 1/2" wide sample strips of mortar set in aluminum or plastic channels.
  - 1. Provide record of mortar mix, composition and field procedures to be followed.

#### **1.03 QUALITY ASSURANCE**

- A. Mock-ups: Raking and Repointing Sample Work:
  - 1. Test/Sample Area and RHPO Approval:
    - a. Initially perform sample joint raking and repointing on each of a 100 sq. ft. test of stone, brick, and terra cotta areas as approved by RHPO.



- b. Demonstrate proficiency with joint raking tools and ability to not damage masonry units with either hand or power tools.
  - c. Mix and cure test batch of repointing mortar and place in joints; repeat test mix until mortar color is approved. Test mortar should be matched, dried and approved before placing in joints.
  - d. Demonstrate workmanship of repointing procedures and joint finishing.
  - e. Gain written approval from RHPO for test area before proceeding with remaining work.
- 2. Joint Raking Method: Rake joints by hand ONLY using special joint cleaning chisels and hammer.
- 3. Repointing Method: Repoint joints by hand ONLY using approved pointing trowels. NO "BAGGING" OR CAULKING GUN POINTING METHODS APPROVED.

#### **1.04 PROJECT/SITE CONDITIONS**

- A. Environmental Conditions: Perform repointing only when the temperature is between 40 degrees Fahrenheit and 80 degrees Fahrenheit. If the temperature is below 40 degrees, the mortar sets too slowly, and there is a good chance of freezing before it fully sets. If the temperature is above 80 degrees, the mortar will set too quickly, and there is a strong chance of excessive loss of water prior to adequate setting.

### **PART 2---PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Repointing Tools: Available from good hardware stores, building material suppliers or mail-order catalogues.
  - 1. The Stanley Gold-blatt Tool Co.
  - 2. Marshalltown Trowel Co.

#### **2.02 MATERIALS**

- A. Lime mortar
- B. Clean, potable water

#### **2.03 EQUIPMENT**

- A. Trowels: range in length from 10-12 inches
- B. Chisels:
  - 1. Joint chisels or a standard mason's chisel with a 1-1/2 in. blade and a long narrow handle
  - 2. Floor chisels
- C. Hammers:
  - 1. 5# stone dressing hammer
  - 2. 2# striking hammer
  - 3. "No-Bounce" hammer
  - 4. Full size and one half size brick hammers

- D. Joint Tools: (see 2.01 MANUFACTURERS above)
  - 1. 3/8"-1/4" raised beaded tool
  - 2. 3/8"-1/4" beaded striking tool
  - 3. 1/2" raised beaded tool with offset handle
  - 4. 1/2" flat joint iron
  - 5. Pointing tool should be about 1/16" narrower than the joint being filled to achieve good compaction
- E. Hawks: Plywood or steel hawk (mortar board)
- F. Brushes:
  - 1. Natural bristle brushes
  - 2. Stiff bristle brushes (no wire)
- G. Spray bottle

## **2.03 MIXES**

- A. See 04 10 00

## **PART 3---EXECUTION**

### **3.01 EXAMINATION**

- A. Examine all existing exterior mortar joints. If the answer to any of the following questions is yes, then the building's joints are deteriorated and need repointing:
  - 1. Are mortar joints eroded back more than 1/4" from the masonry face?
  - 2. Are there cracks running vertically or horizontally through the mortar?
  - 3. Are mortar bonds broken or pulled away from the masonry?
  - 4. Has mortar fallen out of joints?
  - 5. Is mortar excessively soft, powdery or crumbling?
  - 6. Is pointing badly-stained?
- B. Typical exterior damage due to mortar deterioration includes open joints, efflorescence, spalling and loosened masonry units.
- C. Typical interior damage due to mortar deterioration includes failing plaster and stained wall paper.
- D. A professional pointer experienced in old masonry is required for any of the following areas or conditions:
  - 1. Chimneys need repointing
  - 2. Window lintels must be rebuilt.
  - 3. Masonry is loose or missing.
  - 4. Work must be done from scaffolds or extension ladders.
  - 5. The original mortar joints were "beaded"-tooled with a raised, round-profiled joint that projects out from the wall.

### **3.02 PREPARATION**

- A. Preparing the Joints:
  - 1. Clean area of loose dirt and debris using a stiff bristle brush and remove all extraneous fastenings and devices.

2. Install necessary protection of adjacent building materials, property and persons from joint cleaning work and dirt.
  3. Control dust and dirt from raking work; dampen area being worked; and use curtains to limit spread of dust from joint raking and cutting operations.
- B. Joint Cutting and Raking:
1. Cut and rake old mortar from existing joints by hand using a hammer and chisel. NOTE: POWER CHISELS AND POWER SAWS SHOULD NOT BE USED.
  2. Place the chisel in the center of the joint and pound it with a striking hammer or "No-Bounce" hammer until the mortar disintegrates.
  3. Rake out the loose material to a depth of about 1 inch and never to a depth less than their width. Leave a clean, square face at the back of the joint to provide optimum contact with the new mortar.  
CAUTION: AVOID OVERCUTTING ENDS OF VERTICAL JOINTS, WIDENING JOINTS OR CUTTING INTO BEDDING FACES OF MASONRY UNITS.
  4. While raking out joints, remove all metal fittings such as nails, brackets and clips on both horizontal and vertical surfaces.
  5. Carefully clean out the prepared face with a soft or stiff bristle brush, or blow the joints clean with low-pressure compressed air (40-60 psi).
  6. Thoroughly flush out joint with clean, clear water.

### 3.03 ERECTION, INSTALLATION, APPLICATION

- A. Filling Joints:
1. Dampen masonry surfaces and joints to control suction and evaporation before placing repointing mortars.  
NOTE: THERE SHOULD BE NO FREE WATER PRESENT WHICH MAY CAUSE VOIDS IN THE MORTAR.
  2. Using a pointing tool, push the mortar into the joint from a board and iron with the maximum possible pressure; The mortar should be applied in layers, each to a maximum thickness of 3/8".  
NOTE: THE POINTING TOOL SHOULD BE ABOUT 1/16" NARROWER THAN THE JOINT BEING FILLED TO ACHIEVE GOOD COMPACTION. IN SOME CASES, THE JOINTS WILL BE SO THIN THAT A STANDARD POINTING TOOL WILL NEED TO BE GROUND DOWN TO FIT THE JOINT.
  3. Thoroughly compact each layer of mortar and allow to set until thumb-print hard before applying the next layer of mortar.
  4. Fill the joints so that they are slightly recessed from the masonry face. Avoid leaving a joint which is visually wider than the actual historical appearance.
  5. Continuously keep all excess and spilled mortar brushed off the faces of masonry units, ledges and other surfaces before it sets or stains the work.
- B. Joint Finishing:
1. Begin when mortar attains "thumb print" hardness.
  2. Tool the joint to match the old mortar.  
NOTE: IT IS IMPORTANT TO TOOL THE JOINT AT THE RIGHT STAGE; IF THE JOINT IS TOO SOFT, THE COLOR WILL BE LIGHTER THAN EXPECTED AND HAIRLINE SHRINKAGE CRACKS ARE LIKELY TO OCCUR; IF THE JOINT IS TOO HARD WHEN TOOLED, DARK STREAKS MAY APPEAR (TOOL BURNING) AND GOOD CLOSURE OF THE MORTAR AGAINST THE MASONRY WILL NOT BE ACHIEVED. EXCESSIVE TOOLING MAY BRING LIME AND FINE

AGGREGATES TO THE SURFACE, CREATING A VISUAL CHANGE IN THE TEXTURE AND A SURFACE SUBJECT TO EARLY DETERIORATION.

3. To produce a roughened texture, lightly spray the mortar with water after the initial set, stipple the mortar with a stiff bristle brush or dab the mortar with coarse sacking.
4. Protect finished work from direct sun and rain until the face has dried and hardened.

### **3.04 ADJUSTING/CLEANING**

#### **A. Cleaning Up:**

1. Use masking and drop cloths to prevent mortar stains on adjacent work and ledges.
2. Keep work areas clean and free from mortar drips, spills and residue of waste mortars or wash-off.
3. Clean off excess mortar as work proceeds using masonry brushes before mortar sets.
4. Wash completed repointing work when finished mortar joints are set with clean water and masonry brushes, scrubbing only as required to clean mortar stains off masonry without scouring the units and joint faces.
5. Do not use acid or detergent cleaning agent to aid mortar removal and clean-up without written approval from RHPO.

#### **B. Curing:**

1. Schedule work only when moderate weather is forecast.
2. Protect completed work from adverse weather, heavy rainfall, freezing, and drying by direct sunlight and winds until cured.
3. Sprinkle or mist repointed work as required to achieve cure in mortar joints for a minimum of 72 hours after completion.
4. Lime Mortar: Cures by drying and crystallization, not by hydration; and can be washed out of joints if not protected before it cures.

#### **C. Final Cleaning:**

1. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter using stiff nylon or bristle brushes and clean water spray applied at low pressure. NOTE: USE OF METAL SCRAPERS OR BRUSHES IS NOT PERMITTED. USE OF ACID OR ALKALI CLEANING AGENTS IS NOT PERMITTED.

#### **D. Some efflorescence, called new construction "bloom," occasionally appears on the surface within the first few months following a repointing project. These deposits normally are harmless and are removed by the natural washing of the rain. If not removed by natural weathering, they can be removed with dry brushing with a bristle brush. The use of chemical cleaners to remove this type of efflorescence normally is not necessary. AVOID USING ACIDS, PARTICULARLY MURIATIC ACID.**

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated aluminum items, ferrous metal items, galvanized, and prime painted.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Not used.

1.03 RELATED SECTIONS

- A. Section 02510 - Asphaltic Concrete Paving
- B. Section 02511 - Hot-Mixed Asphalt Paving
- C. Section 02512 - Exterior Resilient Sheet Surface.
- D. Section 03200 - Concrete Reinforcement.
- E. Section 03300 - Cast-in-Place Concrete.
- F. Section 09900 - Painting: Paint finish.

1.04 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Not used.

1.05 REFERENCES

- A. ASTM A36 - Structural Steel.
- B. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- C. ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated From Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip.
- D. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A283 - Carbon Steel Plates, Shapes, and Bars.
- F. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- G. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- H. ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products.

- I. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- J. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- K. ASTM B177 - Chromium Electroplating on Steel for Engineering Use.
- L. AWS A2.0 - Standard Welding Symbols.
- M. AWS D1.1 - Structural Welding Code.
- N. SSPC - Steel Structures Painting Council.

#### 1.06 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

#### 1.07 QUALIFICATIONS

- A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of the Project.
- B. Welders Certificates: Submit under provisions of Section 01300, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

#### 1.08 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on the Drawings and shop drawings.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Steel Sections: ASTM A36.
- B. Steel Tubing: ASTM A500, Grade B, ASTM A501.
- C. Plates: ASTM A283.
- D. Pipe: ASTM A53, Grade B, Schedule 40.
- E. Fasteners: As required for specific application.
- F. Bolts, Nuts, and Washers: ASTM A325, A307, galvanized to ASTM A153 for galvanized components.

- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC 20, Type I Inorganic.
- J. Not Used.

## 2.02 FABRICATION

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. 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.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

## 2.03 FINISHES

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prepare, prime, then paint items with two coats in accordance with Painting Specification Section 09900.
- D. Galvanized items to minimum 1.25 oz/sq ft zinc coating in accordance with ASTM A386.
- E. Aluminum items to be finished to match adjacent aluminum assemblies such as storefront aluminum, door frames, etc.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

### 3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required, see Painting Specification Section 09900.

- B. Supply items required to be cast into concrete with setting templates, to appropriate sections.

### 3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on Drawings and shop drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain Architect/Engineer approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not galvanized, except surfaces to be in contact with concrete.

### 3.04 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

### 3.05 SCHEDULE

- A. The Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled and for more information regarding items listed below.
- B. Galvanized Steel Tubes: (handrails, guardrails, etc.) Zinc primer, ready for painting with alkyd enamel finish paint.
- C. Steel Stair Assemblies: Zinc or metal primer, as applies, ready for painting with alkyd enamel finish paint.
- D. Lintels: As detailed; prime paint finish.
- E. Hoistway Divider Beams: Beam sections; prime paint finish.
- F. Braces, hangers, and supports for miscellaneous wall mounted, wall assemblies, exterior metal or stone, and/or ceiling suspended items, prime and paint as required.

END OF SECTION



## SECTION 06 10 00 – ROUGH CARPENTRY

### PART 1 – GENERAL

#### 1.1 SUMMARY

A. Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated. Types of work in this Section include rough carpentry for:

1. Framing lumber and plywood
2. Wood nailers and blocking
3. Other rough carpentry indicated
4. Exterior gypsum sheathing is as specified in Division 9 Section "Gypsum Board".

B. Related Sections include the following:

1. Division 6 Section "Finish Carpentry"
2. Division 6 Section "Interior Architectural Woodwork"
3. Division 9 Section "Gypsum Board"

#### 1.2 REFERENCES

- A. Lumber Standards: Comply with PS 20
- B. Plywood Performance Standards: Must comply with PS2-92 and APA Performance Rating Standards.
- C. Factory mark each piece of lumber and plywood with type, grade, mill and grading agency
- D. Forest Certification: Provide wood components produced from wood obtained from forests certified by an Forest Stewardship Council (FSC) accredited certification body to comply with FSC 1.2, "Principles and Criteria". ([www.fscus.org](http://www.fscus.org))

#### 1.3 DELIVERY STORAGE, AND HANDLING

- A. Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and provide air circulation within stacks.

#### 1.4 PROJECT CONDITIONS

- A. Fit carpentry work to other work; scribe and cope as required for accurate fit.

Correlate location of furring, nailers, blocking, and similar supports to allow proper attachment of other work.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

#### A. Framing Lumber:

1. Nominal sizes are indicated, except as shown by detail dimension.
2. Provide actual sizes as required by PS 20, graded in accordance with established grading rules for moisture content specified for each use.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide kiln-dried lumber with 15% maximum moisture content at time of dressing.
5. Southern Yellow Pine or Douglas Fir of following species and grades:
  - a. Structural Light Framing: Stress Group 1500 F, #2 Dense KD Grade.
  - b. Non-structural light framing: Stress Group 1500 F
6. Miscellaneous Lumber:
  - a. Provide wood for support or attachment of other work including bucks, nailers, blocking, furring, stripping and similar members. Provide lumber of sizes shown or specified worked into shapes shown.
  - b. Grade: Standard or No. 2 Southern Pine.

#### B. Plywood:

1. General:
  - a. Minimum Construction Standards of Plywood are as follows (thickness as indicated on Drawings):
    - (1) 1/2" shall be 4 ply
    - (2) 5/8" shall be 5 ply
    - (3) 3/4" shall be 6 ply
  - b. Warped plywood panels are not acceptable.
  - c. Provide pressure treated plywood at areas indicated on the drawings.
2. General Plywood Sheathing:
  - a. Size: as indicated on Drawings.

b. Grade: APA Rated Sheathing

c. Span Rating: 32/16

d. Exposure Durability: Exposure 1

3. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire retardant treated plywood panels with grade designation, APA C-C Plugged INT with exterior glue, in 3/4" thickness, 6 ply construction.

## 2.2 ACCESSORIES

A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nail, staples, screws, bolts, nuts, washers and anchoring devices.

B. Where rough carpentry work is exposed to weather, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A153).

C. Adhesive:

1. Multipurpose Construction Adhesive: maximum VOCs: 70 grams/liter

## 2.3 WOOD TREATMENT

A. Comply with applicable standards for the American Wood Preservers Association (AWPA). Each piece shall bear the quality mark of an independent agency or inspection service certified by these organizations to inspect treated materials.

1. Use wood treated with preservative Ammoniacal Copper Quaternary (ACQ).
2. Chromated copper arsenate (CCA) or other arsenic containing preservatives will not be accepted.

B. Preservative Treated (PT) Wood: All wood in contact with ground and concrete, or indicated as "Treated" or preservative treated (such as when in contact with masonry, steel, and other conditions) shall be pressure treated in accordance with AWPB Standards. Retention levels and use categories are as follows:

1. Above Ground: .25 (UC1-3)
2. Ground Contact: .40 (UC4A)
3. Ground Contact (Structural): .60 (UC4B)

C. Borates (SBX) waterborne preservative may be used above ground and

continuously protected from liquid water applications such as sill plates or other enclosed structural framing at retentions of 0.25 lbs/cubic foot.

D. Where possible, all special cuts and holes should be fabricated before treatment.

If cut after treatment, coat surfaces with liberal brushed solution of copper naphthenate containing a minimum of 2 percent metallic copper in solution in accordance with AWP Standard M4.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

#### A. General Requirements:

1. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
2. Framing lumber and other rough carpentry shall be fitted closely, set accurately to the required lines and levels and shall be secured in place in a rigid and substantial manner.
3. All framing and support members, not indicated or specified, shall be provided as necessary for the proper completion of the work.
4. Spiking, nailing and bolting shall be done in an approved manner; spikes, nails and bolts shall be of the proper size, and care shall be used so as not to split the members. Members shall be drilled accurately for bolting; and for nailing where necessary to avoid splitting. Suitable washers shall be provided under bolt heads, and nuts and bolts shall be drawn up tight.
5. Provide framing to support all edges of covering material.

#### B. Wood Nailers, and Blocking:

1. Provide wherever shown and where required for attachment of other work. Form to shapes as shown or required and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry work.

C. Installation of Plywood:

1. General: Comply with applicable recommendations contained in Form No. E 304 "APA Design/Construction Guide - Residential & Commercial" for types of plywood products and applications indicated.
2. Apply sheathing with long dimension (face grain) perpendicular to framing. Apply with side edges 1/4 inch apart and end edges 1/8 inch apart. All end edges of sheathing shall bear on a support. Stagger end joints of roof sheathing.
3. For wood framing, nail to supports with 6d common nails spaced 6 inches on center along edges and 12 inches on center at intermediate supports.
4. Use 11 gauge galvanized roofing nails 1-3/4" inches long with 7/16 inch heads for wood framing. Fasteners shall be installed at 6" o.c. on panel edges, at 12" o.c. along intermediate supports, and 3/8" minimum from panel edge.

3.2 CLEANING

- A. Remove and recycle all excess material.
- B. Separate the following categories for salvage or reuse on site:
  1. Sheet materials larger than 2 sq. ft.
  2. Framing members larger than 16"
  3. Multiple offcuts of any size larger than 12"
- C. Set aside damaged wood for acceptable alternative uses; for example, use as bracing, blocking, cripples, or ties.
- D. Separate the following categories for disposal and place in designated areas for hazardous materials:
  1. Treated, stained, painted, or contaminated wood.

END OF SECTION

## SECTION 06 10 73

### WOOD BLOCKING AND CURBING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Roof curbs and cants.
- B. Blocking in wall and roof openings and as necessary for the attachment of Architectural, Electrical and Mechanical assemblies.
- C. Wood furring and grounds.
- D. Concealed wood blocking for support of toilet and bath accessories, wall cabinets, wood assemblies, fixtures, projection screens, tv monitors, signage and wood trim.
- E. Telephone and electrical panel boards and other services .
- F. Preservative treatment of wood.

##### 1.02 RELATED SECTIONS

- A. Section 06200 Finish Carpentry
- B. Section 06400 Architectural Woodwork
- C. Relevant Architectural Sections: Windows and Doors, Storefront, Access Panels, etc.
- D. Relevant Mechanical & Electrical Sections: Fixtures, Electrical and Telephone boards, etc.

##### 1.03 REFERENCES

- A. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.
- B. APA: American Plywood Association.
- C. AWP (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.
- D. AWP (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process.
- E. NFPA: National Forest Products Association.
- F. RIS: Redwood Inspection Service.
- G. SPIB: Southern Pine Inspection Bureau.
- H. WCLIB: West Coast Lumber Inspection Bureau.
- I. WWPA: Western Wood Products Association.

##### 1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.

- B. Product Data: Provide technical data on wood preservative materials and application instructions. Include certification by treatment plant stating type of solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

## 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with the following agencies:
  - 1. Lumber Grading Agency: Certified by ALSC.
  - 2. Plywood Grading Agency: Certified by APA.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Lumber Grading Rules: NFPA, RIS, SPIB, WCLIB, WWPA.
- B. Miscellaneous Framing: 19 percent maximum moisture content, pressure preservative treated when in contact with floor slab or building envelope.
- C. Plywood: APA Structural I, Grade C-D; Exposure Durability 1, 5/8" unless otherwise noted.

### 2.02 ACCESSORIES

- A. Fasteners and Anchors:
  - 1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
  - 2. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.

### 2.03 WOOD TREATMENT

- A. Identify treated wood with appropriate classification marking of Underwriters Laboratories Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.
- B. Fire retardant:

Factory Applied: AWPAC Treatment C20, Exterior and Interior Type, chemically treated and pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 25 (or as required); manufactured by The Hickson Corporation or Hoover Treated Wood Products.

Site Applied: Class 1 intumescent coating for wood. Apply in a manner and quantity to achieve the required rating for specific application. Apply as a primer in painted applications and a clear coat in stained applications unless otherwise specified. WT-102 Fire Retardant Paint (primer) or WT-103 Fire Retardant Clear Coat; manufactured by Firetect or approved equal.
- C. Wood Preservative Pressure Treatment: AWPAC Treatment C1 using water borne preservative with 0.25 percent retainage.

- D. Wood Preservative (Surface Application): Clear type, manufactured by PPG Industries or manufacturer approved by Architect.

## PART 3 EXECUTION

### 3.01 FRAMING

- A. Set members level and plumb, in correct position.
- B. Place horizontal members flat, crown side up.
- C. Construct curb members of single pieces.
- D. Space framing and furring 16 inches o.c.
- E. Curb roof openings (except where prefabricated curbs are provided). Form corners by alternating lapping side members.
- F. Coordinate curb installation with installation of decking and support of deck openings, roofing vapor retardant, and parapet construction.

### 3.02 SHEATHING

- A. Secure sheathing to framing members with ends over firm bearing and staggered.
- B. Install telephone and electrical panel boards with plywood sheathing material where required. Over size the panel by 12 inches on all sides.

### 3.03 SITE APPLIED WOOD TREATMENT

- A. Apply all treatments in accordance with manufacturer's instructions.
- B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials, roofing and related metal flashings. Treat site-sawn cuts.

Apply the required quantity of flame retardant or fire retardant coating to achieve the required rating per the manufacturer's recommendations. See drawings and details for specific required ratings. Otherwise apply fire retardant to wood detailing in egress corridors to achieve a Class B rating (flame spread range 26-75) and in enclosed vertical exits to achieve a Class A rating (flame spread range 0-25).

All treatment preparation and application is to comply with the manufacturer's recommendations for the required rating.

- C. Allow treatment to dry prior to erecting members.

### 3.04 SCHEDULES

- A. See drawings, details and specifications for locations.
- B. Telephone and Electrical Panel Boards: 3/4 inch thick, square edges, site brush applied preservative treated.

END OF SECTION



## SECTION 06 15 00

### WOOD DECKING AND SHEATHING

#### PART 1 – GENERAL

##### 1.01 SECTION INCLUDES

- A. Plywood structural wood decking.

##### 1.02 RELATED REQUIREMENTS

- A. Section 06100 – Rough Carpentry.

##### 1.03 REFERENCE STANDARDS

- A. AITC 109 - Standard for Preservative Treatment of Structural Glued Laminated Timber; American Institute of Timber Construction; 2007.
- B. AITC 110 - Standard Appearance Grades for Structural Glued Laminated Timber; American Institute of Timber Construction; 2001.
- C. AITC 111 - Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection; American Institute of Timber Construction; 2005.
- D. AITC 112 - Standard for Tongue-and-Groove Heavy Timber Roof Decking; American Institute of Timber Construction; 1993, and errata.
- E. AITC 113 - Standard for Dimensions of Structural Glued Laminated Timber; American Institute of Timber Construction; 2010.
- F. AITC A190.1 - American National Standard for Wood Products - Structural Glued Laminated Timber; American Institute of Timber Construction; 2007.
- G. ANSI A208.1 - American National Standard for Particleboard; 2009.
- H. ASTM D143 - Standard Method of Testing Small Clear Specimens of Timber; 2009.
- I. ASTM D198 - Standard Test Methods of Static Tests of Lumber in Structural Sizes; 2009.
- J. ASTM D1761 - Standard Test Method for Mechanical Fasteners in Wood; 2006.
- K. ASTM D2559 - Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions; 2010a.
- L. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood-Preservers' Association; 2010.
- M. PS 1 - Structural Plywood; 2007.
- N. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2002.

#### 1.04 SUBMITTALS

- A. See Section 01340 – Shop Drawings, Product Data, and Samples.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience and certified by AITC.
- B. Installer: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect glue laminated members in accordance with AITC 111 requirements for unwrapped material.

### PART 2 – PRODUCTS

#### 2.01 WOOD MATERIALS

- A. Marking: Mark each piece with producer's stamp indicating compliance with specified requirements; for pieces exposed to view in completed construction, submit manufacturer's certificate certifying that products conform to specified requirements in lieu of grade stamping.
- B. Plywood Decking for Roof: PS 1 veneer plywood; 3/4" thick; Exterior grade; sanded.

#### 2.02 ACCESSORIES

- A. Fasteners and Anchors:
  - 1. Fastener Type and Finish: Hot-dipped galvanized steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
  - 2. Anchors: Toggle bolt type for anchorage to hollow masonry.
  - 3. Adhesives: Waterproof, air cure type, cartridge dispensed.

#### 2.03 WOOD TREATMENT

- A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
- B. Preservative Pressure Treatment:
  - 1. Preservative Pressure Treatment of Plywood Decking: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.

- a. Kiln dry plywood after treatment to maximum moisture content of 18 percent.
- 2. Marking: Mark each piece with stamp of an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

### PART 3 – EXECUTION

#### 3.01 EXAMINATION

- A. Verify that support framing is ready to receive decking.

#### 3.02 PREPARATION

- A. Coordinate placement of bearing items.

#### 3.03 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment in accordance with manufacturer's instructions.
- B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials, roofing and related metal flashings. Treat site-sawn cuts.
- C. Allow preservative to dry prior to erecting members.

#### 3.04 INSTALLATION - PLYWOOD DECKING

- A. Install decking perpendicular to framing members, with ends staggered over firm bearing. On sloped surfaces, lay decking with tongue upward.
- B. Engage plywood tongue and groove edges.
- C. Allow expansion space at edges and ends.
- D. Attach decking with adhesive and fasteners.
- E. Use sheathing clips at unsupported edges of plywood between supporting framing members.
- F. Cut decking to accommodate roof drain and flange.

#### 3.05 TOLERANCES

- A. Surface Flatness of Decking Without Load: 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

END OF SECTION 06 15 00

SECTION 07 28 00  
VAPOR RETARDERS

**PART 1 – GENERAL**

**1.01 SECTION INCLUDES**

- A. Provide total air/vapor barrier system to complete the Work as shown on the Drawings and as specified herein to bridge and seal air leakage pathways and gaps:
  - 1. Vapor Permeable Air and Water Barriers
  - 2. Liquid Applied Detailing Compound
- B. Related Sections include the following:
  - 1. Division 6 Section "Rough Carpentry"

**1.02 SUBMITTALS**

- A. Product Data:
  - 1. Submit Spec-Data, details, and installation procedures.
  - 2. Manufacturer's installation instructions for placement, seaming and penetration repair instructions.
- B. Show Drawings: Show locations and extent of air barrier. Include details for substrate joints, cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
- C. Include details of interfaces with other materials that form part of the air barrier.
- D. Test Reports: Indicating compliance with the performance requirements of this section.
- E. Samples: Submit representative samples of all components as specified herein for approval.

**1.03 QUALITY ASSURANCE**

- A. Perform Work in accordance with manufacturer's written instructions and this specification.
- B. Maintain one copy of manufacturer's written instructions on site.
- C. Systems used shall contain components from one manufacturer only (example: sheet membrane, air barrier sealants, primers, mastics, and adhesives). NOTE: Different manufacturers may be used for different systems.
- D. Provide products which comply with all federal, state and local regulations controlling use of volatile organic compounds (VOCs).

E. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Preinstallation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:

1. Review of submittals.
2. Review of surface preparation, minimum curing period and installation procedures.
3. Review of special details and flashings.
4. Sequence of construction, responsibilities and schedule for subsequent operations.
5. Review of inspection, testing, protection and repair procedures.

F. Provide an independent laboratory per Division 1 Section "Testing Laboratory Services" to perform field tests as specified herein in Part 3.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with manufacturer's recommendations for storage and handling of each product.
- B. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.
- C. Store roll materials on end in original packaging. Protect rolls from direct sunlight until ready for use.
- D. Store air barrier membranes, adhesives and primers at temperatures of 40 degrees F and rising.
- E. E. Keep solvent away from open flame or excessive heat.

#### **1.05 PROJECT CONDITIONS**

- A. Environmental Limitations: Apply vapor and air barriers within the range of ambient and substrate temperatures recommended by manufacturer. Protect substrates from environmental conditions that affect performance. Do not apply barriers to a wet substrate or during snow, rain, fog, or mist.

#### **1.06 WARRANTY**

- A. Material Warranty:
  1. Manufacturer's standard form in which manufacturer agrees to replace membrane materials that fail within specified warranty period when installed and used in strict conformance with written manufacturer's instructions.
    - a. Minimum 10 year product warranty required.

### **PART 2 – PRODUCTS**

#### **2.01 UNDER SLAB VAPOR BARRIER**

- A. Vapor Barrier
  1. Vapor Barrier must have the following qualities:

a. Permeance of less than 0.01 Perms as tested in accordance with ASTM E 1745 Section 7.

b. Other performance criteria:

(1) Strength: ASTM E 1745 Class A.

(2) Thickness: 15 mils minimum

2. Vapor Barrier Products:

a. "Stego Wrap (15 mil yellow)"; Stego Industries.

b. "Vaporblock VB15 (15 mil blue)"; Raven Industries.

c. "Viper II (15-mil blue)"; Insulation Solutions.

B. Accessories:

1. Seam Tape

a. Water Vapor Transmission Rate: ASTM E 96, 0.3 perms or lower

b. Equal to "Stego Tape" by Stego Industries

2. Vapor Proofing Mastic

a. Water Vapor Transmission Rate: ASTM E 96, 0.3 perms or lower

b. Equal to "Stego Mastic" by Stego Industries

2.02 VAPOR PERMEABLE AIR AND WATER BARRIER –

A. A fluid-applied, vapor permeable, acrylic membrane that cures to form a resilient, monolithic, fully bonded elastomeric membrane when applied to construction surfaces. Product shall have the following minimum physical properties:

1. Membrane Air Permeance: ASTM E2178: Not to exceed 0.0004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf).

2. Assembly Performance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.0008 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) when tested in accordance with ASTM E2357.

3. Membrane Vapor Permeance: ASTM E96, Method B: 11.2 perms

4. Peel Adhesion: ASTM D903: min. 5 pli or substrate failure to glass faced wall board, min. 20 pli to concrete/CMU

5. UV Exposure Limit: Not more than 180 calendar days

B. Products:

1. "Perm-A-Barrier VP"; Grace Construction Products

2. "Air-Shield LMP"; W.R. Meadows

3. "Air-Bloc 31MR"; Henry Company

4. Enershield-HP; BASF

5. R-Guard MVP; Prosoco

2.03 SELF ADHERING ROOF MEMBRANE

A. See Section 07 30 11 Roof Underlayment HT

2.04 SELF ADHERING FLASHING MEMBRANE –

A. Location: Provide around windows, doors, and other openings whether indicated on drawings or not, and as indicated on Drawings to receive “self-adhering flashing membrane”.

B. Product:

1. “Perm-A-Barrier Wall Flashing”; Grace Construction Products.
2. “Air-Shield Thru Wall Flashing”; W.R. Meadows
3. “Blueskin TWF”; Henry Company

C. Description:

1. 1 mm (40 mil) of self-adhesive, cold applied tape consisting of 0.8 mm (32 mil) of rubberized asphalt integrally bonded to a 0.2 (8 mil) high density, cross laminated polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

D. Water Vapor Transmission: ASTM E 96, Method B 29 ng (0.5 perms) maximum.

E. Water Absorption: ASTM D 570 Max. 0.1% by weight

F. Puncture Resistance: ASTM E 154 178 N (40 lbs.)

G. Tear Resistance:

1. Initiation ASTM D 1004 min. 58 N (13.0 lbs.) M.D.
2. Propagation ASTM D 1938 min. 40 N (9.0 lbs.) M.D.

H. Lap Adhesion at -4°C (25°F): ASTM D 1876 875 N/m (60 lbs. /ft.) of width.

I. Low Temperature Flexibility ASTM D 1970 Unaffected to -43°C (-45°F).

J. Tensile Strength: ASTM D 412, Die C Modified: Min. 5500 kPa (800 psi).

K. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D 412 Die C Min. 200%.

2.06 LIQUID APPLIED DETAILING COMPOUND – USED AT ALL OPENINGS.

A. Two component, elastomeric, cold applied, trowel grade material.

B. Physical Properties:

1. Solids Content: 100% per ASTM D1644

2. Elongation: 250% minimum per ASTM D412
3. Peel Strength: 880 N/m (5 lbs/in) minimum per ASTM D903

C. Product:

1. "Bituthene Liquid Membrane"; Grace Construction Products
2. "Fast Flash R Guard"; Prosoco
2. Equal as approved.

## **2.07 ACCESSORIES**

A. Provide all accessories for a complete system application.

B. Provide stainless steel termination bars per Division 7 Section "Flashing and Sheet Metal" where sheet goods terminate on CMU or concrete.

C. Surface Conditioner (Primer):

1. Provide manufacturer's standard, equal to "Perm-A-Barrier WB Primer" manufactured by Grace Construction Products
2. Description: Water-based primer which imparts an aggressive, high tack finish on the treated substrate.
  - a. Flash Point: No flash to boiling point
  - b. Solvent Type: Water
  - c. VOC Content: Not to exceed 10 g/L
  - d. Application Temperature: -4°C (25°F) and above
  - e. Freezing point (as packaged): -7°C (21°F)

D. Termination Mastic:

1. Provide manufacturer's standard, equal to "Bituthene Mastic" manufactured by Grace Construction Products
2. Description: Rubberized asphalt-based mastic with 200 g/l max VOC Content.

## **PART 3 – EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrates and conditions are ready to accept the Work of this section. Notify architect in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
- B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full-flush.



- C. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

### **3.02 PREPARATION**

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the system.
- B. Exterior sheathing panels:
  - 1. Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 2-3 inch wide, manufacturer's recommended mesh-style (fiberglass) tape. Gaps greater than 1/4 inch, but less than 1/2 inch should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the mesh-style tape and air barrier system.
    - a. Refer to Division 9 Section "Gypsum Board Assemblies" for additional information.
- C. Concrete/Masonry Substrates:
  - 1. Apply air and vapor barrier over concrete block and brick with smooth trowel cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.
  - 2. New concrete should be cured for a minimum of 14 days and must be dry before air/vapor barrier membranes are applied.
  - 3. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces.
  - 4. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.
  - 5. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- D. Liquid applied only: Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- E. At changes in substrate plane, apply sealant or manufacturer's standard liquid membrane at sharp corners and edges to form a smooth transition from one plane to another.
- F. Cover gaps greater than 1/2 inch and form a smooth transition from one substrate plane to another with min 22 gauge stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

- G. Apply primer at rate recommended by manufacturer to all areas to receive selfadhering sheet air/vapor barrier membrane and or through-wall flashing membrane as indicated on drawings by roller or spray and allow minimum 30 minute open time. Primed surfaces not covered by self-adhering membrane or self-adhering through-wall flashing membrane during the same working day must be re-primed.

### **3.03 INSTALLATION**

- A. General: Install air & vapor barrier to dry surfaces at air and surface temperatures of -25°F and above in accordance with manufacturer's recommendations, at locations indicated on Drawings.

- 1. Do not allow rubberized asphalt surfaces to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.

- B. Under Slab Vapor Barrier:

- 1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98.
  - 2. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.
  - 3. Lap Vapor Barrier/Retarder over footings and seal to foundation walls.
  - 4. Overlap joints 6 inches and seal with manufacturer's approved tape.
  - 5. Seal all penetrations per manufacturer's instructions.
  - 6. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
  - 7. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

- C. Vapor Permeable Air And Water Barrier:

- 1. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
  - 2. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
  - 3. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
    - a. Vapor-Permeable Membrane Air Barrier: 90-mil (2.4-mm) wet film thickness, 42~45-mil (1.2-mm) dry film thickness.
  - 4. Do not cover air barrier until it has approved by Independent Testing Agency in writing. Refer to field tests required as specified herein.
  - 5. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

- D. Self-adhering wall membrane:

- 1. Precut pieces of air & vapor barrier into easily-handled lengths.
  - 2. Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.

3. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
4. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
5. Overlap horizontally-adjacent pieces 2" and roll seams.
6. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 2". Roll firmly into place.
7. Seal around masonry reinforcing or ties and all penetrations with termination mastic.
8. Continue the membrane into all openings in the wall, such as doors, windows, etc., and terminate at points that will prevent visibility from interior.
9. Coordinate the installation of air & vapor barrier with roof installer to ensure continuity of membrane with rooftop air & vapor membrane.
10. At end of each working day seal top edge of air & vapor barrier to substrate with termination mastic.
11. Do not allow the rubberized asphalt surface of the air & vapor barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
12. Do not expose air & vapor barrier membrane to sunlight for more than thirty days prior to enclosure.
13. Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 6" in all directions from the perimeter of the affected area.

E. Self-adhering Flashing Membrane:

1. Install as thru-wall water stop in exterior walls above and around all openings, at all breaks in masonry back-up, at wall base, and all other locations indicated on Drawings.
2. Installation: All surfaces to receive the flashing shall be reasonably smooth, free from irregularities and deleterious materials. On all horizontal surfaces the flashing shall be laid either in a fresh bed of mortar above and below or a trowel coat of mastic. Vertical surfaces shall be pressed firmly in place by hand roller.
3. Over Concrete Foundations: The flashing shall be laid either in a fresh bed of mortar above and below or a trowel coat of mastic. At the intersection with column, the flashing should be brought a minimum of 10" up the column only and not on sides of column and secured with a metal termination bar and sealant.
4. Spandrels: Flashing shall start at the outside toe of the shelf angle, go up the face of the beam and through the wall turning up on the inside face of the wall not less than 2" and be secured with a metal termination bar and sealant.
5. Around openings: Flashing shall start ½" from outside face of wall, then through the wall turning up at the inside not less than 6" and extend 6" on each side of the opening. It shall be turned at the ends forming a 2" deep pan running entirely through the wall. Flashing shall be secured with a metal termination bar and sealant.
6. Coping: overlap flashing a minimum of 3 inches down the side of each wall.
7. Joints: The material shall be lapped at least 2" and rolled with a steel hand roller.

F. Termination Sealant:

1. Seal membrane terminations, seams, cuts, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the primary water resistive air barrier membrane and around the perimeter edge of membrane terminations at window and door frames with specified termination sealant.

### **3.04 FIELD QUALITY CONTROL**

A. Inspections: Air barrier materials and installation are to be inspected by an Independent Laboratory for compliance with manufacturer and project requirements. Inspections to include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths.
8. Termination sealant has been applied on cut edges.
9. Strips and transition membrane have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

A. Remove and replace deficient air barrier components and retest as specified above at no cost to the Owner.

### **3.05 PROTECTION**

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Repair holes, fishmouths, tears, and damage to membrane with a round patch of membrane extending past the damaged area 6 inches in all directions. If fasteners are removed leaving holes in the membrane, they must be patched.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer.

1. Remove and replace air barrier material exposed for more than 30 days.

- C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- D. Remove masking materials after installation.

END OF SECTION

## SECTION 073011 - ROOFING UNDERLAYMENT, HIGH-TEMPERATURE

### **PART 1 — GENERAL**

#### 1.1 SECTION INCLUDES

- A. This Section specifies a self-adhering sheet membrane used as underlayment for sloped roofs.
- B. High temperature application, 260F resistance, Grace Ice & Water Shield® HT.

#### 1.2 RELATED REQUIREMENTS: Refer to the following specification sections for coordination:

- A. SECTION 061000 - ROUGH CARPENTRY.
- B. SECTION 07 41 13 – METAL ROOF PANELS

#### 1.3 REFERENCES

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
- B. ASTM D461 - Standard Test Methods for Felt.
- C. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- D. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- E. ASTM D3767 - Standard Practice for Rubber—Measurement of Dimensions.
- F. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- G. ASTM G90 – EMMAqua test.

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions.

#### 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.
- B. Manufacturer: Minimum 10 years experience producing roofing underlayment.
- C. Installer: Minimum 2 years experience with installation of similar underlayment.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened factory labeled packages. Protect from damage.

- B. Cover materials and store in dry condition between temperatures of 40 and 90 degrees F (5 and 32 degrees
- C. Use within one year of date of manufacture. Do not store at elevated temperatures as that will reduce the shelf life of the product.

## **PART 2 — PRODUCTS**

### **2.1 MANUFACTURER**

- A. Basis of Design Manufacturer: GCP Applied Technologies, Inc., 62 Whittemore Avenue, Cambridge, MA 02140, Toll Free 866-333-3726, [www.gcpat.com](http://www.gcpat.com).

### **2.2 MATERIALS**

- A. Self-Adhering Sheet Membrane Roof Underlayment: Provide Grace Ice and Water Shield HT by GCP Applied Technologies, Inc (Or Equal) with the following characteristics:
  - 1. Material: Cold applied, self adhering membrane composed of an innovative and proprietary rubberized asphalt adhesive and interwound with a disposable release sheet. An embossed, slip resistant surface is provided on the high performance film with UV barrier properties.
  - 2. Membrane Thickness: 40 mils (1.02 mm) per ASTM D3767 Method A.
  - 3. Membrane Tensile Strength: MD 33 lbf/in, CD 31 lbf/inch per ASTM D412 Die C Modified.
  - 4. Membrane Elongation: 250% per ASTM D412 Die C Modified.
  - 5. Low Temperature Flexibility: Unaffected at -20 degrees F (-29 degrees C) per ASTM D1970.
  - 6. Adhesion to Plywood: 5.0 lb/in. width ( 876 N/m) per ASTM D903.
  - 7. Maximum Permeance: 0.05 perms (2.9 ng/sgms Pa) per ASTM E96.
  - 8. Maximum Material Weight Installed: 0.22 pounds/sqft (1.1 kg/sqm) per ASTM D461.
  - 9. Service Temperature: 260 degrees F (115.6 degrees C) per ASTM D1204
  - 10. Compatibility: Suitable for use under all types of sloped roofing with the exception high altitude climates where zinc, copper or Cor-Ten roof coverings are used.
  - 11. Adhesive: Rubberized asphalt adhesive containing post-consumer recycled content, contains no calcium carbonate, sand or fly ash.

12. Exposure: Can be left exposed for a maximum of 120 days from date of installation per ASTM G90 – EMMAqua test.
13. Primer: Water-based Perm-A-Barrier WB Primer by GCP Applied Technologies, Inc.
14. Code and Standards Compliance: Grace Ice and Water Shield HT meets the following requirements:
  - a. ASTM D1970.
  - b. ICC-ES ESR-3121, per AC 48 Acceptance Criteria for Roof Underlayments used in Severe Climate Areas.
  - c. Underwriters Laboratories Inc. R13399 - Class A fire classification under fiber-glass shingles and Class C under organic felt shingles (per ASTM E108/UL 790).
  - d. Underwriters Laboratories Inc. Classified Sheathing Material Fire Resistance Classification with Roof Designs: P225, P227, P230, P237, P259, P508, P510, P512, P514, P701, P711, P717, P722, P723, P732, P734, P736, P742, P803, P814, P818, P824
  - e. Miami-Dade County Code Report NOA #15-0728.11
  - f. Florida State Approval Report No. FL289-R3
  - g. CCMC Approval No. 13671-L

### **PART 3 — EXECUTION**

#### **3.1 EXAMINATION**

- A. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of roofing underlayment. Verify flashing has been installed. Starting work indicates installers acceptance of existing conditions.

#### **3.2 INSTALLATION**

- A. Installation: Install roofing underlayment on sloped surfaces at locations indicated on the Drawings, but not less than at hips, ridges, eaves, valleys, sidewalls and chimneys, and surfaces over interior space within 36 inches (914 mm) from the inside face of the exterior wall. Strictly comply with manufacturer's installation instructions including but not limited to the following:
  1. Schedule installation such that underlayment is covered by roofing within the published exposure limit of the underlayment.
  2. Do not install underlayment on wet or frozen substrates.
  3. Install when surface temperature of substrate is a minimum of 40 degrees F (5 degrees C) and rising.
  4. Remove dust, dirt, loose materials and protrusions from deck surface.
  5. Install membrane on clean, dry, continuous structural deck. Fill voids and damaged or unsupported areas prior to installation.
  6. Prime concrete and masonry surfaces using specified primer at a rate of 500-600 square feet per gallon (12-15 sqm/L). Priming is not required for other suitable clean and dry surfaces.



7. Install membrane such that all laps shed water. Work from the low point to the high point of the roof at all times. Apply the membrane in valleys before the membrane is applied to the eaves. Following placement along the eaves, continue application of the membrane up the roof. Membrane may be installed either vertically or horizontally after the first horizontal course.
8. Side laps minimum 3-1/2 inches (89 mm) and end laps minimum 6 inches (152 mm) following lap lines marked on underlayment.
9. Patch penetrations and damage using manufacturer's recommended methods.

### 3.3 CLEANING AND PROTECTION

- A. Protection: Protect from damage during construction operations and installation of roofing materials. Promptly repair any damaged or deteriorated surfaces.
- B. Repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired in the opinion of the Architect.
- C. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protective film and reclean as necessary immediately before final acceptance.

END OF SECTION

## SECTION 073110

### SYNTHETIC

### SHINGLES

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. **Multi-Width** Synthetic shake shingles, underlayment, flashings, fasteners, and accessories

##### 1.2 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry
- B. Section 07600 - Flashing and Sheet Metal
- C. Section 07600 - Flashing and Sheet Metal
- D. Section 07910 - Joint Fillers

##### 1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
  - 2. ASTM E 108 (UL 790) - Standard Test Methods for Fire Tests of Roof Coverings
- B. Underwriters Laboratories (UL)
  - 1. ASTM E 108 (UL 790) - Standard Test Methods for Fire Tests of Roof Coverings
- C. International Code Council (ICC): ES Acceptance Criteria AC07 Section 4.9

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Shake roof system to consist of manufactured synthetic shakes attached to structural substrate to form weather tight roof envelope with no measurable water penetration
- B. Shakes shall be manufactured with variations in size, textured faces and edges, and no less than 3/4" thickness to provide a realistic installed appearance
- C. Shakes shall be manufactured with no variation in color
- D. Method of attachments shall be designed to adequately resist wind uplift for roof configuration and project location

##### 1.5 SUBMITTALS

- A. Submit under provisions of Section 01300 - Administrative Requirements
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Shingles, underlayment, flashings, fasteners, and accessories indicating composition, properties, and dimensions. Provide data showing compliance with specified requirements
  - 2. Preparation instructions and recommendations
  - 3. Storage and handling requirements and recommendations
  - 4. Installation methods
- C. Shop Drawings: Drawings illustrating shingle layout, method of attachment, flashings, trim, conditions at eaves, intersections with adjacent materials, and other installation details

- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and surface textures
- E. Verification Samples: For each finish product specified, two samples, representing actual product, color, and texture

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturer of synthetic shingles
- B. Installer Qualifications: Company specializing in installing shingle roof systems with 5 years minimum experience
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship
  - 1. Finish areas designated by Architect
  - 2. Do not proceed with remaining work until workmanship, color, and pattern are approved by Architect
  - 3. Rework mock-up area as required to produce acceptable work

#### 1.7 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at the site prior to commencing work of this Section: Require attendance of entities directly concerned with roof installation. Agenda shall include:
  - 1. Installation procedures and manufacturer's recommendations
  - 2. Safety procedures
  - 3. Coordination with installation of other work
  - 4. Availability of roofing materials
  - 5. Preparation and approval of substrate and penetrations through roof
  - 6. Other items related to successful execution of work

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Ship in bundles of shingles. Bundles shall be assembled such that sorting at job site is not required
- B. Deliver shingles to site in manufacturer's unopened, labeled bundles. Promptly verify quantities and condition. Immediately remove damaged products from site
- C. Store products in protected environment, clear of ground, moisture, UV, and protected from traffic and construction activities. Store shingles on edge no more than 2 pallets high, do not store flat. Do not store on site for prolonged period unless weather and UV protected
- D. Store synthetic shake products at temperature between 40- and 120-degrees F (4 degrees C and 49 degrees C)
- E. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction

#### 1.9 PROJECT CONDITIONS

- A. Anticipate and observe environmental conditions (temperature, humidity, and moisture) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits

## 1.10 WARRANTY

### A. Warranty Requirements:

1. Manufacturer's 50 years warranty for manufacturing defects that results in leaks under normal weather and use conditions
2. Installer's 2 years total roof system warranty including underlayment, flashings, trim, and other roof components against water penetration

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer: CeDUR manufactured by Colorado Roofing Products, LLC, which is located at: 3590 Himalaya Road, Aurora, CO 80011; Toll Free Tel: (844) 974-9196; Tel: (720) 974-9200; Fax: (720) 974-3193; Email: [Info@CeDUR.com](mailto:Info@CeDUR.com), Web: [www.cedur.com](http://www.cedur.com)
- B. Substitutions: Equal per requirements of Division 01

### 2.2 SYNTHETIC SHAKE SHINGLES

- A. Lightweight, synthetic shakes with the appearance, color, texture, and thickness of natural wood shakes
  1. Product: Multi-Width Shake as manufactured by CeDUR
  2. Material: Engineered polymer formulated from 100 percent virgin polyurethanes to ensure high quality and consistency of raw materials. Use of recycled materials is not acceptable
  3. Attributes:
    - a. Fire resistance: Class A (without the use of Class A rated underlayment's) tested in accordance with ASTM E 108/UL 790
    - b. Impact resistance: Class 4 to withstand two drops of 2 inches (52 mm) diameter, 1.2 pounds (0.54 kg) steel ball dropped from 20 feet (6 m) tested in accordance with UL 2218
    - c. Freeze-thaw resistance: No crazing, cracking, or other deleterious surface changes after one-month exposure with temperature cycled from -40 to +180 degrees F (0 degrees to 82 degrees C) in 22 hours tested in accordance with International Code Council (ICC) – ES Acceptance Criteria AC07 Section 4.9
    - d. Accelerated weathering: Little change after 2,500 hours exposure to ultraviolet (UV) radiation, elevated temperature, moisture, and thermal shock tested in accordance with International Code Council (ICC) – ES Acceptance Criteria AC07 Section 4.9
    - e. Installed weight:
      1. At 9 inches (229 mm) exposure: 188 pounds per square (9.18 kg/sq. m)
      2. At 10 inches (254 mm) exposure: 170 pounds per square (8.3 kg/sq. m)
  4. Profile: Solid polyurethane product manufactured in a rectangular shape with exposed to view upper surface and edges textured to resemble natural wood shake
  5. Size: Shake
    - a. Thickness: Varies from 1/8 inch (3 mm) at top to 3/4 inch (19 mm) at bottom
    - b. Length: 23.75 inches (603 mm)
    - c. Variable widths: 5, 7, and 12 inches (127, 178, and 305 mm) to create appearance of random sized natural wood shake
  6. Starter Shingle: Provide 15 inches (381 mm) long by 15 inches (381 mm) wide
  7. Markings: Form shingles with markings on upper surface to indicate nailing locations along with manufacturers quality markings
  8. Color: Provide shingles in single color comparable to natural wood shakes, no color stabilizers allowed providing a natural aging process

9. Shake Pattern: Provide shakes factory blended single color and widths to create installed appearance designated as follows
  - a. Golden Cedar by CeDUR
  - b. Live Oak by CeDUR
  - c. Shiloh by CeDUR
  - d. Walden by CeDUR

## 2.3 ACCESSORIES

- A. Underlayment: Architecturally specified underlayment that meets ASTM D226 requirement.
- B. Waterproof Sheet Membrane: Cold applied, self-adhering waterproof membrane composed of polyethylene film coated one side with rubberized asphalt adhesive
  1. Thickness: 40 mils (1 mm)
  2. Low temperature flexibility: Unaffected at minus 32 degrees F (-36 degrees C)
  3. Minimum tensile strength: 250 psi (1724 kPa)
  4. Minimum elongation: 250 percent
  5. Permeance: 0.05 perms maximum
- C. Flashing: Fabricate from sheet to profiles and dimensions indicated on Drawings and approved shop drawings and in accordance with general requirements specified in Section 07 60 00 – Flashing and Sheet Metal
  1. Material: 16-ounce copper
  2. Material: No less than 26 gauge (0.455 mm) galvanized steel
  3. Linear components: Form in longest possible lengths with 8 feet (2.5 m) as minimum
  4. Counter Flashings: Extend 5 inches (127 mm) minimum up vertical surfaces and 5 inches (127 mm) minimum under shingles
  5. Valley flashings: 24 inches minimum width and extending 11 inches (279 mm) minimum from valley center line
  6. Fabricate eave flashings with bottom edge formed outward ¼ inch (6 mm) and hemmed to form drip
- D. Fasteners: 3/8-inch (9.5 mm) ring shank flat head nails 1-3/4 inches (44 mm) long
  1. Material: Copper
  2. Material: Stainless steel
  3. Material: Hot-dipped galvanized

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding

### 3.2 PREPERATION

- A. Coordinate installation with provision of gutters and downspouts specified in Section 07 60 00 - Flashing and Sheet Metal
- B. Inspect roof framing and plywood or OSB substrate. Verify roof is complete, rigid, braced, and deck members are securely fastened. Ensure proper ventilation has been provided for roof space. Do not proceed with roofing until deficiencies are addressed
- C. Verify roof deck is clean, dry, and ready to receive synthetic shake shingles

- D. Remove dirt, loose fasteners, and other protrusions from roof surface

### 3.3 INSTALLATION GENERAL

- A. Install self-adhered waterproof sheet membrane on the eaves. Cover the waterproof sheet membrane and the remaining portions of the roof as scheduled with the approved underlayment(s). Then install waterproof sheet membrane in valleys, along walls and around projections terminating on top of underlayment

### 3.4 UNDERLAYMENT INSTALLATION

- A. Stripping Ply: A full sheet of self-adhered waterproof sheet membrane is required in all valleys. At least 18 inches (457 mm) shall be required on all gable ends, against walls, and around projections
  - 1. In areas where the average daily temperature in January is 25 degrees F (-4 degrees C) or lower or where ice buildup is possible, install self-adhered waterproof sheet membrane from the bottom edge extending two feet (610 mm) above the exterior wall line on all eaves
- B. Install waterproof sheet membrane over full roof area. Apply waterproof sheet membrane in fair weather at temperatures of 40 degrees F (4 degrees C) or higher. Adhere and attach as recommended by manufacturer of waterproof sheet membrane
  - 1. Start underlayment installation at lower edge of roof. Install perpendicular to roof slope with 4 inches (102 mm) minimum side laps and 6 inches (152 mm) minimum end laps. Extend underlayment 4 inches (102 mm) minimum up vertical wall intersections
  - 2. Do not leave underlayment membrane exposed for lengthy period of time. Exercise care not to puncture or tear underlayment barrier with subsequent roofing operations
- C. Underlayment/Slip Sheet: Install one-ply asphalt felt over full roof area, with ends weather lapped 4 inches (102 mm) minimum. Nail in place with roofing nails spaced in accordance with manufacturer's recommendations

### 3.5 INTERLAYMENT

- A. For pitches 4:12 and 5:12 install a minimum 18" wide strip of interlay of ASTM D 226 type II (ASTM D 4869) No. 30 shall be laid over the top portion of the starter shakes, the butt end of the interlay course extending up-slope onto the sheathing and/or dry-in, approximately 9 inches above the fascia (For a 1 inch overhang). After installing the field shakes over the starter shakes, position the bottom edge of the next interlay on the 10-inch line of the interlay previously installed, with successive courses laid on the 10-inch line (or less depending on roof layouts less than 10")
- B. Felt interlayment on the CeDUR Shakes is to be installed so it does not extend below a line that is twice the exposure above the butt (i.e. 23.5" shakes at 10", exposure would have felt applied 20" above the butt). No felt should be visible between the side joints of the shakes (keyway). Refer to the CeDUR Shakes Technical Specification Details

### 3.6 FLASHING INSTALLATION

- A. Install overhanging drip edge on eaves and gable ends and metal flashings at valleys, ridges, hips, roof curbs, penetrations, and intersections with vertical surfaces in accordance with Section 07 60 00 - Flashing and Sheet Metal
- B. Weather lap joints 2 inches (52 mm) minimum and seal with sealant as specified in Section 07 91 26 - Joint Fillers
- C. Secure in place with clips, nails, or other fasteners

### 3.7 INSTALLATION – GENERAL

- A. Install synthetic shakes in accordance with manufacturer's instructions and approved shop drawings
- B. Accurately layout shingles. Ensure that edges are parallel and perpendicular to roof eaves
- C. Cutting: Layout work to avoid cutting shingles. 1. At gables and vertical intersections, vary combination of shingle widths and spacing of shingles to avoid cutting
  - 1. At gables and vertical intersections, vary combination of shingle widths and spacing of shingles to avoid cutting
  - 2. If cutting is required, place shingle such that cut edge is not exposed
  - 3. Use circular saw or straight edge and utility knife if cuts are necessary

### 3.8 SHAKE SHINGLE INSTALLATION

- A. Install shingles in a rack or pyramid style from factory assembled bundles
- B. Exposure: Install shingles in staggered pattern with 9 inches (229 mm) exposure and bottom edges of adjacent shingles staggered 1 inch (25 mm)
- C. Exposure: Install shingles in staggered pattern with 9 inches (229 mm) exposure and bottom edges of adjacent shingles staggered 1 inch (25 mm)
- D. Spacing: Provide 1/4 - 3/8-inch (6.35 - 9.52 mm) gap between shingles to allow for expansion and contraction
- E. Stagger shingle joints in one course 1-1/2 inches (38 mm) minimum from joints in course below
- F. Eaves: Install row of starter shingles at eaves as base layer. Project eave shingles approximately 1 inch (25 mm), 1/8 inch (3 mm) past overhanging drip edge, or as required to allow water to drain into gutter or off eave as indicated or required
- G. Gables: Project shingles approximately 3/4 inch beyond gable rakes or 1/8 inch (3 mm) past overhanging drip edge
- H. Ridges and Hips: After field shingle installation is complete, install preformed 5-inch CeDUR Hip/Ridge
  - 1. Ridges: Use 5" (127 mm) CeDUR preformed Hip/Ridge shakes with 10" (254 mm) exposure. Start ridge shingles at leeward end. Face shingle laps away from prevailing wind
  - 2. Hips: Use 5" (127 mm) CeDUR preformed Hip/Ridge shakes with 10" (254 mm) exposure. Start hip course at eave
- I. Fastening: Attach each shingle to wood deck with 2 or 3 nails depending on shake size using hammer or pneumatic nail gun.
  - 1. Place nails at locations indicated on shingles
  - 2. Ensure good penetration but do not overdrive nail. Do not nail at angle. Ensure head is flush with shingle surface to avoid creating craters
  - 3. At valleys do not nail shingles within 5 inches (127 mm) of valley center line
- J. Snow Guards: Install snow guards in areas where snow fall is possible

### 3.9 FIELD QUALITY CONTROL

- A. Inspect units as they are installed. Do not install cracked, broken, twisted, curled, or otherwise damaged units
- B. As work progresses, exercise care not to scratch or mar installed units. Units damaged during installation shall be immediately removed and discarded

- C. After approximately 200 units have been installed, inspect roof from ground. Verify proper layout and appearance. Repeat inspection every 200 shingles
- D. Visually inspect complete installation to ensure that it is weather tight

### 3.10 CLEANING AND PROTECTION

- A. Remove excess materials and debris from finished surfaces and adjacent roof areas
- B. Do not allow work force on completed roof
- C. Protect installed products until completion of project
- D. Touch-up, repair or replace damaged products before Substantial Completion

END OF SECTION



## SECTION 07 31 13 ASPHALT SHINGLES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Asphalt shingles.
- B. Self-adhering sheet underlayment.

#### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM D 226; Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
  - 2. ASTM D 1970; Standard specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
  - 3. ASTM D 3161; Standard Test Method for Wind Resistance of Asphalt Shingles (Fan Induced Method)
  - 4. ASTM D 3462; Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules
  - 5. ASTM D 4586; Standard Specification for Asphalt Roof Cement, Asbestos-Free
  - 6. ASTM D 4869; Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steel Slope Roofing
  - 7. ASTM D 6757; Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing
  - 8. ASTM D 7158; Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)
  - 9. ASTM F 1667; Standard Specification for Driven Fasteners; Nails, Spikes, and Staples.
- B. Underwriters Laboratories, Inc.:
  - 1. UL 790 – Tests for Fire Resistance of Roof Covering Materials
  - 2. CAN/ULC (Underwriters Laboratories of Canada)-S107 – Methods of Fire Tests of Roof Coverings
- C. National Roofing Contractors Association:
  - 1. The NRCA Roofing Manual: Steep-slope Roofing Systems – 2009

#### 1.3 SUBMITTALS

- A. Refer to Division 01.
- B. Product Data: Submit manufacturer current technical literature for each component.
- C. Samples for Initial Selection: For each type of asphalt shingle, [ridge and hip cap shingles] [and] [ridge vent] product indicated.
  - 1. Include similar Samples of exposed trim and accessories involving color selection.
- D. Samples for Verification: For the following products, of sizes indicated and to verify color selected:
  - 1. Asphalt Shingle: Full-size asphalt shingle strip.
  - 2. Ridge and Hip Cap Shingles: Full-size ridge and hip cap asphalt shingle.

3. Self-Adhering Underlayment: 12-inches square.
- E. Maintenance data: For asphalt shingles to include in maintenance manuals.
- F. Warranties: Sample of special warranties specified in this Section.
- G. Closeout Submittals:
  1. Refer to Division 01.

#### **1.4 QUALITY ASSURANCE**

- A. Qualifications:
  1. Installer shall have successful installation experience with installation of PABCO® Roofing Products under similar conditions.
  2. Installation shall be in accordance with asphalt shingle manufacturer's installation guidelines and recommendations.
- B. Source Limitations: Provide ridge and hip cap shingles [and] [self-adhering sheet underlayment] through one source as recommended by the asphalt shingle manufacturer.
- C. Fire-Test Response Characteristics:
  1. Exterior Fire Test Exposure: Class A; UL 790 and CAN/ULC S-107 for application and roof slopes indicated. Identify materials with appropriate markings of applicable testing and inspecting agency.
- D. Mock-up:
  1. Install mock-up using approved asphalt shingle assembly including related accessories per manufacturer's current printed instructions and recommendations.
    - a. Mock-up size: [10-feet by 10-feet].
    - b. Mock-up may remain as part of the work.
  2. Contact manufacturer's designated representative prior to asphalt shingle assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.
- E. Pre-installation Meeting:
  1. Hold a pre-installation conference, prior to start of asphalt shingle installation at Project site to review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of asphalt shingle assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.
    - a. Attendees shall include Contractor, Architect, installer, Owner's Representative, and asphalt shingle manufacturer's designated representative.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Deliver asphalt shingle materials and components in manufacturer's original, unopened, undamaged packages with identification labels intact.
- B. Store asphalt shingle materials as recommended by asphalt shingle manufacturer.

## **1.6 WARRANTY**

- A. Provide PABCO® Limited Shingle Warranty: PABCO® warrants that shingles are free from manufacturing defects that adversely affect their performance.
- B. Algae Resistance:
  - 1. Algae Defender® Algae Resistant Roofing System warrants that shingles will remain algae resistant for 20 years.

## **PART 2 - PRODUCTS**

### **2.1 GLASS FIBER REINFORCED ASPHALT SHINGLES**

- A. Laminated Asphalt Shingles: ASTM D 3462, laminated, multi-ply construction, glass fiber reinforced, mineral granule surfaced, and self-sealing.
- B. Wind Resistance: ASTM D3161 Class F.
- C. Wind Resistance: ASTM D7158 Class H.

### **2.2 MANUFACTURER**

- A. Basis of Design Manufacturer: Subject to compliance with requirements, the design for glass-fiber-reinforced asphalt shingles is based on PABCO® Roofing Products, Tacoma, WA 98421; Phone: (253) 272.0374; [www.pabcoroofing.com](http://www.pabcoroofing.com).
- B. Basis of Design Product: The design for glass-fiber-reinforced asphalt shingles is based on [Cascade™] as follows:
  - 1. Cascade™:
    - a. Signature Cut Diamond Shape Shingles.
    - b. [Algae Resistance].
    - c. Warranty Available:
      - 1) All Other Structures: [50-years Limited Warranty/1-time transfer Limited and 110 mph/130 mph Wind Resistance Warranty.]
    - d. Color: As selected by Owner and Architect.
    - e. Performance Characteristics:
      - 1) Size: 15-1/2 inches by 40-inches.
      - 2) Exposure: 4-1/2 inches.
      - 3) Offset: 5-inches repeating.
      - 4) Approx. Lbs. per Square: 255.
  - 2. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.
    - a. Shadow Cap to match asphalt shingles.

### **2.3 ROOF DECK REQUIREMENTS FOR NEW CONSTRUCTION**

- A. Plywood decks must be at least 3/8-inch thick plywood or 7/16-inch OSB type structural sheets conforming to the exposure standards and specifications of the APA - The Engineered Wood Association and the building code, or wood board decks must be well-seasoned, minimum nominal thickness 1-inch, not over 6-inches in width.

### **2.4 ACCESSORIES**

- A. Starter Strip:

1. Paramount Starter:
    - a. Size: 13-1/4 inches by 40-inches.
    - b. Coverage: 73.3 linear feet.
  2. Universal Starter:
    - a. Size: 13-1/4 inches by 40 inches.
    - b. Coverage: 73.3 linear feet.
- B. Shadow Cap
1. Size: 13-1/4 inches by 39-3/8 inches, perforated into 4 pieces.
  2. Coverage: 41-1/4 linear feet.
- C. Self-Adhering Sheet Underlayment: ASTM D 1970.
- D. Asphalt Roofing Cement: ASTM D 4586, asbestos free.
- E. Fasteners:
1. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, **[barbed] [smooth]** shank, sharp-pointed, with a minimum 3/8-inch diameter flat head and of sufficient length to penetrate 3/4-inch into solid wood decking or through OSB or plywood sheathing.
  2. **Where nails are in contact with metal flashing, use nails made from same metal as flashing.**
- F. METAL FLASHING AND TRIM
1. Sheet Metal Flashing and Trim: **[Comply with requirements in Section 07 62 00 - Sheet Metal Flashing and Trim.] [Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item.]**
  2. Drip Edges: Fabricate in lengths not exceeding **[10-feet] [Insert length]** with a minimum 2-inch roof deck flange and a minimum 1-1/2 inch fascia flange with 3/8-inch drip at lower edge.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify substrate and surface conditions are in accordance with asphalt shingle manufacturer recommended tolerances prior to installation of asphalt shingle and accessories.

### **3.2 GENERAL INSTALLATION OF SHINGLES**

- A. General: Install in accordance with PABCO® Roofing Products' written instructions and in compliance with local authorities having jurisdiction. To qualify for warranty protection and to obtain stated coverage, manufacturer's written instructions must be followed.
- B. Manufacturer's standard application instructions apply to slope/inclines between 4-inches per foot and 20-inches per foot. Refer to manufacturer's additional requirements for use on slopes between 2:12 and 4:12, or greater than 20:12.
- C. From shingle course to shingle course upwards on roof deck, end joints must be maintained with the specified horizontal offset of **[5-inches for Cascade™.]** Installer must assure end

joints are covered; uncovered end joints may result in leaks, which are not covered by the PABCO® Limited Shingle Warranty.

- D. Ventilation: Provide minimum of 1 square feet of total net free ventilating area for each 150 square feet of ceiling area, or 1 square foot for each 300 square feet of ceiling area if either a vapor barrier is installed on warm side of ceiling area or if approximately one-half the ventilation is provided near roof ridge.

### **3.3 UNDERLAYMENT**

- A. **Self-Adhering Underlayment:** Apply self-adhering underlayment according to underlayment manufacturer's written instructions and in compliance with local building code.

### **3.4 EAVE FLASHING**

- A. Install self-adhering underlayment as an eave flashing for ice dam protection in areas of winter temperatures averaging 30°F or less, applied parallel to the eave. Eave flashing overhangs drip edge 1/4-inch to 3/8-inch and extends up the roof to at least 24-inches inside the interior wall line. Horizontal (top) overlaps (when needed), should be located over the overhang area. Top laps are at least 4-inches, end laps are at least 6-inches.
- B. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

### **3.5 NAILING INSTRUCTIONS**

- A. Use five nails per shingle for normal application, positioned in the nail zone as recommended by shingle manufacturer. Nails shall be at least 1-1/4 inches long for Paramount Advantage®; 1-inch long for Paramount® or Cascade™, aluminum or galvanized, 3/8-inch head, 11- or 12-gauge roofing nails. Nails must be driven flush with shingle surface. **NAILS MUST NOT BE OVERDRIVEN TO CUT INTO SHINGLES.**
- B. Special Applications:
  - 1. For areas where local knowledge indicates exposure to high winds may occur, shingles must be applied with 6 nails and sealed to qualify for wind damage warranty coverage.
  - 2. Steep Slope Application: On slopes greater than 20-inches per foot (Mansard type roofs), 6 nails are required, spaced according to shingle manufacturer's written instructions. These shingles are to be hand sealed at the time of application with asphalt roof cement, by applying 4 spots about the size of a quarter, each centered under a tooth, 1-inch up from the bottom edge of that covering tooth.

### **3.6 VALLEYS**

- A. Open Valleys: Valley starts with 36-inches self-adhered, bottom layer underlayment centered down the valley. Extend felt underlayment over this and trim overlap 6-inches. A second layer of felt is applied over this, centered down the valley. Apply metal valley flashing, minimum 26-gauge galvanized metal or an equally corrosion resistant metal; minimum 24-inches wide, formed with a "W" shape and center rib and avoid puncturing. Center metal flashing in valley over second layer of felt underlayment, extending beyond drip edge 1/4-inch to 3/8-inch. If more than one piece of flashing metal is needed, the lower piece is nailed at the top. The upper piece laps over the lower piece nails by at least 8-inches and the lap is cemented together with asphalt roof cement complying with ASTM D 4586.

- B. Snap two chalk lines down valley, starting 3-inches on either side of valley center line, at top of valley and diverging from each other 1/8-inch per foot down valley. Apply shingles into valley in the typical sequence of application on balance of roof. Trim shingles to the chalk line; avoid pieces less than 12-inches wide. If necessary, trim the preceding shingle on the course. Apply the shingles into the valley so that no nails pass through the valley metal. Clip the upper shingle corner (in the valley) 1-inch at 45°. Embed each shingle end in a 3-inches wide strip of asphalt roof cement.

### 3.7 APPLICATION DIAGONAL OFFSET PATTERN

- A. First Starter Course: Use PABCO® Universal Starter or a self sealing three-tab shingle with the tabs cut off and the adhesive at the eave. Remove 7-½ inches from the end of the first piece and apply it at the lower left hand corner of the roof, overhanging the drip edge 1/4-inch to 3/8-inch. Nail in place with 4 nails about 2-inches up from the eave, spaced evenly across the shingle. Continue the Universal Starter across the deck with full shingles.
- B. Second Starter Course: Use Paramount® Starter to assure matching shingle colors. Cut 5-¾ inches off the length of the first slab of Starter and apply at the lower left-hand corner of the roof. This Paramount® Starter is applied, flush with the first starter course at the rake and eave drip edge. Continue the Paramount® Starter across the deck with full shingles. See the [\[Cascade™\] Application Detail - Getting Started at www.pabcoroofing.com](http://www.pabcoroofing.com) for more information and details.
- C. Base and Cap (Counter) Flashing:
  - 1. Install the metal base flashing for the front of a chimney, skylight, vent or adjoining wall, over the headlap of the last course of shingles below the chimney and extending up the chimney. Set both the roof and chimney overlaps in asphalt roof cement. Where the roof abuts the chimney or vertical wall, the shingles must be flashed with metal flashing shingles applied over the end of each course of shingles. The flashing shingles are 8-inches by 6-1/2 inches, bent to extend 4-inches out over the shingles on the roof deck and 4-inches up the vertical surface. Each flashing shingle is placed so that its bottom edge is just back from the exposed edge of the shingle which will overlap it. It is secured to the deck with one nail near the top corner. The base flashing must be flashed with cap flashing of sheet metal. The cap flashing must extend at least 1-inch into the masonry mortar joints and be caulked with asphalt roof cement to insure a water-tight connection. Base flashing should be cut to cover the entire cricket and extend 6-inches up the brickwork on the chimney. See ARMA Residential Asphalt Roofing Manual for additional details.
- D. Hips and Ridges:
  - 1. Trim shingles to be even with the ridge and cap with PABCO® Shadow Cap shingles exposed 5-5/8 inches to the weather. Nail 6-5/8 inches back from the exposed edge and 1-inch up from the bottom edge with galvanized roofing nails long enough to penetrate deck 3/4-inch. Applying PABCO® Shadow Cap as a double layer piece is recommended to accent the hip and ridge lines.  
In cold weather (40°F or below) store shingles for hip & ridge in heated location 24 hours prior to application.

END OF SECTION 07 31 13

SECTION 07 31 29  
WOOD SHINGLE AND SHAKE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cedar Shingle Roofing of the following types:
  - 1. Cedar Shingles. (Certigrade)
  - 2. Pressure-Impregnated, Preservative Treated Shingles. (Certi-Last)
  - 3. Pressure-Impregnated, Fire-Retardant Treated Shingles. (Certi-Guard)
- B. Cedar Shake Roofing of the following types:
  - 1. Handsplit and Resawn Shakes. (Certi-Split)
  - 2. Tapersawn Shakes. (Certi-Sawn)
  - 3. Tapersplit Shakes. (Certi-Split)
  - 4. Straight-Split Shakes. (Certi-Split)
  - 5. Pressure-Impregnated, Preservative Treated Shakes. (Certi-Last)
  - 6. Pressure-Impregnated, Fire-Retardant Treated Shakes. (Certi-Guard)

1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim.

1.3 REFERENCES

- A. Cedar Shake and Shingle Bureau (CSSB):
  - 1. Registered Trademarks: The following terms are registered trademarks of the Cedar Shake and Shingle Bureau (CSSB) and are only to be used in the representation and specification of products manufactured by members of the CSSB.
    - a. Certi-Wood.
    - b. Certi-Label.
    - c. Certigrade.
    - d. Certi-Last.
    - e. Certi-Guard.
    - f. Certi-Ridge.
    - g. Certi-Split..
    - h. Certi-Sawn
    - i. Blue Label.
  - 2. CSSB Certi-Label: Grading and Packing Rules for Western Red Cedar Shake and Western Red Cedar Singles.
  - 3. CSSB New Roof Construction Manual.
- B. ASTM Annual Book of Standards (ASTM):
  - 1. ASTM A153 - Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
  - 2. ASTM A493 - Standard Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging.
  - 3. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Type II Used in Roofing and Waterproofing.
  - 4. ASTM D4869 - Standard Specification for Asphalt-Saturated Organic Felt Type IV Underlayment Used in Steep Slope Roofing.

5. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data:
  - 1. Manufacturer's data sheets on each product to be used.
  - 2. Preparation instructions and recommendations.
  - 3. Storage and handling requirements and recommendations.
  - 4. Typical installation methods.
- C. Verification Samples: Two representative units of each type, size, pattern and color.
- D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
- D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
  - 1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
  - 2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
  - 3. Retain mock-up during construction as a standard for comparison with completed work.
  - 4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.6 PRE-INSTALLATION CONFERENCE

- A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
- B. Protect from damage due to weather, excessive temperature, and construction operations.
- C. Allow all cedar roofing products to acclimate to site conditions before installing.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.



- B. Do not install when rain is present.
- C. Provide attic ventilation 1/150 is recommended.
- D. Do not insulate directly under plywood decking or spaced sheathing.

## 1.9 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Members of the Cedar Shake and Shingle Bureau, which is located at: P.O. Box 1178; Sumas, WA 98295-1178; ASD Phone: 604-820-7700; Fax: 604-820-0266; Email: info@cedarbureau.com; Web: www.cedarbureau.org.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

### 2.2 CEDAR SHINGLES

- A. Basis of Design: Certigrade Cedar Shingles, Blue Label; as manufactured by Members of the Cedar Shake and Shingle Bureau.
  - 1. Grade: Number 1, Blue Label 100 percent clear, edge grain, heartwood.
  - 2. Species: Western Red Cedar.
  - 3. Species: Alaskan Yellow Cedar.
- B. Cedar Shingle Characteristics and Ancillary Items:
  - 1. Size: 16 inches (406 mm) by 5/2, 5 butt ends equal 2 inches (51 mm).
    - a. 4/12 and Greater Blue Label Maximum Exposure: 5 inches (127 mm).
  - 2. Size: 18 inches (457 mm) by 5/2-1/4, 5 butt ends equal 2-1/4 inches (57 mm).
    - a. 4/12 and Greater Blue Label Maximum Exposure: 5-1/2 inches (140 mm).
  - 3. Size: 24 inches (610 mm) by 4/2, 4 units equal 2 inches (51 mm).
    - a. 4/12 and Greater Blue Label Maximum Exposure: 7 inches (178 mm).
  - 4. Size and Exposure: \_\_\_\_\_.
  - 5. Treatment: Preservative. Pressure-impregnated. Certi-Last; as manufactured by Members of the Cedar Shake and Shingle Bureau.
    - a. Nail Material: Type 316 stainless steel.
    - b. Nail Length: Shake: 18 inch (457 mm) Straight-Split. 5d Box.
    - c. Nail Length: Shake: 18 and 24 inch (457 and 610 mm) Handsplit and Resawn. 6d Box.
    - d. Nail Length: Shake: 24 inch (610 mm) Tapersplit. 5d Box.
    - e. Nail Length: Shake: 18 and 24 inch (457 and 610 mm) Tapersawn. 6d Box.
- C. Hip and Ridge Caps:
  - 1. Basis of Design: Certi-Ridge, Shingle; as manufactured by Members of the Cedar Shake and Shingle Bureau.
    - a. Species: Western Red Cedar.
    - b. Species: Alaskan Yellow Cedar.
    - c. Grade: Number 1. 100 percent clear, edge grain, heartwood in each bundle.
    - d. Size: 16 inches (406 mm) by 5/2, 5 butt ends equal 2 inches (51 mm).
    - e. Size: 18 inches (457 mm) by 5/2-1/4, 5 butt ends equal 2-1/4 inches (57 mm).
    - f. Size: 24 inches (610 mm) by 5/2-1/2, 5 butt ends equal 2-1/2 inches (64 mm).
    - g. Size: \_\_\_\_\_.
    - h. Treatment: Preservative. Pressure-impregnated. Certi-Last; as manufactured

by Members of the Cedar Shake and Shingle Bureau.

## 2.3 CEDAR SHAKES

- A. Shakes: Certi-Split Tapersplit Shakes.
  - 1. Basis of Design: Certi-Split Tapersplit Shakes; as manufactured by Members of the Cedar Shake and Shingle Bureau.
    - a. Face: Hand split. Back: Hand split.
- B. Cedar Shake Characteristics and Ancillary Items:
  - 1. Grade: Number 1 Premium Grade, 100 percent edge grain.
  - 2. Grade: Number 1 Grade, up to 20 percent flat grain in each bundle.
  - 3. Species: Western Red Cedar.
  - 4. Species: Alaskan Yellow Cedar.
  - 5. Butt Thickness: match existing
  - 6. Length: 18 inches (457 mm). Maximum Exposure: 7-1/2 inch (191 mm).
  - 7. Length: 24 inches (610 mm). Maximum Exposure: 10 inch (254 mm).
  - 8. Length: \_\_\_\_\_.
  - 9. Treatment: Preservative. Pressure-impregnated. Certi-Last; as manufactured by Members of the Cedar Shake and Shingle Bureau.
  - 10. Fasteners: Electrogalvanized fasteners are NOT acceptable.
    - a. Nail Material: Type 316 stainless steel.
    - b. Nail Length: Shake: 18 inch (457 mm) Straight-Split. 5d Box.
    - c. Nail Length: Shake: 18 and 24 inch (457 and 610 mm) Handsplit and Resawn. 6d Box 2.
    - d. Nail Length: Shake: 24 inch (610 mm) Tapersplit. 5d Box.
    - e. Nail Length: Shake: 18 and 24 inch (457 and 610 mm) Tapersawn. 6d Box 2.
- C. Hip and Ridge Caps:
  - 1. Basis of Design: Certi-Ridge, Handsplit; as manufactured by Members of the Cedar Shake and Shingle Bureau.
    - a. Face: Split. Back Sawn
  - 2. Basis of Design: Certi-Ridge, Tapersawn; as manufactured by Members of the Cedar Shake and Shingle Bureau.
    - a. Face: Sawn, Back Sawn
  - 3. Hip and Ridge Cap Characteristics:
    - a. Species: Western Red Cedar.
    - b. Grade: Premium Grade, 100 percent edge grain.
    - c. Grade: Number 1 Grade, up to 20 percent flat grain allowed in each bundle.
    - d. Thickness: 1/2 inch (13 mm).
    - e. Thickness: 5/8 inch (16 mm).
    - f. Thickness: 3/4 inch (19 mm).
    - g. Thickness: 7/8 inch (22 mm).
    - h. Thickness: \_\_\_\_\_.
    - i. Length: 18 inches (457 mm).
    - j. Length: 24 inches (610 mm).
    - k. Length: \_\_\_\_\_.
    - l. Treatment: Preservative. Pressure-impregnated. Certi-Last; as manufactured by Members of the Cedar Shake and Shingle Bureau.

## 2.4 ATTIC VENTILATION

- A. Ridge Vents: Flexible or rigid plastic ridge ventilator designed to allow the passage of hot air from attics, while resisting snow infiltration. For use in conjunction with eave/soffit ventilation products.
  - 1. Net Free Ventilation Area (NFVA): 12.5 sq inches per lineal ft (26460 sq.mm per m).

- B. METAL FLASHING
  - 1. Flashing: see Drawings.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly constructed and prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Verify that the deck is dry, sound, clean and smooth. It shall be free of any depressions, waves, and projections.
- C. Replace damaged deck with new materials.
- D. Clean deck surfaces thoroughly prior to installation of eaves protection membrane and underlayment.

### 3.3 INSTALLATION

- A. Install all roofing products in accordance with federal, state, local codes, manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
  - 1. Refer to application instructions for the selected starter shingles or shakes.
- B. Shakes: When solid sheathing is specified plywood is required
  - 1. Solid Deck is Recommended for the Following Situations: See CSSB New Roof Construction Manual pages 20 and 21 for more information.
    - a. Seismic activity zones.
    - b. Hurricane and tornado regions.
    - c. Where wind-driven snow is encountered.
    - d. Under pressure impregnated treated shakes.
    - e. Continuous ventilation product.
    - f. Vertical Strips: 2 x 4 inch (51 x 102 mm). Horizontal: 1 x 4 inch (25 x 102 mm) or 1 x 6 inch (25 x 152 mm).
  - 2. Check with local building code official for plywood thickness and dimensions.
  - 3. Install valley and eave protection as required by local code
  - 4. Felt Interlay:
    - a. Apply a 36 inch (914 mm) wide strip of roofing felt at the eave line.
    - b. Apply an 18 inch (457 mm) wide strip of roofing felt over the top portion of the shakes; maximum 4 inches (102 mm) from the top of the shake, and extend onto the sheathing.
    - c. Position bottom edge of felt at a distance above the butt equal to twice the weather exposure.
    - d. Felt interlay between courses is not necessary when straight-split, or taper-split shakes are applied in snow-free areas at weather exposures of less than one-third the total shake length; 3-ply roof. Check with local building code official for local jurisdiction requirements
  - 5. Shakes to be a starter shake or doubled at all eaves.
  - 6. Butts of the shakes in the first course on roofs shall project 1-1/2 inches (38 mm) from the edge of roof eaves to insure proper spill into gutters and approximately 1 inch (25 mm) at gable and rake edge.

7. Spaces between adjacent rows shall be 1-1/2 inches (38 mm) apart minimum
  8. No Shake smaller than 4 inches (102 mm) wide should be installed
  9. Shake Spacing: Not less than 3/8 inch (10 mm), not more than 5/8 inch (16 mm).
  10. Premium and Number 1 Grade Maximum Weather Exposure:
    - a. Shake Length: 18 inch (457 mm). Exposure: 7-1/2 inch (190 mm).
    - b. Shake Length: 24 inch (610 mm). Exposure: 10 inch (254 mm).
    - c. Resawn Shakes: 24 x 3/8 inch (610 x 10 mm). Exposure: 7-1/2 inch (191 mm).
  11. Chimney Flashing: Extend up chimney to a height not less than 3 inches (76 mm), up the roof slope to a point equal in height to the flashing on the chimney but never less than 1 1/2 times Shake exposure. All metal flashings should be painted.
  12. Manufactured Step-Flashing: 8 x 12 shakes: 4 inch (102 mm) horizontal.
  13. Step Flashing: Minimum height of 3 inches (76 mm). Greater heights are often required. Check with local building code official for step flashing height.
  14. Apron Counter Flashing: Extend to within 1 inch (25 mm) of surface of finished roof.
- C. Shingles: Apply over solid sheathing, plywood is the only sheathing recommended.
1. A solid deck is recommended in seismic activity, hurricane and tornado regions and in areas where wind-driven snow is encountered and under pressure impregnated treated shakes.
  2. Check with local building code official for plywood thickness/dimensions.
  3. Shingles to be at least doubled at all eaves.
  4. Butts of the shingles in the first course on roofs shall project 1-1/2 inch (38 mm) from the edge of roof eaves to insure proper spill into gutters and approximately 1 inch (25 mm) at gable and rake edge.
  5. Shingles Spacing: Not less than 1/4 inch (6 mm), not more than 3/8 inch (10 mm).
  6. Number 1 Blue Label Maximum Weather Exposure:
    - a. Shingle Length: 16 inch (406 mm).
      - 1) Roof Slope: 3:12 to 4:12: 3-3/4 inch (95 mm).
      - 2) Roof Slope: 4:12 and Steeper: 5 inch (127 mm).
    - b. Shingle Length: 18 inch (457 mm).
      - 1) Roof Slope: 3:12 to 4:12. Exposure: 4-1/4 inch (108 mm).
      - 2) Roof Slope: 4:12 and Steeper. Exposure: 5-1/2 inch (140 mm).
    - c. Shingle Length: 24 inch (610 mm).
      - 1) Roof Slope: 3:12 to 4:12. Exposure: 5-3/4 inch (146 mm).
      - 2) Roof Slope: 4:12 and Steeper. Exposure: 7-1/2 inch (191 mm).
  7. Number 2 Red label Maximum weather Exposure:
    - a. Shingle Length 16 inch (406 mm):
      - 1) Roof slope 3:12 to 4:12: 3-1/2 inches (89 mm).
      - 2) Roof slope 4:12 and steeper 4 inches (102 mm).
    - b. Shingle Length 18 inch (457 mm):
      - 1) Roof slope 3:12 to 4:12: 4 inches (102 mm).
      - 2) Roof slope 4:12 and steeper 4-1/2 inches (114 mm).
    - c. Shingle Length 24 inch (610 mm):
      - 1) Roof slope 3:12 to 4:12: 5-1/2 inches (140 mm).
      - 2) Roof slope 4:12 and steeper 6-1/2 inches (165 mm).
  8. Chimney Flashing: Extend up chimney to a height not less than 3 inches (76 mm), up the roof slope to a point equal in height to the flashing on the chimney but never less than 1-1/2 times shingle exposure. All metal flashings should be painted.
  9. Manufactured Step-Flashing: Horizontal and Vertical 2-1/2 inch (64 mm) step flashings require a 3 inch (76 mm) minimum overlap.
  10. Step Flashing: Minimum height of 2-1/2 inches (64 mm). Greater heights are often required. Check with local building code official for step flashing height.
  11. Apron Counter Flashing: Extend to within 1 inch (25 mm) of surface of finished roof.
- D. Saddles or Crickets: Formed in back of chimneys, curves or similar vertical surfaces, they shall be carried not be less than 10 inch (254 mm) under shakes and shingles.

- E. Step flashing is to be used where vertical surfaces occur in connection with slopes. They are to be formed of separate pieces. Extend flashing horizontally not less than 3 inches (76 mm) and up the vertical wall so that they are lapped by the counter flashing. Counter flashing shall be vertically at least 4 inches (102 mm) above roof surface. Install step flashing in step fashion. Each piece to lap not less than 3 inches (76 mm); one flashing installed on each course concealed under the covering course. If other than masonry is used, the flashing is to extend up the wall not less than 3 inches (76 mm) behind the sheathing paper.
- F. Dormer Flashings: To run 3 inches (76 mm) up under the sheathing paper and not less than 3 inches (76 mm) horizontally.
- G. Window Caps and Other Projections: At points where rain water accumulates, provide with flashings extending a distance of 3 inches (76 mm) up the wall behind the sheathing paper.
- H. Soil Pipes: Metal to extend no less than 6 inches (152 mm) in all directions and installed to lap and shed water to shakes or shingles below.
- I. Hips and Ridges: To be of alternate overlap type applied at same exposure as field of roof and with nails long enough to penetrate into sheathing at least 3/4 inches (19 mm).
  - 1. Position fasteners approximately 2 inches (51 mm) above exposure line.
  - 2. Install a strip of felt, eave protection material or metal over hip or ridge under the ridge or hip cap. If longer or shorter ridge cap is used, adjust exposure accordingly.
- J. Valleys:
  - 1. Install eaves protection membrane at least 36 inches (914 mm) wide and centered on the valley. Lap ends 6 inches (152 mm) and seal.
  - 2. Shakes or shingles extending into the valley shall be sawed to the proper miter.
  - 3. Do not lay shakes or shingles with grain parallel with the centerline of valleys.
  - 4. All valleys shall be installed with shakes or shingles lapping the valley flashing not less than 7 inches (178 mm) on each side.
  - 5. On shingle roofs of less than 6:12 slope, flashing should extend at least 11 inches (279 mm) on each side.
  - 6. For shakes, metal valley sheets shall be center-crimped; of 20 inches (508 mm) minimum width; underlaid with a strip of roofing felt over the sheathing, and coated with a metal paint.
  - 7. Where valleys are indicated to be "open valleys", install metal flashing over leak barrier before shingles or shakes are installed. Secure the flashing by nailing at 18 inches (457 mm) on center. No nails closer than 9 inches (229 mm) from center of valley.
  - 8. Valley metals that have proved reliable in a particular geographic region should be selected.
    - a. Copper Flashing: Check with local building code official on the durability of copper valleys in your area.
- K. Fasteners:
  - 1. Fasteners to be long enough to penetrate into the solid wood sheathing at least 3/4 inch (19 mm) or all the way through.
  - 2. Nails are to be driven flush but not so that the nail head crushes the wood. Place approximately 3/4 to 1 inch (19 to 25 mm) from the side edges of the shakes or shingles and approximately 1-1/2 inches (38 mm) above the butt line of the following course.
  - 3. Each roof shake or shingle shall be secured with two full-driven, required fasteners.
- L. Attic Ventilation required. As recommended by local code.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.
- B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

### 3.5 CLEANING AND PROTECTION

- A. Clean products in accordance with the manufacturer's recommendations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

## 07 31 35 Slate Roofing Repair

### PART 1---GENERAL

#### 1.01 SUMMARY

- A. This procedure provides supplemental guidelines to be used when specifying repair or replacement work on slate roofs. Guidelines for qualification, materials, fabrication and general guidelines for installation are included. This procedure should be used to supplement "Minor Repairs To Slate Roofs" and "Reroofing Using Slate Shingles".

#### 1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, installation instructions and recommendations for each type of roofing product required. Include data substantiating that materials comply with requirements. Submit three samples of slates. Submit samples of nails, rag felt and plastic cement.

#### 1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide primary products, produced by a single manufacturer, which has produced that type product successfully for not less than 3 years. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified.
- B. Installer Qualifications: A single Installer ("Roofer") shall perform the work of this section; and shall be a firm with not less than 5 years of successful experience in installation of slate shingle roofs similar to those required for this project and which is acceptable to or licensed by the manufacturer of primary roofing material.
  - 1. Installer Certification: Obtain written certification from manufacturer certifying that installer is approved by manufacturer for installation of specified roofing system. Provide copy of certification to Contracting Officer prior to award of roofing work.
  - 2. Installer's Field Supervision: Installer must maintain full-time supervisor/foreperson on jobsite during times that roofing work is in progress. Supervisor must have minimum of 5 years experience in roofing work similar to nature and scope of specified roofing.
  - 3. Provide detailed written resume of slate installer's qualifications including at least 5 examples of quality slate installations.
- C. Pre-Application Roofing Conference: Approximately two weeks prior to scheduled commencement of slate shingle installation and associated work, meet at project site with Installer, installer of each component of associated work, other work in and around roofing which must precede or follow roofing work, the Contracting Officer, Government, roofing system manufacturer's representative, and other representatives directly concerned with performance of the work including (where applicable) Government's insurers, test agencies, and governing authorities. Record (Contractor) discussions of conference and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:

1. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by other trades.
2. Review roofing system requirements (drawings, specifications and other contract documents).
3. Review required submittals, both completed and yet to be completed.
4. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
5. Review required inspection, testing, certifying and materials usage accounting procedures.
6. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).

#### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Store in a dry, well ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused felts on the roof overnight or when roofing work is not in progress. Store rolls of felt and other sheet materials on end on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.
- B. Felt rolls and shingles which are stored on roof overnight shall be covered with tarpaulins, not plastic. Coverage shall be complete, with tarpaulins extending to bottom to prevent exposure in wind. Material shall be stored in such a manner so as not to exceed 20 PSF loading on roof.

#### 1.05 PROJECT/SITE CONDITIONS

- A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.
- B. Temporary Protection: Contractor shall be responsible for protection of spaces and contents below roof deck from water leakage. Roof deck shall never be left exposed overnight or during inclement weather.
- C. The contractor shall be responsible for protection of spaces and contents below roof deck from water leakage. Roof decks or insulation shall never be left exposed overnight or during inclement weather.

#### 1.06 WARRANTY

- A. Contractor shall submit, before installation, certification from the producer of slate shingles that the Contractor has undergone training in the application of these shingles by the producer.
- B. The Contractor shall provide a two-year warranty against leaks, faulty material and workmanship.



## PART 2---PRODUCTS

### 2.01 MANUFACTURERS

Slate Shingles: Provide new slate shingles hand-cleft from sound stone, meeting Federal Specification, 55-5-451, Grade A, maximum water absorption (ASTM C121) of .1%. Color and appearance shall match existing as closely as possible.

- A. Slate shingles:
  - 1. Buckingham-Slate Corporation
  - 2. Evergreen Slate Co.
  - 3. Hilltop Slate Co.
  - 4. Midland Engineering Co.
  - 5. Vermont Slate Company Mr. Slate
  - 6. Penn Big Bed Slate Co.
  - 7. Monson Maine Slate Co.
  - 8. Rising and Nelson Slate Co.
  - 9. Shelton Slate Products Co.
  - 10. Structural Slate Co.  
Vermont Structural Slate Co.

### 2.02 MATERIALS

Reference: ASTM C406/C406M -10 Standard Specification of Roofing Slate

- A. Material and Workmanship: Slate shall conform to the following requirements:
  - 1. Unless otherwise specified, surfaces shall be of reasonably smooth cleavage.
  - 2. Slate shall be free from knots or knurls that would lessen the durability or weather tightness of the finished work.
  - 3. Unless otherwise specified, slate shall be rectangular, with straight cut edges.
  - 4. Unless otherwise specified, corners shall be reasonably full on exposed edges, with no broken corners on covered ends that would diminish the nailing strength or weather tightness.
  - 5. Unless otherwise specified, the thickness shall be approximately three-eighth inch.
  - 6. Flatness - The maximum bend shall not exceed one- eighth inch in 12 inches.
  - 7. Unless otherwise specified, holes shall be machine- punched for 3-inch double lap.
- B. General Requirements:
  - 1. Slate shall be whole and clean. Not more than 2 percent of broken slate will be accepted.

2. All slate shall be hard, dense, sound rock, punched for two nails each. No cracked slate shall be used. All exposed corners shall be practically full. No broken corners on covered ends which sacrifice nailing strength or the laying of a water-tight roof will be allowed.
- C. Detail Requirements:
1. Color: To match existing or original and as approved by RHPO.
  2. Strength: The average modulus of rupture across the grain shall not be lower than 9,000 pounds per square inch.
  3. Absorption: The maximum absorption shall be - ASTM Grade S1--0.08%
  4. Acid Resistance: The slate shall, under the acid test, show no softening to an average depth greater than - ASTM Grade S1 -- 0.002 inch.
- D. Methods of Sampling, Inspection and Tests:
1. The inspection of the slate may be made at the discretion of the Government either before or after delivery.
  2. Samples for test, when required, shall be selected by the Inspector and shall be representative of the material. At least one sample of slate shall be selected from each carload or fraction thereof. Additional samples may be taken for test at any time or place at the discretion of the Government.
  3. Absorption Test: The specimen shall consist of a square or rectangular slab not less than 4 inches on any side, cut from the slate shingle so that the saw cut is nowhere nearer than 1 inch to the sheared edge.
- E. Slate: Natural slate roofing units used for replacement should duplicate existing slate installed on the roof and match for thickness, color and texture, as well as type, size and existing, and should be punched for nailing.
- F. Nails:
1. All nails, rivets, and similar fastenings, if any, used throughout the work should be of best grade hard copper.
  2. Nails should be large flat-head copper wire nails. DO NOT USE COPPER ROOFING NAILS OR ORDINARY COPPER WIRE NAILS.
  3. Nail length should be twice the thickness of the slates plus 1". Minimum length is 7/8". Sizes: 3d for commercial standard slates up to 18" in length; 4d for slates over 18"; 6d for ridge and hip slates.
- G. Flashings:
1. All intersections of roofs with vertical surfaces of every kind and all openings in roof surfaces, should be properly flashed.
  2. Match appearance of original materials. If any existing flashings are to be reused, new material must be the same as the original material to prevent galvanic corrosion.
    - A. Copper - 16-oz. soft copper; occasionally 20-oz. required, consult manufacturer.
    - B. Lead - 2-1/2# to 3#.
    - C. Terne - 20# or 40# depending on type of flashing, i.e cap and base flashing, 20# or vertical and horizontal surfaces, 40#. Consult manufacturer.
    - D. Galvanized - 24 ga. to 26 ga. depending o type of flashing, consult manufacturer.
- H. Base flashings:
1. Should be at least 4" high.
  2. Should project at least 4" out onto the roof.
  3. Should be a full 96" in length. On sloping roofs they should lap longitudinally at least 3".
- I. Reglets:
1. Flashings should finish in reglets in the masonry.

2. The flashing should be turned into the reglet the full depth and should be turned back to form a hook. After the flashing is in place the reglet should be filled caulked, using molten lead on flat surfaces, and lead wool on vertical surfaces. After caulking the reglet should be made smooth by filling with elastic cement.
- J. Step flashings:
1. Step flashings should be used where vertical surfaces occur in connection with slopes.
  2. They should be formed of separate pieces built into the masonry as specified for cap flashings in masonry.
  3. Steps should generally be 3", but should in no case be less than 2", and should not be soldered. Lap joints should be vertical.
- K. Vent flashings:
1. All pipes passing through roofs should be flashed and counterflashed.
  2. Base flashings should extend out on the roof not less than 6". They should be of sufficient length to cover the slate course next below the pipe and to extend up under the slate course above as far as possible without puncture by nails.
- L. Open valley flashings:
1. Open valleys should be not less than 4" wide.  
NOTE: To determine the proper width for flashing, start at the top with a width of 4", increase the width one inch for every 8 feet of length of the valley. Flashing pieces should be full length sheets and of sufficient width to cover the open portion of the valley and extend up under the slate not less than 4" on each side.
  2. Where two valleys of unequal size come together, or where the areas drained by the valley are unequal, there should be placed in the valley a "crimp" angle or tee not less than 1" high. This "crimp" may be formed in the valley sheet before placing, or it may be made of a separate piece soldered to the valley sheet.
- M. Closed valley flashings:
1. Flashing pieces, for closed valley should be of sufficient length to extend 2" above the top of slate roofing piece and lap the flashing piece below 3", and of width sufficient to extend up the sides of the valley far enough to make the valley inches deep.
  2. They should be placed with the slate so that all pieces are separated by a course of slate. Pieces should be set so as to lap at least 3" and to be entirely concealed by the slates. They should be fastened by the nails at the top edge only.
- N. Elastic cement or exterior grade caulk such as "Gutter- Seal" (Dow), "Roof Sealant" (Alcoa), or approved equal.
1. A sticky, waterproof compound used to secure hip and ridge slates.
  2. It has a high melting point and low freezing point.

## PART 3---EXECUTION

### 3.01 EXAMINATION

- A. Examine substrate surfaces to receive slate shingles and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
1. Verify that flatness and fastening of wood roof decks are securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16-inch out of plane. Pull out or drive home projecting fasteners.

- B. Condition of Surfaces: Decks to which roofing system is to be applied shall be sound and dry, clean, smooth and free from projections. Application of roof system components shall not progress when there is ice, frost, surface moisture, or dampness, visible on the roof deck. Deck shall be thoroughly broomed clean, including within flutes.
- C. Replace any boards of the wood roof deck if shown to be weak structurally, rotted, splintered or broken with treated boards.

### 3.02 PREPARATION

- A. Roof removal is to commence in the center of areas to be removed and to proceed outward to the edge of the areas to be removed.
- B. Any disintegrating, wet or failed material shall be removed and replaced.
- C. Removed roofing, insulation, flashing and masonry will be removed from the roof immediately without allowing accumulation of piles of trash. Tossing of any trash, tools or any objects from roof to any areas below, including from one roof level to another, is expressly prohibited.
- D. Removed materials shall become the property of Contractor and shall be removed from the site. Debris and scrap shall be removed from the work area daily.
- E. Temporary Roof Installation:
  - 1. If adverse weather conditions require protection of exposed deck, install 6 mil polyethylene sheets horizontally, shingling, from top to bottom. Staple and tape all joints and edges.
  - 2. Remove temporary roof completely prior to installation of permanent roofing system.

### 3.03 ERECTION, INSTALLATION, APPLICATION

- A. Removal of Existing Loose or Damaged Shingles:
  - 0. Using a slate ripper, carefully remove any loose, cracked and broken slate shingles from the roof, taking care not to break those that are only loose. Remove any remaining small pieces of slate.
  - 1. Store removed full slate shingles for reuse, to the extent desired by the Contracting Officer on the job site where directed.
- B. Acceptance of Roof Deck: Inspect roof deck for flaws which could prevent the proper installation of the new slates. Report any defects to the Contracting Officer in writing.
- C. Replacement of Slate Roofing (method one):
  - 0. Slide in new slates to replace broken, missing or cracked slates. Reuse existing full slates wherever possible.
  - 1. Line up slate in its course making sure any pre-punched holes are covered by the slates above.
  - 2. Neatly fit the slate around all pipes, vents and other penetrations.
  - 3. Mark location of new nail hole through the vertical joint of slates in the overlying course, approximately 5 inches from the head of the overlaying slate or 2 inches below the tail of the second course of slate above.
  - 4. Punch or drill new hole and nail slate into position using copper nails as specified. Cut nail head as required to fit between slates in overlaying courses. Nail shall not be driven so far as to put strain on the slates; slate should hang from the nail.
  - 5. Slates overlapping sheet metal shall have the nails so placed as to avoid puncturing the sheet metal.

6. Cut a piece of copper approximately 3 inches wide by 8 inches long. Cut edge slightly to help with friction fit. Bend piece slightly lengthwise to make it concave or convex which will insure its remaining tightly in place. Insert the piece of copper lengthwise over the slating nail and under the course above so that it extends a approximately two inches under the succeeding course and completely covers the new nail hole.
- D. Alternative method: THIS METHOD SHOULD NOT BE USED IN NORTHERN CLIMATES WHERE SNOW AND ICE COULD CAUSE TAB TO UNBEND.
  0. Remove damaged slate as directed above.
  1. Cut a copper tab approximately 1 inch wide by 8 inches long. Double over bottom 4 inches and bend up to form an "L" shape.
  2. Nail top of tab to roof deck using a copper nail. Daub nail head with non-corrosive, non-staining elastic roofing cement.
  3. Slide replacement slate into place so that bottom of slate rests on copper tab. Bend doubled portion of tab up and over the bottom of the slate to hold it in place. Approximately 1 inch of the tab should be visible.

### **3.04 ADJUSTING/CLEANING**

- A. Clean work areas of all debris as roofing work progresses. At conclusion of job, clean up loose slates, containers and nails and leave job site neat and clean.

## SECTION 07 56 50

### PREPARATION FOR RE-ROOFING

#### PART 1 - GENERAL

##### 1.1. SCOPE OF WORK

- A. Preparation of existing surface to receive new roof system while maintaining weathertight conditions.

##### 1.2. PRE-INSTALLATION CONFERENCE

- A. Refer to Project Meeting requirements
- B. Review installation procedures and coordination required with related work.

##### 1.3. ENVIRONMENTAL REQUIREMENTS

- A. Do not remove existing roofing system when weather conditions threaten the integrity of the building contents or intended continued occupancy. Maintain continued temporary protection prior to installation of the new roofing system.

##### 1.4. PROTECTION

- A. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction. A four (4) hour time limit shall be given from the time of notification of emergency conditions. In the event of water penetration during rain or a storm, the Contractor shall provide for repair or protection of the building contents and interior. If the Contractor does not respond or cannot be contacted, the Owner will affect repairs or emergency action and the Contractor shall be back charged for all expenses and damages, if any.

##### 1.5. SCHEDULING

- A. Schedule work to coincide with commencement of installation of new roofing system

#### PART 2 - EXECUTION

##### 3.1. EXAMINATION

- A. Roofing Contractor to verify existing site conditions, including roof dimensions.
- B. Verify that existing roof surface is clear and ready for work of the Section.
- C. Verify that the installation of all materials (membrane, flashings, or any other accessories/components) will be installed in such a manner that any existing flashing conditions, masonry weeps, drains, etc. will not be covered or compromised. For example; do not cover existing masonry weeps or restrict (make smaller) roof drains or scuppers). It is the Contractor's responsibility to alter any details so that they will not negatively affect any flashing, moisture or drainage condition. All such details must be coordinated with the roof manufacturer so that the required warranty will not be affected.

### 3.2. MATERIALS REMOVAL

- A. Remove all gravel, membrane, cant strips, base flashings, shingles, underlayments, etc. and any other items necessary for the installation of the new roof system. In addition, completely removal of all nails and other debris to leave a smooth, even surface for re-roofing.

Core information (when provided) is available for the convenience of the Contractor and to aid the Professional in the design of the new roof. Core information (and all existing roof information, insulation thicknesses, etc) are believed to be accurate; but, may not be correct in all cases. Additionally, any original drawing information (when made available to the Professional) is also shown on the drawings/details. However, the professional cannot attest to the accuracy of these drawings or whether the building was actually constructed as designed. As a result, the Contractor is responsible for verifying any and all conditions that will affect the work necessary to achieve the scope of work and/or the associated pricing. The roof will be made available for the Contractor to core and otherwise inspect as he feels is necessary. If the Contractor chooses to not visit the site and/or verify any conditions, this does not relieve the Contractor of his responsibility to properly prepare the roof (and remove/dispose of materials) as necessary for the installation of the new roofing system as described.

On surfaces where a non-typical or non-standard roofing material or coating exists, this material/coating must be completely removed prior to any installation that requires adhesion to this surface. If any remnants remain, the contractor is solely responsible for obtaining written permission from the roofing material manufacturer that will be supplying the warranty. This written permission must state that this existing condition is acceptable to the manufacturer and will not alter the required warranty. The manufacturer must also verify in writing that the remnants of the material are completely compatible with the new materials that are being installed.

- B. Under certain conditions, it will be necessary and desirable to incorporate one or more of the following methods for removal of dirt, silt, gravel, debris, and roof membrane from the roof surface in order to preserve the ecology, eliminate unsightly conditions, and protect the building surfaces:
1. Roof vacuum systems.
  2. Crane and hopper with dump truck system.
  3. Enclosed chutes with protective shrouds on the building and ground surfaces.
- C. All debris removed from the roof shall be transported from the roof via proper chutes into dumpsters or trucks, and this debris shall be removed from the premises when vehicles are full at the Contractors cost. No debris shall be transported from the area being worked on over a previously finished roof without proper protection that is approved by the roof system manufacturer that carries the warranty and the owner/professional. Prior approval is required before working on or transporting over a previously finished roof area
- D. All roof equipment and supplies not in use or being staged will be parked on the column lines (or other structural support lines) on with proper protection underneath.

END OF SECTION 07 56 50



**SECTION 07 61 01**  
**COPPER ROOFING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Flat-seam copper roofing.
  - 2. Flat locked and soldered roofing.
  - 3. Standing-seam copper roofing.
- B. Related Requirements:
  - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 and Division 02 Specification Sections, apply to this Section.
  - 2. Copper Wall Cladding.
  - 3. Copper Roofing Specialties: Accessories on roof
  - 4. Copper Flashing and Trim: Flashing and other trim not part of roofing.
  - 5. Copper Gutters and Downspouts: Gutters and downspouts associated with roofing.
  - 6. Copper Expansion Joint Cover Assemblies.
  - 7. Division 07 Section "Joint Sealants" for field-applied panel sealants.
  - 8. Wood framing and decking is specified in a Division 06 Section.
  - 9. "Copper in Architecture" handbook published by the Copper Development Association Inc. (CDA). This handbook is available to download or view on line at [copper.org](http://copper.org)

**1.2 COORDINATION**

- A. Coordinate copper roofing with rain drainage work, flashing, gutters, downspouts, trim and deck conditions, parapets, walls, and other adjoining work to provide permanently watertight, secure, and noncorrosive installation during and after the construction process.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Installation Requirements: Fabricator is responsible for installing system, including anchorage to substrate and necessary modifications to meet specified and drawn requirements and maintain visual design concepts in accordance with Contract Documents and installation methods as stipulated in the "Copper in Architecture" handbook published by the Copper Development Association Inc. (CDA). This handbook is available to download or view on line at [copper.org](http://copper.org)
  - 1. Drawings are diagrammatic and are intended to establish basic dimension of units, sight lines, and profiles of units.
  - 2. Make modifications only to meet field conditions and to ensure fitting of system components and as necessary to properly waterproof existing conditions, conditions not specifically detailed and tie-ins with existing work.
  - 3. Obtain Architect's approval of modifications.
  - 4. Provide concealed fastening wherever possible.
  - 5. Attachment considerations: Account for site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening and fracturing connection between units and building structure or between components themselves. In general, expansion is to be allowed for at all wall conditions, transitions and similar conditions. See "Copper in Architecture" handbook for additional information.
  - 6. Obtain Architect's approval for connections to building elements at locations that are not specifically indicated in the Contract Documents.
  - 7. Accommodate building structure deflections in system connections to structure.
- B. Performance Requirements:
  - 1. System shall accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to seasonal temperature changes and live loads as defined in "Copper in Architecture".
  - 2. Design and install system capable of withstanding building code requirements for negative wind pressure.

- C. Interface with Adjacent Systems:
  - 1. Integrate design and connections with adjacent construction.
  - 2. Accommodate allowable tolerances and deflections for structural members in installation.

#### **1.4 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract, Division 01 Specification Sections.
- B. Product data including metal manufacturer's specifications, installation instructions, and general recommendations for roofing applications **that are specific to this project**. Include certification or other data substantiating that materials comply with requirements.
- C. Shop drawings showing manner of forming, joining, and securing copper roofing, and pattern of seams. Show expansion joint details and waterproof connections to adjoining work and at obstructions and penetrations. **In particular, show any connections or other conditions that are not specifically shown in the Construction Documents.**
- D. Samples consisting of 6-inch or 12-inch square specimens of specified copper roofing material.
- E. Certificates: Fabricator's certification that products furnished for Project meets or exceeds specified requirements **and are compatible with all other accessory items.**

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Provide maintenance data in Operations and Maintenance manual for maintaining applied coatings **and any other components/materials that have maintenance requirements related to copper panels. See Division 0 and 01 for all close out requirements.**

#### **1.6 QUALITY ASSURANCE**

- A. Fabricator's Qualifications: Company specializing in copper sheet metal roofing work with three years experience in similar size and type of installations.
- B. Installer: A firm with 3 years of successful experience with installation of copper roofing of type and scope equivalent to Work of this Section.
- C. Industry Standard: Except as otherwise shown or specified, comply with applicable recommendations and details of the "Copper in Architecture" handbook published by the Copper Development Association (CDA). Conform to dimensions and profiles shown.
- D. Wind Uplift: Provide roof assemblies meeting wind uplift ratings as required by code.
- E. Mock-Up: Before proceeding with final purchase of materials and fabrication of copper roofing components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements. Install mock-up at roof area location directed by Architect **and Owner**. Retain accepted mock-up as quality standard for acceptance of completed copper roofing. If accepted, mock-up may be incorporated as part of copper roofing work.
  - 1. Provide mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and color.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Packing, Shipping, Handling, and Unloading: Protect finish panel faces.
- B. Acceptance at Site: Examine each panel and accessory as delivered and confirm that finish is undamaged. Do not accept or install damaged panels.
- C. Storage and Protection:
  - 1. Stack pre-formed material to prevent twisting, bending, and abrasions.
  - 2. Provide ventilation.
  - 3. Prevent contact with materials which may cause discoloration or staining.

#### **1.8 WARRANTY**

- A. Warrant installed system and components to be free from defects in material and workmanship for period of 2 years.
- B. Include coverage against leakage and damages to finishes.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering materials that may be incorporated in the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide materials by one of the following manufacturers. The contractor shall verify that the proposed manufacturer has materials readily available and that these materials are suitable for the applications in this project.
  - 1. Hussey Copper, Ltd.
  - 2. Luvata, Inc.
  - 3. PMX Industries Inc.
  - 4. Revere Copper Products, Inc.

### 2.2 MATERIALS

- A. Copper Roofing Sheets: Cold-rolled copper sheet complying with ASTM B370 temper H00, unless otherwise indicated, and as follows:
  - 1. Weight: **16 oz. per sq. ft.** (0.0216-inch thick) (0.55 mm) unless otherwise indicated.
- B. Miscellaneous Materials: Provide materials and types of fasteners, solder, protective coatings, separators, sealants and accessory items as recommended by copper sheet manufacturer for copper roofing work, except as otherwise indicated.
- C. Accessories: Except as indicated as work of another specification Section, provide components required for a complete roof system, including trim, copings, fascias, ridge closures, cleats, seam covers, battens, flashings, gutters, vents, sealants, gaskets, and closure strips. Match materials and finishes of roof.
  - 1. Sealing Tape: Pressure-sensitive 100 percent solids polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
  - 2. Joint Sealant: One-part, copper compatible elastomeric polyurethane, polysulfide, butyl or silicone rubber sealant as tested and recommended by sealant manufacturer for copper substrates.
  - 3. Cleats
    - a. Concealed type as indicated in the "Copper in Architecture" handbook published by the Copper Development Association (CDA) for standing seam spaced on 16 inch centers **unless indicated otherwise.**
    - b. Fabricate cleats to allow thermal movement of copper roof panels while preventing copper panel distortion due to wind uplift forces.
  - 4. Trim, Closure Pieces, and Accessories:
    - a. Same material, finish **and thicknesses (unless specifically indicated on the construction documents)** as adjacent copper roof panels, brake formed to required profiles.
    - b. Comply with standards conforming to recognized industry standard sheet metal practice.
- D. Bituminous Coating: SSPC - Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film), nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- E. High Temperature Grade Water Barrier Underlayment: Cold applied, self-adhering membrane composed of a high density, cross laminated polyethylene film coated on one side with a layer of butyl rubber or high temperature asphalt adhesive. Provide primer when recommended by water barrier manufacturer.
  - 1. Minimum Thickness: 30 mil.
  - 2. Tensile Strength: ASTM D412 (Die C Modified); 250 psi.
  - 3. Membrane Elongation: ASTM D412 (Die C Modified); 250%
  - 4. Permeance (Max): ASTM E96; 0.05 Perms.
  - 5. Acceptable Products:
    - a. **Ultra, W.R. Grace Company.**
    - b. **Approved equal per Division 1**
- F. Paper Slip Sheet: Minimum 4-lb. red rosin-sized building paper.

1. Wood Batten Strips, **blocking and assemblies**: Fabricated to size indicated from lumber complying with requirements of Division 06 Section "Rough Carpentry" and preservative treated by pressure process using a chemical solution that is nonhygroscopic and noncorrosive to type of copper roofing.
- G. Nails for Wood Substrates: Copper or hardware bronze, 0.109 inch minimum not less than 7/8-inch (22 mm) long barbed with large head.
- H. Screws & Bolts: Copper, bronze, brass, or passivated stainless steel (300 Series) of sufficient size and length to sustain imposed stresses.
- I. Cleats: 16 or 20 oz ounce cold rolled copper, as required to sustain loads 2-inch (50 mm) wide x 3-inch (75 mm) long.
- J. Solder: ASTM B32; Provide 50-50 tin/lead or lead-free alternative of similar or greater strength solder. Killed acid flux.
- K. Flux: Muriatic acid neutralized with zinc or approved brand of soldering flux.
- L. Rivets:
  1. Provide solid copper rivet (tinner's rivets) where structural integrity of seam is required.

- **SLOPES GREATER THAN 6:12 – DRY SEAMS WITHOUT SEALANT OR SOLDER.**
- **SLOPES GREATER THAN 3:12 UP TO 6:12 – SEALANT OR BUTYL TAPES CONCEALED IN SEAMS.**
- **FLAT AND SLOPES UP TO 3:12 – FULLY SOLDER SEAMS.**

## 2.3 FABRICATION

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of the "Copper in Architecture" handbook published by the Copper Development Association (CDA) and other recognized industry practices. Fabricate for waterproof and weather-resistant performance with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work **with proper tolerances to allow for movement**. Form work to fit substrate. Comply with material manufacturer's instructions and recommendations for forming material. Form exposed copper work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
  1. Fabricate to allow for adjustments in field for proper anchoring and joining.
  2. Form sections true to shape, accurate in size, square, free from distortion and defects.
  3. Cleats: Fabricate cleats and starter strips of same material as sheet, interlockable with sheet in accordance with CDA recommendations.
  4. Tin **all** edges of copper sheets and cleats at soldered joints for flat lock and soldered system.
  5. Flat Panel Seams:
    - a. Fabricate flat seams for solid soldered, sealant in or dry joints **based on slope and location**.
    - b. Fabricate seams for panels to be installed in overlapped, interlocking shingle manner.
    - c. Fold two adjacent edges over 180 degrees for width of 3/4 inch and other two adjacent edges under 3/4 inch. Refer to CDA "Copper in Architecture" handbook.
  6. Flat Locked Panel Seams:
    - a. Fabricate flat seams for solid soldered joints.
    - b. Fabricate seams for panels to be installed in overlapped, interlocking shingle manner for locked down engaged seams.
    - c. Fold two adjacent edges over 180 degrees for width of 3/4 inch and other two adjacent edges under 3/4 inch (19 mm). Refer to CDA "Copper in Architecture Handbook".
    - d. Fabricate flat seam roofing from pans 18 inches (450 mm) by 24 inches (600 mm) in size.
  7. Standing Seam Panels:
    - a. Fabricate pans to interlock standing seam with center to center seam spacing as indicated on Drawings.
    - b. Fabricate interlocking seams to heights and patterns indicated.

- c. Form overlapping and interlocking transverse joints.
- B. Seams: Fabricate nonmoving seams in copper sheet with flat-lock seams. Tin edges and cleats to be soldered, form seams, and solder.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, non-expansion-type joints are indicated or required for proper performance of work, form copper to provide for proper installation of elastomeric sealant, in compliance with the "Copper in Architecture" handbook published by the Copper Development Association (CDA).
- E. Separations: Provide for separation of copper from noncompatible metal or corrosive substrate by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Solder:
  1. Solder and seal non-moving copper joints on slopes up to 3:12, except those indicated or required to be expansive type joints.
  2. After soldering, remove flux. Wipe and wash solder joints clean. Refer to CLEANING Article in PART 3.

## 2.4 FINISHES

- A. Natural weathering mill finished copper. No applied finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. General: Examine conditions and proceed with work when substrates are ready.
- B. Confirm that substrate system is even, smooth, sound, clean, dry, and free from defects. **Correct any defects so that substrates are ready to receive the new work.**
- C. Verify roof openings, pipes, sleeves, ducts, and vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.

### 3.2 PREPARATION

- A. Clean surfaces to receive copper roofing. Substrate to be smooth and free of defects. Drive all projecting nails or other fasteners flush with substrate.
- B. Water Barrier Underlayment:
  1. Install high temperature grade water barrier on clean, dry roof substrate.
  2. Remove dust, dirt, and loose fasteners.
  3. Remove protrusions from the deck area.
  4. Verify substrate has no voids, damaged, or unsupported areas.
  5. Repair voids or unacceptable areas before installing membrane.
  6. Prime substrates with manufacturer's approved primer if required for proper installation of membrane over substrate. **See manufacture's literature for recommendations.**
  7. Install membrane in strict accordance with manufacturer's printed application procedures, precautions, and limitations.
  8. Start application at low points and lap membrane shingle fashion to prevent water penetration.
  9. Membrane Underlayment: Apply horizontally, lapping preceding layer not less than 4 inches. End lap membrane not less than 6 inches.
    - a. Maximize adhesion to substrate by brooming or rolling membrane in place after placement.
    - b. Center membrane at valleys, hips, and ridges.
- C. Install underlayment and paper slip sheet on substrate under copper roofing to greatest extent possible unless otherwise recommended by manufacturer of sheet metal. Paper slip sheets must be installed over the underlayment. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under copper roofing. Lap joints 2 inch minimum.

### 3.3 INSTALLATION

- A. Manufacturer's Recommendations: Except as otherwise shown or specified, comply with recommendations and instructions of manufacturer of copper being fabricated and installed.
- B. General:
  - 1. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized asphalt or butyl underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
  - 2. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of copper roofing to profiles, patterns, and drainage arrangements shown and as required for permanently leakproof construction. Provide for thermal expansion and contraction of the work, as indicated and as recommended by the "Copper in Architecture" handbook. Seal joints as shown or indicated in the specifications and as required for leakproof construction. Shop-fabricate materials to greatest extent possible.
  - 3. Sealant-Type Joints: Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1-inch into sealant. Form joints to conceal sealant completely. When ambient temperature is moderate at time of installation, 40 degrees to 70 degrees F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher or lower ambient temperatures. Do not install sealant-type joints at temperatures below 40 degrees F. Comply with all additional requirements of Division 07 "Joint Sealant" Sections for handling and installing sealants.
  - 4. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, and sealant. Except as otherwise shown, fold back sheet metal to form a hem on concealed side of exposed edges.
  - 5. Conceal fasteners and expansion provisions where possible in exposed work, and locate so as to minimize possibility of leakage and to optimize expansion. Cover and seal fasteners and anchors as required for a tight installation.
  - 6. Tin all uncoated copper surfaces and cleats at edges of sheets to be soldered, for a width of 1-1/2 inch, using solder recommended for copper work.
- C. Flat Seam Panels:
  - 1. Install copper work in accordance with the "Copper in Architecture" handbook published by the Copper Development Association (CDA).
  - 2. Flat Seam Metal Panels: Fasten system to substrate with concealed metal cleats and screws/nails at spacings required to resist code required wind uplift.
  - 3. Align, level, and plumb system with structure.
  - 4. Fasten cleats using cleats mated to folded flat seams and fastener pattern to resist design loads with screws or barbed nails of sufficient length to penetrate substrate.
  - 5. Fully seat adjacent panel to on two sides to achieve continuous engagement of seam joint.
  - 6. Apply flux and fully sweat seams with solder to achieve watertight installation.
  - 7. Install ridge assembly and cleats to allow roof panels to thermally move.
  - 8. Install expansion battens at 25 to 30 feet in both directions.
  - 9. Apply flux and fully sweat seams with solder to achieve watertight installation.
  - 10. Install expansion battens at 25 to 30 feet (7500 mm to 9000 mm) in both directions.
- D. Standing Seam Roofing:
  - 1. Fold lower end of each pan under 3/4 inch. Slit fold one inch away from corner to form tab where pan turns up to make standing seam. Fold upper end of each pan over 2 inches. Hook fold on lower end of upper pan into fold on upper end of underlying pan.
  - 2. Apply pans beginning at eaves (where applicable). Loose lock pans to valley flashing and edge strips at eaves and gable rakes.
  - 3. Finish standing seams one inch high. Bend up one side edge 1-1/2 inch and other 1-3/4 inch. Make first fold 1/4 inch wide single fold and second fold 1/2 inch wide, providing locked portion of standing seam with 5 plies in thickness. Fold lower ends of seams at eaves over at 45 degree angle. Terminate standing seams at ridge and hips by turning down in tapered fold.

4. Form valleys of sheets not exceeding 10'-0" in length. Lap joints 8 inches in direction of drainage. Extend valley sheet minimum 6 inches under roofing sheets. At valley, double fold valley and roofing sheets and secure with cleats spaced 12 inch centers.

### **3.4 CLEANING**

- A. Remove protective film (if any) from exposed surfaces of copper roofing promptly upon installation. Strip with care to avoid damage to finishes.
- B. Upon completion of each area of soldering, carefully remove flux and other residue from surfaces. Neutralize acid flux by washing with baking soda solution, and then flushing clear water rinse. Use special care to neutralize and clean crevices.
- C. Clean exposed metal surfaces of substances that would interfere with uniform oxidation and weathering.

### **3.5 PROTECTION**

- A. Provide final protection in a manner acceptable to installer that ensures that copper roofing is without damage or deterioration (**other than natural weathering**) at time of Substantial Completion.

**END OF SECTION**



**SECTION 07 62 10**  
**MANUFACTURED COPPER ROOFING SPECIALTIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Copper roofing specialties and accessories of standard manufactured components that are typically factory fabricated (not field fabricated). Includes accessories installed on and in roofing other than mechanical and structural items, such as:
  - 1. Factory-manufactured curbset wall counterflashing and expansion joints.
  - 2. Factory-manufactured miscellaneous sheet copper fascia, copings, trim and accessories.
- B. Related Requirements:
  - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this Section.
  - 2. Integral masonry flashings (when applicable) may be specified as masonry work in sections of Division 04.
  - 3. Roofing flashing and trim installed integral with roofing membrane are specified in roofing system sections as roofing work.
  - 4. Coordinate installation with mechanical equipment specified in the appropriate Mechanical divisions and drawings when part of the project

**1.2 COORDINATION**

- A. Coordinate work of this section with interfacing and adjacent work for proper sequencing. Ensure weather resistance and durability of work and protection of materials and finishes. Coordinate this work with all project specific and existing conditions. Alter work as necessary to accommodate these conditions.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Installation Requirements: Installation contractor is responsible for installing system, including anchorage to substrate and necessary modifications to meet specified and drawn requirements and maintain visual design concepts in accordance with Contract Documents and following installation methods as stipulated by the manufacturer.
- B. Drawings are diagrammatic and are intended to establish basic dimension of units, sight lines, and profiles of units.
  - 1. Make modifications to meet field conditions and to ensure fitting of system components as necessary to properly waterproof existing conditions and tie-ins with existing work.
  - 2. Obtain Architect's approval of modifications.
  - 3. Provide concealed fastening wherever possible.
  - 4. Attachment considerations: Account for site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening and fracturing connection between units and building structure or between components themselves. follow installation methods as stipulated in the "Copper in Architecture" handbook published by the Copper Development Association Inc. (CDA). This handbook is available to download or view on line at copper.org
  - 5. Obtain Architect's approval for connections to building elements at locations that are not specifically indicated in the Contract Documents.
  - 6. Accommodate building structure and roofing system deflections in system connections to structure.
- C. Performance Requirements:
  - 1. System shall accommodate movement of roofing and structural components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to seasonal temperature changes and live loads.
  - 2. Design and install system capable of withstanding building code requirements for negative wind pressure.



#### 1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract, Division 01 and Division 02 Specification Sections.
- B. Product Data: Manufacturer's technical product data, installation instructions, and general recommendations for each specified sheet material and fabricated product.
- C. Shop drawings showing layout, profiles, methods of joining, and anchorage details, including major trim systems. Provide layouts at 1/4 inch scale and details at 3-inch scale. Show any conditions that are not specifically shown in the Construction Documents.
- D. Samples of the following items:
  - 1. 6-inch or 12-inch square samples of specified sheet materials to be exposed as finished surfaces.
  - 2. 6-inch or 12-inch long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.
  - 3. By submitting products, the Contractor is assuring that the product is compatible with the all other installed items and the project specific conditions.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Provide maintenance data in Operations and Maintenance manual for maintaining applied coatings on copper panels and all other installed items that have maintenance requirements. See Division 01 and Division 02 for all close out requirements.

#### 1.6 QUALITY ASSURANCE

- A. Fabricator's Qualifications: Company specializing in copper sheet metal roof specialties work with three years experience in similar size and type of installations.
- B. Installer: A firm with 3 years of successful experience with installation of copper roof specialties of type and scope equivalent to Work of this Section.
- C. Industry Standard: Except as otherwise shown or specified, comply with applicable recommendations and details of the "Copper in Architecture" handbook published by the Copper Development Association (CDA). This handbook is available for free download at [copper.org](http://copper.org). Conform to dimensions and profiles shown.
- D. Mock-Up: Before proceeding with final purchase of materials and fabrication of copper roof specialty components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements. Install mock-up at location directed by Architect and Owner. Retain accepted mock-up as quality standard for acceptance of completed copper work. If accepted, mock-up may be incorporated as part of copper work.
  - 1. Provide mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and color.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading: Protect finish metal faces.
- B. Acceptance at Site: Examine each component and accessory as delivered and confirm that material and finish is undamaged. Do not accept or install damaged materials.
- C. Storage and Protection:
  - 1. Stack pre-formed material to prevent twisting, bending, and abrasions.
  - 2. Provide ventilation.
  - 3. Prevent contact with materials which may cause discoloration or staining.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Copper: ASTM B370; temper H00 (cold-rolled) except where temper 060 is required for forming; 16 oz. per sq. ft. (0.0216-inch thick) (0.55 mm) except as otherwise indicated.

## 2.2 ACCESSORIES:

- A. Wood Nailers: Softwood lumber, pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2; not less than 1-1/2-inch (38 mm) thick.
- B. Solder: ASTM B32; Provide 50-50 tin/lead or lead free alternative of similar or greater strength solder. Killed acid flux.
- C. Flux: Muriatic acid neutralized with zinc or approved brand of soldering flux.
- D. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
- E. Bituminous Coating: SSPC - Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film), nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- F. Joint Sealant: One-part, copper compatible elastomeric polyurethane, polysulfide, butyl or silicone rubber sealant as tested by sealant manufacturer for copper substrates. Refer to Division 07 **for any additional requirements**.
- G. Sheet Copper Accessories: Provide sheet copper cleats, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gauge required for performance.
- H. Roofing Cement: ASTM D2822, asphaltic.
- I. High Temperature Grade Water Barrier Underlayment: Cold applied, self-adhering membrane composed of a high density, cross laminated polyethylene film coated on one side with a layer of butyl rubber or high temperature asphalt adhesive. Provide primer when recommended by water barrier manufacturer.
  - 1. Minimum Thickness: 30 mil.
  - 2. Tensile Strength: ASTM D412 (Die C Modified); 250 psi.
  - 3. Membrane Elongation: ASTM D412 (Die C Modified); 250%
  - 4. Permeance (Max): ASTM E96; 0.05 Perms.
  - 5. Acceptable Products:
    - a. Blueskin PE 200 HT, Henry.
    - b. Ultra, W.R. Grace Company.
    - c. CCW MiraDRI WIP 300 High Temperature, Carlisle Coatings and Waterproofing.
- J. Paper Slip Sheet: Minimum 4-lb. red rosin-sized building paper.
- K. Rivets:
  - 1. Provide solid copper rivet (tinner's rivets) where structural integrity of seam is required.

## 2.3 FABRICATION

- A. General Sheet Copper Fabrication: Provide materials of standard factory fabrication to greatest extent possible. Comply with details shown and with applicable requirements of CDA "Copper in Architecture Handbook" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work **with proper tolerances to allow for movement**. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet copper work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
  - 1. Fabricate to allow for adjustments in field for proper anchoring and joining.
  - 2. Form sections true to shape, accurate in size, square, free from distortion and defects.
  - 3. Cleats: Fabricate cleats of same material as sheet, interlockable with sheet in accordance with CDA recommendations.
- B. Seams: Fabricate nonmoving seams in sheet copper with flat-lock seams. Tin **all** edges and cleats to be seamed, form seams, and solder. Use 1 inch wide lapped rivet and soldered joints where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

- D. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form copper to provide for proper installation of elastomeric sealant, in compliance with CDA standard details.
- E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Preformed Gravel Stop/Fascia:
  - 1. Copper water dam with fascia.
  - 2. Provide with continuous cleat mechanically fastened to be secured and engaged against roofing membrane.
  - 3. Secure to obtain wind uplift resistance to comply with code.
  - 4. Provide with overflow scupper **as detailed or otherwise indicated**
  - 5. Provide with splice plates to conceal and weatherseal joints between sections of dam and fascia.
- G. Preformed Coping:
  - 1. Coping: 16 oz. per sq. ft. unless otherwise indicated.
  - 2. Anchor Cleat: 20 oz. per sq. ft. otherwise indicated.
  - 3. Gutter/Splice Plate: Anchor cleat with integral drainable gutter or manufacturer's standard closed cell composition compressible material gasket between anchor plate and coping finish top match coping.
  - 4. Secure to obtain wind uplift resistance to comply with code.
  - 5. Slope coping towards roof **when not specifically indicated otherwise.**
  - 6. Provide gutter/splice plates at joints between sections of coping.
- H. Fabrication:
  - 1. Form sections true to shape, accurate in size, square, free from distortion and defects, to profiles indicated.
  - 2. Shop fabricate intersections, inside corners, and outside corners with miters welded in factory prior to finishing.
  - 3. Shop fabricate radius curved corners.

## 2.4 FINISHES

- A. Natural weathering mill finished copper. No applied finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. General: Examine conditions and proceed with work when substrates are ready.
- B. Confirm that substrate system is even, smooth, sound, clean, dry, and free from defects. **Correct any defects so that substrates are ready to receive the new work.**

### 3.2 INSTALLATION

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with CDA "Copper in Architecture Handbook". Anchor units of work securely in place by methods indicated, providing for thermal expansion of copper units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
  - 1. Install units plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction **within tolerances that allow for expansion.**
  - 2. Securely anchor roof specialties to supporting substrates with appropriate type fasteners.
  - 3. Coordinate with installation of roofing system and related flashings.
- B. Parapet Cap Water Barrier Membrane Underlayment:
  - 1. Clean substrate of dirt, dust, and materials which may impair adhesion.
  - 2. Apply primer, when required, in accordance with manufacturer's requirements.
  - 3. Apply to top of parapet wall under coping and gravel stops.
  - 4. Turn membrane down exterior wall face and parapet wall face 2 inches.

5. Install without fishmouths and wrinkles.
  6. Press tape into firm contact with substrate.
  7. Lap tape ends minimum of 2 inches.
- C. Underlayment: Where units are to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper over the underlayment
- D. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- E. Fascia:
1. Secure in place with concealed fasteners and cleats using methods as recommended by manufacturer and CDA to maintain sightlines and wind resistance.
  2. Seal joints and splice plates watertight.
- F. Coping:
1. Secure in place with concealed fasteners and cleats using methods as recommended by manufacturer and CDA to maintain sightlines and wind resistance.
  2. Seal joints and splice plates watertight.

### **3.3 CLEANING**

- A. Remove protective film (if any) from exposed surfaces of copper promptly upon installation. Strip with care to avoid damage to finishes.
- B. Clean exposed copper surfaces, removing substances that might cause corrosion of copper or deterioration of finishes.
- C. Upon completion of each area of soldering, carefully remove flux and other residue from surfaces. Neutralize acid flux by washing with baking soda solution, and then flushing clear water rinse. Use special care to neutralize and clean crevices.
- D. Clean exposed metal surfaces of substances that would interfere with uniform oxidation and weathering.

### **3.4 PROTECTION**

- A. Protection: Follow all necessary procedures for surveillance and protection of flashings and sheet copper work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

**END OF SECTION**

**SECTION 07 62 20**  
**COPPER FLASHING AND TRIM**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes shop and field formed copper accessories and trim, such as:
  - 1. Counterflashing and base flashing.
  - 2. Wall flashing.
  - 3. Gravel stops.
  - 4. Copings.
  - 5. Valley flashing.
  - 6. Exposed trim/fascia units.
  - 7. Miscellaneous accessories.
  - 8. Laminated flashing.
- B. Related Requirements:
  - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 01 Specification Sections, apply to work of this Section.
  - 2. system sections as roofing work coordinate all work with adjacent building materials, roof types, etc. See drawings and details for additional information.
  - 3. Copper Wall Cladding.
  - 4. Copper Roofing.
  - 5. Copper Roofing Specialties: Roof accessory units of premanufactured, set-on type.
  - 6. Copper Gutters and Downspouts: Gutters and downspouts associated with roofing.
  - 7. Copper Expansion Joint Cover Assemblies: Building expansion joint covers.."
  - 8. Sealants are generally specified in Division 07 Section, "Joint Sealants."
  - 9. Coordinate installation with HVAC mechanical equipment
  - 10. "Copper in Architecture" handbook published by the Copper Development Association Inc. (CDA). [This handbook is available to download or view on line at copper.org](http://copper.org)

**1.2 COORDINATION**

- A. Coordinate work of this section with interfacing and adjacent work for proper sequencing. Ensure weather resistance and durability of work and protection of materials and finishes [during and after the construction process](#).

**1.3 PERFORMANCE REQUIREMENTS**

- A. Installation Requirements: Fabricator is responsible for installing system, including anchorage to substrate and necessary modifications to meet specified and drawn requirements and maintain visual design concepts in accordance with Contract Documents and following installation methods as stipulated in the "Copper in Architecture" handbook published by the Copper Development Association (CDA) [This handbook is available for free viewing and download at copper.org](http://copper.org)
  - 1. Drawings are diagrammatic and are intended to establish basic dimension of units, sight lines, and profiles of units.
  - 2. Make modifications only to meet field conditions and to ensure fitting of system components [and as necessary to properly waterproof existing conditions, conditions not specifically detailed and tie-ins to existing work](#).
  - 3. Obtain Architect's approval of modifications.
  - 4. Provide concealed fastening wherever possible.
  - 5. Attachment considerations: Account for site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening and fracturing connection between units and building structure or between components themselves. [In general, expansion is to be allowed for at all wall conditions, transitions and similar conditions. See "Copper in Architecture" handbook for additional information.](#)

6. Obtain Architect's approval for connections to building elements at locations other than indicated in Drawings.
7. Accommodate building structure deflections in system connections to structure.
- B. Performance Requirements:
  1. System shall accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to seasonal temperature changes and live loads **as defined in "Copper in Architecture"**.
  2. Design system capable of withstanding building code requirements for negative wind pressure.

#### 1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product data for flashing, metal, and accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product **and other components/materials that have maintenance requirement related to this section.**
- C. Shop drawings showing layout, profiles, methods of joining, and anchorage details, including major counterflashings, copings, trim/fascia units, and gravel stops systems. Provide layouts at 1/4 inch scale and details at 3-inch scale.
- D. Samples of the following flashing, sheet metal, and accessory items:
  1. 6-inch or 12-inch square samples of specified sheet materials to be exposed as finished surfaces.
  2. 6-inch or 12-inch long samples of fabricated products exposed as finished work. Provide complete with specified finish.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Provide maintenance data in Operations and Maintenance manual for maintaining applied coatings **and any other components/materials that have maintenance requirements related to copper panels. See Division 0 and 01 for all close out requirements.**

#### 1.6 QUALITY ASSURANCE

- A. Fabricator's Qualifications: Company specializing in copper flashing and trim work with three years experience in similar size and type of installations.
- B. Installer: A firm with 3 years of successful experience with installation of copper flashing and trim work of type and scope equivalent to Work of this Section.
- C. Industry Standard: Except as otherwise shown or specified, comply with applicable recommendations and details of the "Copper in Architecture" handbook published by the Copper Development Association (CDA). Conform to dimensions and profiles shown.
- D. Mock-Up: Before proceeding with final purchase of materials and fabrication of copper flashing and trim work components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements. Install mock-up at location directed by Architect **and Owner**. Retain accepted mock-up as quality standard for acceptance of completed copper work. If accepted, mock-up may be incorporated as part of copper work.
  1. Provide mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and color.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading: Protect finish metal faces.
- B. Acceptance at Site: Examine each component and accessory as delivered and confirm that material and finish is undamaged. Do not accept or install damaged materials.
- C. Storage and Protection:
  1. Stack pre-formed material to prevent twisting, bending, and abrasions.
  2. Provide ventilation.
  3. Prevent contact with materials which may cause discoloration or staining.

## 1.8 WARRANTY

- A. Warrant installed flashing, copings, gravel stops, and trim components to be free from defects in material and workmanship for period of 2 years.
- B. Include coverage against leakage and damages to finishes.

## PART 2 - PRODUCTS

### 2.1 FLASHING AND TRIM MATERIALS

- A. Copper: ASTM B370; temper H00 (cold-rolled) except where temper 060 is required for forming;
  - 1. **16 oz. per sq. ft.** (0.0216-inch thick) (0.55 mm) except as otherwise indicated.

### 2.2 LAMINATED COMPOSITION SHEET FLASHING

- A. Copper/Fiberglass Laminated Flashing.
  - 1. Description: Asphalt free copper fabric flashing, 3 **[5] [7]** ounce minimum weight.
  - 2. Material: Copper sheet with 060 temper conforming to ASTM B370 bonded with a proprietary rubber based adhesive, between two layers of fiberglass fabric weighing not less than 0.3 oz/sq.ft./layer with a minimum of 20x20 threads per inch.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
- C. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Copper Sealite 2000, Advanced Building Products, Inc.
  - 2. Multi-Flash 500 Series Asphalt Free, York Manufacturing, Inc.

### 2.3 ACCESSORIES

- A. Solder: ASTM B32; Provide 50-50 tin/lead or lead free alternative of similar or greater strength solder. Killed acid flux.
- B. Flux: Muriatic acid neutralized with zinc or approved brand of soldering flux.
- C. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
- D. Bituminous Coating: SSPC - Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film), nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- E. Joint Sealant: One-part, copper compatible elastomeric polyurethane, polysulfide, butyl or silicone rubber sealant as tested by sealant manufacturer for copper substrates. Refer to Division 07.
- F. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of and compatibility with flashing sheet.
- G. High Temperature Grade Water Barrier Underlayment: Cold applied, self-adhering membrane composed of a high density, cross laminated polyethylene film coated on one side with a layer of butyl rubber or high temperature asphalt adhesive. Provide primer when recommended by water barrier manufacturer.
  - 1. Minimum Thickness: 30 mil.
  - 2. Tensile Strength: ASTM D412 (Die C Modified); 250 psi.
  - 3. Membrane Elongation: ASTM D412 (Die C Modified); 250%
  - 4. Permeance (Max): ASTM E96; 0.05 Perms.
  - 5. Acceptable Products:
    - a. **Ultra, W.R. Grace Company.**
    - b. **Approved equal per Division 1**
- H. Paper Slip Sheet: Minimum 4-lb. red rosin-sized building paper.
- I. Reglets: Units of type and profile indicated, compatible with copper, noncorrosive.
- J. Metal Accessories: Provide cleats, straps, anchoring devices, and similar accessory units as required for installation of work, noncorrosive, size and gauge required for performance.
- K. Roofing Cement: ASTM D2822, asphaltic.
- L. Rivets:



1. Provide solid copper rivet (tinner's rivets) where structural integrity of seam is required.

## 2.4 FABRICATION

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of Copper Development Association (CDA) "Copper in Architecture" handbook and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work **with proper tolerances to allow for expansion**. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed copper work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
  1. Fabricate to allow for adjustments in field for proper anchoring and joining.
  2. Form sections true to shape, accurate in size, square, free from distortion and defects.
  3. Cleats: Fabricate cleats of same material as sheet, interlockable with sheet in accordance with CDA recommendations.
  4. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; solder for rigidity if required; seal non-soldered weather joints with sealant.
- B. Seams: Fabricate nonmoving seams with flat-lock seams where possible. Tin edges and cleats to be seamed, form seams, and solder. Where soldered flat-lock seams are not possible, use soldered riveted lap seams joints for additional strength.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with CDA standards.
- E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Solder
  1. Solder and seal metal joints except those indicated or required to be expansive type joints.
  2. Tin edges of copper sheets and cleats at soldered joints.
  3. After soldering, carefully remove flux and other residue from surfaces. Neutralize acid flux by washing with baking soda solution, and then flushing clear water rinse. Wipe and wash solder joints clean.
- G. Seams:
  1. Provide following seam types unless noted or detailed otherwise.
  2. Flat: Drive cleat
  3. Corner: Double lock corner
  4. Standing: Double lock standing
- H. Copper Thickness: Comply with CDA recommendations for copper size and shape.
- I. Flashing and Counter Flashing:
  1. Fabricate as indicated on Drawings and in accordance with the CDA "Copper in Architecture" handbook.
  2. Hem exposed flashings on underside 1/2 inch (13 mm); miter and seam corners.
  3. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
  4. Fabricate flashings to allow toe to extend minimum 2 inches (50 mm) over wall surfaces.
- J. Coping: As indicated on Drawings and in accordance with the CDA "Copper in Architecture" handbook.
- K. Fascia/Gravel Stop: As indicated on Drawings and in accordance with the CDA "Copper in Architecture" handbook.



- L. Valley Flashing:
  - 1. Fabricate valley flashing according to details and specified requirements.
  - 2. Fabricate metal flashings at open valleys with a minimum 1 inch (25 mm) high standing rib at center of valley to break force of water flow.
- M. Masonry Through Wall Flashings: See details

## 2.5 FINISHES

- A. Natural weathering mill finished copper. No applied finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. General: Examine conditions and proceed with work when substrates are ready.
- B. Confirm that substrate system is even, smooth, sound, clean, dry, and free from defects. **Correct any defects so that substrates are ready to receive the new work.**

### 3.2 INSTALLATION

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with the "Copper in Architecture" handbook published by the Copper Development Association (CDA). Anchor units of work securely in place by methods indicated, providing for thermal expansion of units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
  - 1. Install units plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction.
  - 2. Apply asphalt mastic on copper surfaces of units in contact with dissimilar metals.
  - 3. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
  - 4. Miter, lap seam and close corner joints with solder. Seal seams and joints watertight.
  - 5. Install expansion joints at frequency recommended by CDA. Do not fasten moving seams such that movement is restricted.
  - 6. Coordinate with installation of roofing system and roof accessories.
- B. Parapet Cap Water Barrier Membrane Underlayment:
  - 1. Clean substrate of dirt, dust, and materials which may impair adhesion.
  - 2. Apply primer, when required, in accordance with manufacturer's requirements.
  - 3. Apply to top of parapet wall under coping and gravel stops.
  - 4. Turn membrane down exterior wall face and parapet wall face 2 inches (50 mm).
  - 5. Install without fishmouths and wrinkles.
  - 6. Press tape into firm contact with substrate.
  - 7. Lap tape ends minimum of 2 inches (50 mm ).
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 03 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 04 sections.
- E. Counterflashing and Reglets:
  - 1. Fabricate counterflashings and reglets as 2 piece assemblies to permit installation of counterflashing after base flashings are in place.
  - 2. Fabricate reglets of same metal and thickness as counterflashings.
  - 3. Overlap roof base flashing 4 inches (100 mm) minimum.
  - 4. Install bottom edge tight against base flashing.
  - 5. Lap seam vertical joints 3 inches (75 mm) minimum and apply sealant.

- F. Install counterflashing in reglets, either by snap-in seal arrangement, lock seal in accordance with the "Copper in Architecture" handbook published by the Copper Development Association (CDA), or by soldering in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.
- G. Install laminated flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.
- H. Fasten flashing to curb nailers at maximum spacing of 3 inches (75 mm) O.C. Fabricate seams at joints between units with minimum 4-inch (100 mm) overlap, to form continuous, waterproof system in accordance with the "Copper in Architecture" handbook published by the Copper Development Association (CDA).
- I. Coping, and Fascia/Gravel Stops:
  - 1. Space seams: 10'-0" (3000 mm) o.c. maximum.
  - 2. Lock exterior edges over continuous cleats to secure to substrate.
  - 3. Slope towards inside of parapet, 1/2 inch (13 mm) minimum, unless indicated otherwise.
  - 4. Lock interior edges to substrate with cleats spaced at 12 inch (300) mm centers.
  - 5. Provide drainage system at seams to prevent water infiltration.
- J. Valley Flashing:
  - 1. Extend metal flashing a minimum of 12 inches (300 mm) onto roof deck on each side of valley.
  - 2. If valley length exceeds 12 feet (3600 mm), increase width of valley flashing by 1 inch (25 mm) on each side per 96 inches (2400 mm) of valley length.

### **3.3 CLEANING**

- A. Remove protective film (if any) from exposed surfaces of copper promptly upon installation. Strip with care to avoid damage to finishes.
- B. Clean exposed copper surfaces, removing substances that might cause abnormal discoloration of metal.
- C. Upon completion of each area of soldering, carefully remove flux and other residue from surfaces. Neutralize acid flux by washing with baking soda solution, and then flushing with clear water rinse. Use special care to neutralize and clean crevices.
- D. Clean exposed metal surfaces of substances that would interfere with normal oxidation and weathering.

### **3.4 PROTECTION**

- A. Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

**END OF SECTION**

## SECTION 07 92 00

### JOINT SEALERS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Preparing sealant substrate surfaces.
- B. Sealant and joint backing.

##### 1.02 SYSTEM DESCRIPTION

- A. System performance to achieve moisture and air tight joint seals.

##### 1.03 SUBMITTALS

- A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations and colors available and compatibility with system to be sealed (window, metal, door, etc.). Provide manufacturer's descriptive data to include storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). Provide a copy of the Material Safety Data Sheet for each solvent, primer or sealant material.

##### 1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SWRI (Sealant, Waterproofing and Restoration Institute) requirements for materials and installation.

##### 1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

#### PART 2 PRODUCTS

##### 2.01 SEALANTS

- A. Butyl Sealant (Type A): ASTM C920, single component, solvent release, non-skinning, non-sagging, color as selected.
  - 1. Elongation Capability- 7 to 10 percent.
  - 2. Service Temperature Range- 13 to 180 degrees F.
  - 3. Shore A Hardness Range- 10 to 30.
- B. Polyurethane Sealant (Type B and Type B-P): ASTM C920, single component, chemical curing, non-staining, non-bleeding, non-sagging, (pourable or self-leveling; Type B-P only); color as selected.
  - 1. Elongation Capability- 25 percent.
  - 2. Service Temperature Range- 40 to 180 degrees F.
  - 3. Shore A Hardness Range- 20 to 35.

- C. Silicone Sealant (Type C): ASTM C920, single component, solvent curing, non-sagging, non-staining, non-bleeding; color as selected.
    - 1. Elongation Capability- 25 percent.
    - 2. Service Temperature Range- 65 to 180 degrees F.
    - 3. Shore A Hardness Range 15 to 35.
  - D. Siliconized Acrylic Sealant (Type D): ASTM C834, single component, solvent curing, non-sagging, non-staining, non-bleeding; color as selected
    - 1. Elongation Capability (min.)- 25 percent
    - 2. Service Temperature Range- 0 to 180 degrees F.
    - 3. Shore A Hardness Range- 10 to 30.
  - E. Pourable, Elastomeric Concrete Expansion Joint Sealer: Resilient, grey in color (for sidewalks and other finished concrete) or to match surrounding color (adjacent to precast or rubbed concrete of a particular color), crack and shrink resistant, water proof and UV resistant. Shall be a product specifically formulated for the particular application. Typically used in exterior applications in concrete stair, ramp, sidewalk and similar construction. All products subject to Architect's approval.
- Note: Do not use silicon sealants in any roofing situations. All caulking and joint sealants shall be in strict accordance with roof manufacturer's specifications and approved by roof manufacturer.**
- F. Pre-Compressed (PreFormed) Expansion Joint Sealants: For structural expansion joints between new additions and existing buildings, use equal to EmSeal ColorSeal. See section 07901.

## 2.02 ACCESSORIES

- A. Primer: Provide a nonstaining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Provide glass fiber roping or neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Make backstop material compatible with sealant. Do not use oakum or other types of absorptive materials as backstops.
- D. Bond Breaker: Provide pressure sensitive tape if approved by sealant manufacturer to suit application. Otherwise, provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

## PART 3 EXECUTION

### 3.01 EXAMINATION AND PREPARATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.

- B. Remove loose materials and foreign matter which might impair adhesion of sealant.
- C. Verify that joint backing and release tapes are compatible with sealant.

### 3.02 INSTALLATION

- A. Clean joints in accordance with manufacturer's instructions.
- B. Install sealant in accordance with manufacturer's instructions.
- C. Measure joint dimensions and size materials to achieve 2:1 width/depth ratios.
- D. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width. Cut-back or trim the joint backing/separator to achieve an adequate depth as necessary for proper installation and as recommended by sealant manufacturer.
- E. Install bond breaker where joint backing is not used.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave, unless otherwise noted or recommended for the particular application.

### 3.03 SCHEDULES

In general, where sealant is visible and is intended to be painted, color shall be either white or a base color appropriate for the final intended finish coat color. Where sealant is visible and not intended to be painted, color shall be selected by Architect. Where sealant is not visible, color shall be gray.

The following schedule is provided as a general guideline for sealant usage. In no case shall this schedule be interpreted as superceding any manufacturer's recommendation for sealant use with their particular system(s) or product. Follow all sealant recommendations for the product or item being installed. Always use sealants that are compatible with the item or system for which the sealant is being used. If, for instance, a storefront or window manufacturer recommends a specific sealant, contractor shall supply and use such sealant, and in the manner recommended, in order not to void manufacturer's warranty. Any specialty sealants must be used that are recommended by the manufacturer of any item specified or otherwise approved for use in this project.

### INTERIOR SEALANTS - Provide sealant type(s) at locations indicated:

- |  |               |
|--|---------------|
| a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items. | <u>Type D</u> |
| b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.   | <u>Type D</u> |
| c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless  | <u>Type D</u> |

otherwise detailed.

- |  |               |
|--|---------------|
| d. Joints between edge members for acoustical tile and adjoining vertical surfaces.  | <u>Type D</u> |
| e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.                  | <u>Type D</u> |
| f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplanar tile surfaces meet. | <u>Type C</u> |
| g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change. | <u>Type C</u> |
| h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.   | <u>Type C</u> |

EXTERIOR SEALANTS - Provide sealant type(s) at locations indicated:

- |   |                    |
|---|--------------------|
| a. Joints and recesses formed where frames and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations. | <u>Type A</u>      |
| b. Joints between new and existing exterior masonry walls.  | <u>Type B</u>      |
| c. Masonry joints where shelf angles occur.   | <u>Type A</u>      |
| d. Joints in wash surfaces of stonework.  | <u>Type B</u>      |
| e. Expansion and control joints.  | <u>Type B, F</u>   |
| f. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.   | <u>Type D</u>      |
| g. Voids where items pass through exterior walls.   | <u>Type A or B</u> |
| h. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.  | <u>Type B</u>      |
| i. Metal-to-metal joints where sealant is indicated or specified.   | <u>Type A</u>      |
| j. Joints between ends of gravel stops, fascias, copings, and adjacent walls.   | <u>Type A or B</u> |
| k. Seats of metal thresholds for exterior doors.  | <u>Type B-P</u>    |

I. Sidewalk expansion joints

Type E

END OF SECTION 07 92 00

## SECTION 08 50 00

### REPAIR & RESTORATION OF HISTORIC WOOD WINDOWS

#### PART 1 – GENERAL

This specification covers the requirements for the repair and restoration of wood windows and transoms in historic buildings. These specifications are to be used in conjunction with the design drawings. The drawings show sizes, positions, configurations and other designated information. In addition to this information, it is the Contractor's responsibility to visit the site to be familiar with existing conditions and to verify all dimensions or conditions in question or not clearly defined.

##### 1.1 REFERENCES

The following publications from the United States Department of the Interior – National Park Service provide useful guidance in the restoration of historic wood windows and may be included as addenda to the specifications:

- Preservation Brief #9 – (1981) The Repair of Historic Wood Windows
- Preservation Brief #10 – (1982) Exterior Paint Problems on Historic Woodwork

##### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM C 741 (1993; R 1998) - Accelerated Aging of Wood Sash Face Compound
- ASTM C 742 (1999) - Degree of Set for Wood Sash Glazing Compound
- ASTM C 1184 (2000a) - Structural Silicone Sealants

Issue date of above references should be of the most current revision available.

The publications listed above form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

##### 1.2 SUBMITTALS

Submittals will be of all items necessary for adequate quality control. Submit in accordance with specification SUBMITTAL section.

##### 1.3 SHOP DRAWINGS

Shop drawings will indicate elevations of units, full size sections, fastenings, methods of installation and anchorage, method of glazing, locations of operating hardware, mullion details, method and material for weather-stripping, insect screen (if required), details, connection with other work and window schedules showing location of each window unit as necessary for the indicated work.

##### 1.4 PRODUCT DATA

###### *Installation*

Install per manufacturer's installation instructions for each type of component, hardware and weather-stripping, etc.



### *Qualifications*

Documentation showing qualifications of personnel proposed to perform the window repair, installation, fabrication and rehabilitation work, and a listing identifying prior installations completed by the contractor.

## 1.5 SAMPLES

### *Hardware*

Submit a representative sample of each type of hardware with identifying tags.

### *Moldings*

Submit a 12 inch long piece of each molding type for each window and casing with specified finish.

### *Weather-stripping*

Submit a 12-inch long sample of each type of weather-stripping with fasteners.

## 1.6 QUALIFICATIONS

The Contractor shall provide qualified workers trained and experienced in repairing, restoring, replicating, and replacing (as required) windows in historic buildings and shall submit documentation of 5 consecutive years of work of this type. A list of installations made shall also be provided identifying when, where and for whom the installations were made.

## 1.7 STORAGE

Materials shall be stored out of contact with the ground and under weather tight covering and in accordance with manufacturer's requirements. Coordinate storage and staging areas with the Architect and owner.

## PART 2 - PRODUCTS

Deteriorated historic windows should be repaired rather than replaced wherever possible. In the event replacement is necessary, the new window components should match the historic ones in design, color, size, configuration, reflective qualities, shadow lines, detail, and material. Only when it is not feasible to match the historic fabric should substitute window material be considered. This will be at the Architect's discretion.

## 2.1 MATERIALS

Existing materials shall be reused whenever possible in the repair and rehabilitation of historic wood windows. This includes all wood elements; hardware and glazing that are determined to be of historic significance. Replacement of window elements with new material shall be done only when originals are so deteriorated as to prohibit their useful function.

## 2.2 WOOD

Wood used to replace deteriorated window members shall be of the same species and grade as the original, unless otherwise noted. Finger-jointed stock may be used for interior casing and trim only where scheduled to be painted.

## 2.3 GLASS AND GLAZING

Existing intact original glass shall be reused. Any removed lights shall be reused in their original frames and positions. All existing glass shall be clean and any paint or surface coating that is not original will be removed. New replacement glass and glazing materials will be of a sheet glass type manufactured by a horizontal flat or vertical drawn process. New glass should be of a type not mechanically polished so that inherent natural surface waves are noticeable and match that of the existing glass. The replacement glass is to be installed so that any imperfections (waves) are in the same orientation as the existing panes. In general, any replacement will be of the same thickness, clarity, type and material.

## 2.4 HARDWARE

Existing original hardware shall be reused, when it is salvageable. Replacement hardware shall match original in design, material, and finish as approved by the Architect. All installation or re-installation will match the original installation and be in accordance with the manufacturer's recommendations.

## 2.5 FASTENERS

Fasteners shall be stainless steel, galvanized, or non-ferrous metal.

## 2.6 GLAZING COMPOUND

Glazing compound for single pane glass shall be oil-based, non-staining and non-bleeding, and shall pass the test requirements of ASTM C 741, and ASTM C 742. Any existing insulated glass units shall be reglazed with silicone sealant complying with ASTM C 1184 and shall be compatible with the unit seal on the glass unit. All glazing compound products are to be applied per manufacturer's recommendations. These products are to be installed to the thickness recommended and tooled to form a consistent, straight sight line to simulate the original appearance.

## 2.7 GLAZING POINTS

Install new glazing points that shall be stainless steel or galvanized steel.

## 2.8 EPOXY CONSOLIDANTS

### 2.8.1 Liquid Consolidant

Liquid wood consolidant shall consist of a two-part, low-viscosity liquid epoxy meeting criteria in Table A, and manufactured specifically for this type of repair.

### 2.8.2 Epoxy Paste

Epoxy paste shall consist of a two-part, thixotropic paste that meets the criteria of Table A, that is manufactured specifically for use in the construction industry for this type of repair.

TABLE A

	LIQUID CONSOLIDANT	EPOXY PASTE
Properties	Low-Viscosity Liquid	No-Slump, Thixotropic Paste
Toxicity	Low	Very Low
Toxicity Cured	Non-Toxic	Non-Toxic
Ratios	1:1 by Volume	1:1 by Volume
Pot Life @ Room Temp.	30 Min. minimum	50 Min. minimum
Hardening @ Room Temp.	1 hr. or longer	1 hr. or longer
Hardening @ 60 deg. C	16 min. or less	18 min. or less
Viscosity Poises @ 22 deg. C.	4.7 max.	Thixotropic paste
Solids	95% min.	98% min.
Tensile strength	26 Mpa 400 psi	16.2 Mpa 2500 psi
Elongation (%)	50	4

### PART 3 - EXECUTION

#### 3.1 GENERAL

The contractor shall repair wood windows and transoms as indicated, and shall return them to proper original operation, sound condition, and original appearance. At a minimum, all existing windows for this project shall receive work as described for Repair Class 1 (see paragraph 3.2.1 below). Additionally, some windows (see Construction Documents for Window Repair Schedule) shall receive work outlined under Repair Class 2 or 3. For these windows, work for the higher repair classes shall be completed prior to commencement of Repair Class 1 items.

If the building is to be occupied during construction, scheduling of the work will be required to accommodate the operational needs of the building occupants. This may require the work to be carried out in phases. All phasing will be coordinated at the preconstruction meeting and subsequent site and/or monthly meetings. All building contents will be protected with plastic sheeting to guard against contamination from restoration procedures.

#### 3.2 EVALUATION

An evaluation survey of the existing conditions of each wood window was made to estimate the extent of repairs necessary. When a window repair schedule is included as part of these documents it will determine the minimum repair necessary, otherwise the following guidelines will be followed by the *Contractor* to determine the condition of each window and which repair class (see below) is appropriate for each window. If a window has not been evaluated, the *Contractor* will use the following guidelines to determine the repair class and repair required.

- a) Window location – referenced to the building elevation drawings
- b) Condition of the paint – blistering, cracking, flaking, peeling, number of layers, etc.
- c) Condition of the frame and sill – operational, decayed, loose, missing?
- d) Condition of the interior and exterior trim – loose, missing, paint?
- e) Condition of the sash (including rails, stiles, and muntins) – structurally sound, decayed?
- f) Glazing problems – missing, detached, deteriorated?
- g) Window hardware and operating system – existing, operational, missing?
- h) The overall condition of the window – excellent, good, fair, poor?

Wood is to be tested by two different techniques. Decayed wood at the surface can be detected by jabbing an awl into a wetted wood surface at an angle and prying up a small section of the wood. Sound wood will separate in long fibrous splinters. Decayed wood will lift up in short irregular pieces. Decayed wood under the surface can be detected by pushing a sharp object into the wood perpendicular to the surface. Decayed wood will exist under the surface if the probe can be forced through an apparently sound skin deeply into the decayed wood.

### 3.2.1 REPAIR CLASSES:

REPAIR CLASS 1      Routine Maintenance – Operationally sound with some minor wood patching, reapplying glazing compound, repainting.

This repair class consists of the following: Interior and exterior paint removal, Removal, repair and repainting of the sashes, Re-glazing (where necessary) and applying new glazing compound (putty), Repair of the frame, Weatherstripping, Repainting, Repair of the operating system, Installation of hardware and Reassembly.

REPAIR CLASS 2      Stabilization – Partially operational with an additional degree of physical deterioration with partially decayed wood that requires repair before the routine maintenance described in Repair Class 1 can be performed.

This repair class consists of one or more of the following techniques for repairing partially decayed or weathered wood before performing the routine maintenance prescribed by Repair Class 1:

- A.      When wood is split, checked or shows signs of rot it will be repaired in the following manner: Dry the wood, Treat decayed areas with fungicide, waterproof with 2 two applications of boiled linseed oil (applications every 24 hours), fill cracks and holes with putty, caulk all joints, prime and paint the surface.
- B.      When sills or other surface areas exhibit surface weathering they will be repaired in the following manner: Build up the affected area using an epoxy paste or filler (in successive layers), sand, prime and paint.
- C.      When wood requires strengthening and stabilizing, it will be repaired in the following manner: The process of consolidation (using semi-rigid epoxies to saturate the porous, decayed wood, which then harden). The surface of the consolidated wood will then be filled with a semi-rigid epoxy patching compound, sanded, primed and painted. These epoxy patching compounds are to be used to repair missing sections, profiles, and decayed ends of members.

REPAIR CLASS 3      Splices and Parts Replacement – When parts of the frame or sash are so badly deteriorated that they cannot be stabilized, replacement of parts or splicing in new wood becomes necessary. These repairs take place before additional stabilization and routine maintenance are performed as described by Repair Classes 1 and 2.

This repair class consists of the following: Make necessary repairs or splicing in place whenever possible. When removal is necessary, the component requiring repair is to be removed and replaced with a matching piece. The last resort will be the total replacement of an element.

### 3.3 REPAIRS

#### 3.3.1 Example Window

An existing window of each type, to serve as an example of the quality of repairs to be provided, shall be prepared by the Contractor for inspection and approval by the Owner, the Architect, and by a representative of the Mississippi Department of Archives and History. Approved window(s) will serve as a standard of workmanship for the project.

#### 3.3.2 Sash Removal

The interior stops shall be removed first in a method so as to not scar the wood. Connecting hardware and operating mechanisms shall then be detached and the sash shall be removed from the frame. Removed sashes and frames shall be identified as to location to assure reinstallation in their original positions. Windows with counter-weight systems shall have the sash cords detached from the sides of the sash and their ends pinned with a nail or tied in a knot to prevent them from falling into the weight pocket; the lower sash can then be removed. Remove any other operating components and repair for reuse. The parting bead shall be removed so as to not scar the wood. Plastic covering and/or plywood shall be installed to cover the window opening during repairs (at the architects/owners discretion).

#### 3.3.3. Paint Removal

Remove all lead containing paint in compliance with all OSHA and EPA regulations. Due to the nature of existing finish materials on historic structures, it will be assumed that lead exists in painted surfaces, unless otherwise noted. All contact with these surfaces will be conducted in compliance with the most current OSHA and EPA regulations.

Specific OSHA regulations regarding lead for the construction industry may include, but are not limited to the following:

- Section 5(a)(1)-“*General Duty Clause*”; Section 5(a)(2)
- CONSTRUCTION INDUSTRY (29CFR 1926), -1926 Subpart E, *Occupational health and environmental controls*, Appendix A, *Substance data sheet for occupational exposure to lead*, Appendix B, *Employee standard summary*, Appendix C, *Medical surveillance guidelines*.
- PREAMBLES TO FINAL RULES, -*Lead Exposure in Construction* (1993)
- DIRECTIVES, -*Lead Exposure in Construction*; Interim Final Rule – *Inspection and Compliance Procedures*, -*National Emphasis Program: Lead, Lead Exposure in Construction*.

Specific U.S. EPA regulations regarding lead for the construction industry may include, but are not limited to the following:

- Hazard Standards for Lead in Paint, Dust, and Soil (304)*
- Lead-Based Paint Debris Disposal*

The Contractor will provide all required protection equipment for the laborers performing this work. The Contractor is responsible for taking all precautions to ensure none of these materials enter the building.

The Contractor is responsible for taking all precautions to protect the building site and exterior. The Contractor will retain full ownership of all lead waste and construction waste generated. All loose paint or paint bearing materials found in or around the building are to be assumed to be lead containing and will be packaged and disposed of properly. All debris generated during this process will be gathered and disposed of properly. The ground and any plants or shrubs in the area in which exterior paint removal is occurring will be covered with a waterproof sheeting weighted at all edges to prevent

lifting by wind. This covering will extend from the face of the building to a point at least eight feet away from the structure or as necessary. The covering will be sufficient to hold all debris and will be taped or otherwise attached to the structure. The covering will be placed in a manner that traps all debris and water, for example, elevate all edges, etc. All openings or tears in coverings or barriers will be repaired immediately. Coverings and barriers will be maintained as long as necessary for the completion of the work.

Areas on frame, sill, sash and muntins where paint or varnish has peeled, alligatored, blistered or crazed shall have paint removed to bare wood or first sound paint layer, using non-destructive means such as a chemical neutralized after stripping to a litmus pH of 5 to 8.5. Wood shall be allowed to dry to a moisture content of 8 to 12 percent before repainting. If heat methods are used for paint removal, glass shall be protected from sudden temperature change to avoid breakage. No methods will be used that degrade any window components.

#### 3.3.4 Wood Repair

Badly decayed areas (with more than 30 percent wood decayed) shall be removed from wood sash, sill, frame, and trim assemblies. Moderately decayed areas (less than 30 percent decayed), weathered, or gouged wood shall be patched (to match the original profiles) with approved patching compounds, and shall be sanded smooth. Intact sash rails and stiles that are loose shall be repaired with new dowels to make joints tight. All repair is to be in strict accordance with the manufacturer's instructions.

#### 3.3.5 Epoxy Wood Repair

Approved epoxy wood repair materials shall be applied in accordance with manufacturer's written instructions. Health and safety instructions shall be followed in accordance with the manufacturer's instructions. The source of cause of wood decay shall be identified and corrected prior to application of patching materials. Wet wood shall be completely dried to a moisture content of 8 to 12 percent to its full depth before patching. Wood that is to be patched shall be clean of dust, grease, and loose paint. Clean mixing equipment shall be used to avoid contamination. Mix and proportions shall be as directed by the manufacturer. Batched shall be only large enough to complete the specific job intended. Patching materials shall be completely cured before painting or reinstallation of patched pieces.

##### 3.3.5.1 Epoxy Liquid Wood Consolidant

Epoxy liquid wood consolidant shall be used to penetrate and impregnate deteriorated wood sections to reinforce wood fibers that have become softened or absorbent. All such applications are to be preformed in strict compliance to the manufacturer's instructions for preparation and application

##### 3.3.5.2 Epoxy Paste

Epoxy paste shall be used to fill areas where portions of wood are missing such as holes, cracks, gaps, gouges, and other voids. Areas to receive epoxy paste patching material shall be prepared and primed with compatible epoxy liquid wood consolidant or primer recommended by the manufacturer.

#### 3.3.6 Wood Replacement

Pieces decayed beyond repair shall be replaced with new pieces that match originals in all respects. Joinery shall match that of original. Muntins shall have coped mortise and tenon joints. Molded members shall have mitered or coped joints.

### 3.3.7 Hardware

Existing hardware, which is in good condition, shall be reused unless otherwise noted. Reused existing hardware shall be stripped of paint down to bare metal. New hardware shall be installed where original is missing, damaged, or unsuitable for new operation, per manufacturer's directions to provide a secure and smoothly operating window assembly.

### 3.3.8 Glazing

Lights to be reused shall be reinstalled in their original frames and positions. Rabbeted integral glazing recesses shall be brushed with boiled linseed oil prior to the application of bed glazing compound (unless other methods are recommended by the glazing component manufacturer. New glazing compound is to be applied at all panes as necessary to replace the missing, detached or deteriorated compound. Broken glass shall be replaced as specified in Glass and Glazing.

### 3.3.9 Operating System

Windows with counter-weight systems shall be repaired to original operating function. Original sash weights (and sash chains, if applicable) shall be reused wherever possible. Sash cords shall be replaced with new cotton-polypropylene cord rated for sash weight. When new weights are required, they shall match the originals in weight. Replacement weights shall be cast iron or square milled steel bar stock, or of a configuration necessary for proper operation. Sash cords (or chains) will be protected during priming and painting so that cords/chain remain paint free.

Operable transoms shall be reworked to be fully operable. Refurbish the existing hardware where it exists or install new hardware that matches the existing in operation and appearance. At a minimum, install new transom operating hardware similar to that that is existing (if it is able to be determined), new transom stop chain, and a new transom latch. Hardware shall be equal to that from Architecturals.net or Vandykes Restorers.

### 3.3.10 Weather-stripping

Weather-stripping of type approved for this application shall be installed on all operable windows. Weather-stripping shall consist of compression or interlocking weather strips designed for permanent sealing under bumper or wiper action. Weather-stripping shall be provided at the perimeter of each sash including meeting rails and shall be installed per manufacturer's instructions. Weather-stripping shall be completely concealed when sash is closed.

- Where two sashes meet: install a leaf seal similar to WS87 by Resource Conservation Technology. Cut a groove in the meeting rail (on the top of the bottom sash) using a slot cutting bit in a router. Insert the leaf seal to eliminate the gap between the sashes. If the sash lock catches on the seal, cut a half-round notch out of the seal for clearance.
- Where the sash meets the sill or head: install a tube seal similar to WS10 by Resource Conservation Technology. After routing a groove along the bottom rail, tap the seal into the groove. Move across the sash several inches at a time, do not stretch the seal. Be sure that the tube seal does not over-compress when the sash is closed. If necessary trim the sash and mount the seal in a dada cut in the rail. Refer to the manufacturer's recommendations for tolerances.
- For sash edges: Use the appropriate brush seal. Trim so that is not exposed.

## 3.4 WINDOW REPLACEMENT

Replacement of the components is always the least desirable option. This option should only be employed after consultation with the Architect and with the Architect's approval. Any and all replacement parts or components will match in the following regards:

- A. The pattern and size of the opening
- B. The proportions of the frame and sashes
- C. The configuration of the window panes
- D. The muntin profiles
- E. The type and finish of wood
- F. The characteristics of the glass
- G. The associated details and decorative elements

### 3.5 PAINTING PREPARATION

Areas where paint was removed or where existing paint shows crazing, wrinkling, and intercoat peeling shall be scraped, sanded, and shall have edges feathered. Paint shall be removed to bare wood or first sound paint layer. All parts shall be cleaned by brush using a bleach solution and/or trisodium phosphate (TSP) solution and let dry. Existing finish shall be deglossed. Open joints and cracks shall be filled with epoxy repair materials. Perimeter of fixed components shall be sealed (caulked).

### 3.6 PAINTING

Wood elements shall be primed and painted in accordance with PAINTS AND COATINGS SECTION

### 3.7 REASSEMBLY

After repairs are completed, the window shall be reassembled with all parts tight, true and functioning properly. Wood surfaces shall be free of blemishes.

### 3.8 ADJUSTMENTS

Final adjustment for proper operation of ventilating or operable unit shall be made after reassembly. Adjustments shall be made to operating sash or ventilators to assure balance, smooth operation and weather tight performance when locked closed.

### 3.9 CLEANING

Windows shall be cleaned on both exterior and interior.

If the restored building is occupied, the interior spaces will be professionally cleaned by experienced workers at the completion of the work in a particular area. All interior surfaces will be cleaned with cleaning materials recommended by the manufacturer of the material to be cleaned. Use all cleaning products in compliance with manufacturer's recommendations. Ensure that cleaning methods and materials do not remove finishes, mar surfaces, or remove protective coatings of surfaces being cleaned. Vacuum all horizontal surfaces and building contents with a HEPA vacuum to remove all dust, dirt, residual paint from sanding or scraping, etc. Leave all surfaces and building contents perfectly clean and in an unsoiled condition. See additional cleaning requirements in the Section 01710-Cleaning.

END OF SECTION 08 50 00



## SECTION 09 01 00

### PREPARATION OF HISTORIC WOOD AND METAL SURFACES FOR PAINTING

#### PART 1 GENERAL

In general, remove existing paint and otherwise prepare all existing surfaces that are scheduled to be painted. If the building is occupied, scheduling of the work will be required to accommodate the operational needs of the building occupants. This may require the work to be carried out in phases. All phasing will be coordinated at the preconstruction meeting and subsequent site and/or monthly meetings. All building contents will be protected with plastic sheeting to guard against contamination from restoration procedures.

Remove all lead containing paint in compliance with all OSHA and EPA regulations. Due to the nature of existing finish materials on historic structures, it will be assumed that lead exists in painted surfaces, unless otherwise noted. All contact with these surfaces will be conducted in compliance with the most current OSHA and EPA regulations.

Specific OSHA regulations regarding lead for the construction industry may include, but are not limited to the following:

- Section 5(a)(1)-“*General Duty Clause*”; Section 5(a)(2)
- CONSTRUCTION INDUSTRY (29CFR 1926), -1926 Subpart E, *Occupational health and environmental controls*, Appendix A, *Substance data sheet for occupational exposure to lead*, Appendix B, *Employee standard summary*, Appendix C, *Medical surveillance guidelines*.
- PREAMBLES TO FINAL RULES, -*Lead Exposure in Construction* (1993)
- DIRECTIVES, -Lead Exposure in Construction; Interim Final Rule – *Inspection and Compliance Procedures*, -*National Emphasis Program: Lead, Lead Exposure in Construction*.

Specific U.S. EPA regulations regarding lead for the construction industry may include, but are not limited to the following:

- Hazard Standards for Lead in Paint, Dust, and Soil (304)*
- Lead-Based Paint Debris Disposal*

The Contractor will provide all required protection equipment for the laborers performing this work. The Contractor is responsible for taking all precautions to ensure none of these materials enter the building or contaminate the site.

The Contractor is responsible for taking all precautions to protect the building site and exterior. The Contractor will retain full ownership of all lead waste and construction waste generated. All loose paint or paint bearing materials found in or around the building are to be assumed to be lead containing and will be packaged and disposed of properly. All debris generated during this process will be gathered and disposed of properly. The ground and any plants or shrubs in the area in which exterior paint removal is occurring will be covered with a waterproof sheeting weighted at all edges to prevent lifting by wind. This covering will extend from the face of the building to a point at least eight feet away from the structure or greater as necessary. The covering will be sufficient to hold all debris and will be taped or otherwise attached to the structure. The covering will be placed in a manner that traps all debris and water, for example, elevate all edges, etc. All openings or tears in coverings or barriers will be repaired immediately. Coverings and barriers will be maintained as long as necessary for the completion of the work.

## 1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1730	(1967; R 1993) Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting
ASTM D 1731	(1967; R 1993) Preparation of Hot-Dip Aluminum Surfaces for Painting
ASTM D 3274	(1995) Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
ASTM D 3359	(1995a) Measuring Adhesion by Tape Test
ASTM D 4214	(1997) Evaluating Degree of Chalking of Exterior Paint Films

### THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA Guide 5	(1990) Guide to Maintenance Painting Programs
SSPC SP 1	(1982) Solvent Cleaning
SSPC SP 2	(1995) Hand Tool Cleaning
SSPC SP 3	(1995) Power Tool Cleaning

## 1.02 WORK PLAN

The procedures proposed for the accomplishment of the work shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, and coordination with other work in progress. The work shall comply with all manufacturer's safety and health recommendations describing procedures for handling monitoring, and disposition of VOCs and other hazardous and toxic materials. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations. The Contractor shall test the materials designated by the Architect.

## 1.03 SUBMITTALS

The following shall be submitted in accordance with Division 01 SUBMITTAL PROCEDURES:

### SD-03 Product Data

**Materials;** The names, quantity represented, and intended use for proprietary brands of materials proposed to be substituted for the specified materials. Manufacturer's current printed product description, material safety data sheets (MSDS) and technical data sheets for each product. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times shall be provided for each product submitted.

**Qualifications ;** A statement certified by the Contractor attesting that the experience and qualifications of the workers (journeymen) comply with the specifications.

#### **SD-07 Certificates**

**Work Plan ;** Certificate stating that products proposed for use meet the VOC regulations of the local Air Pollution Control Districts and DEQ having jurisdiction over the geographical area in which the project is located.

### **1.04 PACKAGING, LABELING, AND STORING**

Paint removers, solvents, and other chemicals used for surface preparation shall be in sealed containers that legibly show the designated name, formula or specification number, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Such materials shall be furnished in containers not larger than 5 gallons; they shall be stored in accordance with the manufacturer's written directions; and as a minimum stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 40 and 95 degrees F.

### **1.05 ENVIRONMENTAL CONDITIONS**

Unless otherwise recommended by the product manufacturer, the ambient temperature shall be between 45 and 95 degrees F when applying paint removers, solvents, or other preparation materials.

### **1.06 SAFETY AND HEALTH**

Work shall comply with the manufacturer's, local DEQ, and local air pollution district recommendations for handling of all products (The most stringent regulation will apply). All material handling, application and storage will be conducted to minimize the potential negative impact of surface preparation operations on personnel and on others involved in and adjacent to the work zone.

#### **A. Worker Exposures**

Exposure of workers to chemical substances shall not exceed limits as established or recommended by manufacturer.

#### **B. Training**

Workers having access to an affected work area shall be informed of the contents of the applicable material data safety sheets (MSDS) and shall be informed of potential health and safety hazard and protective controls associated with materials used on the project. An affected work area is one which may receive dust, mists, and odors from the surface preparation operations. Workers involved in surface preparation and clean-up shall be trained in the safe handling and application, and the exposure limit, for each material which the worker will use in the project. Personnel having a need to use respirators and masks shall be instructed in the use and maintenance of such equipment.

#### **C. Coordination**

Work shall be coordinated to minimize exposure of building occupants, other Contractor personnel, and visitors to mists and odors from surface preparation and cleaning operations.

Proper notification will be required to allow the building occupants to vehicles and notify building occupants of times and areas to avoid

## 1.07 QUALIFICATIONS

The Contractor shall provide qualified workers trained and experienced in the preparation for painting of wood and metal surfaces in historic structures and shall submit documentation of 5 consecutive years of work of this type. A list of similar jobs shall be provided identifying when, where, and for whom the work was done. A current point-of-contact for identified references shall be provided.

## PART 2 PRODUCTS

### 2.01 PAINT REMOVERS

Chemical paint removers shall be a commercial item specifically manufactured for the type of paint to be removed.

### 2.02 EPOXY CONSOLIDANTS

#### A. Liquid Consolidant

Liquid wood consolidant shall consist of a 2-part, low-viscosity liquid epoxy that meets the criteria of Table 1.

#### B. Epoxy Paste

Epoxy paste shall consist of a 2-part, thixotropic paste that meets the criteria of Table 1.

TABLE 1

	LIQUID CONSOLIDANT	EPOXY PASTE
Properties	Low-Viscosity Liquid	No-Slump, Thixotropic Paste
Toxicity	Low	Very Low
Toxicity Cured	Non-Toxic	Non-Toxic
Ratios	1:1 by Volume	1:1 by Volume
Pot Life @ Room Temp.	30 minutes min.	50 minutes min.
Hardening @ Room Temp.	1 hr. or longer	1 hr. or longer
Hardening @ 140 deg. F	16 min. or less	18 min. or less
Viscosity Poises @ 72 deg. F	4.7 max.	Thixotropic paste
Solids	95 percent min.	98 percent min.

Tensile Strength	4000 psi	2500 psi
Elongation	50 percent	4 percent
Compressive Strength		
Failure	19000 psi	---
Yield	3500 psi	5500 psi

## PART 3 EXECUTION

### 3.01 GENERAL REQUIREMENTS

Methods used for preparation of historic wood and metal surfaces for painting shall be the gentlest possible to achieve the desired results. Historic substrate materials shall not be damaged or marred in the process of surface preparations. Samples of the existing paint finishes shall be collected and analyzed for the purpose of documentation or matching, if directed by Architect or Owner. Material and application requirements for paints are covered in Section 09900 PAINTING, GENERAL.

### 3.02 VENTILATION

Interior work zones having a volume of 10,000 cubic feet or less shall be ventilated at a minimum of 2 air exchanges per hour. Ventilation in larger work zones shall be maintained by means of mechanical exhaust. Solvent vapors shall be exhausted outdoors, away from air intakes and workers. Return air inlets in the work zone shall be temporarily sealed before start of work until the prepared surfaces have dried. Operators and personnel in the vicinity of paint removal processes involving chemicals or mechanical action (sanding or blasting) shall wear respirators.

### 3.03 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workers skilled in the trades involved shall reinstall removed items. Surfaces contaminated by preparation materials shall be restored to original condition.

### 3.04 CLEANING OF SURFACES

Surfaces to be painted shall be clean and free of grease, dirt, dust and other foreign matter before application of paint or surface treatments. After cleaning, surfaces shall exhibit a surface disfigurement rating of 7 or greater when evaluated in accordance with ASTM D 3274. Dirt and surface contaminants shall be cleaned by brush with solutions of water and detergent or trisodium phosphate, then rinsed clean with water and let dry. Surfaces on which mildew or other microbiological growth is present shall be cleaned with a detergent solution containing household bleach. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on newly prepared or newly painted surfaces.

### 3.05 EXISTING PAINT

Existing paint shall be tested for adhesion to substrate per ASTM D 3359, Test Method A and shall obtain a rating of 4 or better in order to be considered sound. Existing paint meeting this requirement may be considered a satisfactory base for repainting.

### 3.06 PAINT REMOVAL

Flaking, cracking, blistering, peeling or otherwise deteriorated paint shall be removed by scraping with hand scrapers. After scraping, removal of large areas of paint or paint on architectural details shall be accomplished using sanders, heat guns or heat plates, or chemical paint removers. Paint shall be removed to bare substrate or first sound paint layer. Open flame heat devices shall not be used. Mechanical paint removal shall not damage or mar the substrate material. The most gentle method that will achieve the desired result is to be utilized.

#### A. Chemical Paint Removers

When Allowed: Chemical paint removers shall be used in accordance with manufacturer's recommendations. If chemical strippers are used, substrate shall be neutralized after stripping to a pH of 5 to 8.5.

#### B. Lead Paint

In preparation of lead-based painted surfaces for repainting, procedures described/required by regulatory authority shall be followed.

### 3.07 SURFACE PREPARATION

After cleaning and removal of deteriorated paint, edges of remaining chipped paint shall be feather-edged and sanded smooth. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas. Slick surfaces shall be roughened. Rusty metal surfaces shall be cleaned per [SSPC SP 2](#). Chalk shall be removed so that when tested in accordance with [ASTM D 4214](#), the chalk resistance rating is no less than 8. New, proposed coatings shall be compatible with existing coatings. If existing surfaces are glossy, the gloss shall be reduced.

### 3.08 WOOD SURFACES

Wood surfaces shall be cleaned of foreign matter. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up before applying water-thinned paints. Small, dry seasoned knots shall be scraped, cleaned, and given a thin coat of commercial knot sealer before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or, if it is still soft, removed with mineral spirits or turpentine, and the resinous area shall be thinly coated with knot sealer.

#### A. Interior Wood Surfaces

Interior wood surfaces to receive stain shall be sanded. Oak and other open-grain wood to receive stain shall be given a coat of wood filler recommended by the finish manufacturer not less than 8 hours before the application of stain; excess filler shall be removed and the surface sanded smooth. Sanding of wood floors is specified in WOOD STRIP FLOORING section. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter, unless otherwise authorized.

#### B. Wood Repair

Badly decayed areas shall be removed and repaired. Areas and pieces decayed beyond repair shall be replaced with new pieces that match originals in all respects. Moderately decayed areas, weathered, or gouged wood shall be patched with approved patching

compounds, and shall be sanded smooth. The source or cause of wood decay shall be identified and corrected prior to application of patching materials. Wet wood shall be completely dried to a moisture content not exceeding 12 percent, as measured by a moisture meter, to its full depth before patching, unless otherwise authorized. Wood that is to be patched shall be clean of dust, grease, and loose paint.

#### 1. Epoxy Wood Repair

Epoxy wood repair materials shall be applied in accordance with manufacturer's written instructions. Health and safety instructions shall be followed in accordance with the manufacturer's instructions. Clean mixing equipment shall be used to avoid contamination. Mix and proportions shall be as directed by the manufacturer. Batches shall be only large enough to complete the specific job intended. Patching materials shall be completely cured before painting or reinstallation of patched pieces.

#### 2. Epoxy Consolidant and Epoxy Paste

Epoxy liquid wood consolidant shall be used: 1) to penetrate and impregnate deteriorated wood sections in order to reinforce wood fibers that have become softened or absorbent. 2) as a primer for areas that are to receive epoxy paste filler. Epoxy paste shall be used to fill areas where portions of wood are missing such as holes, cracks, gaps, gouges, and other voids.

### C. Exposed Ferrous Metals

Exposed ferrous metals such as nail heads on or in contact with wood surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

### D. Finishing Nails

Finishing nails shall be set, and all holes and surface imperfections shall be primed. After priming, holes and imperfections in finish surfaces shall be filled with putty or plastic wood filler, colored to match the finish coat if natural finish is required, allowed to dry, and sanded smooth. Putty or wood filler shall be compatible with subsequent coatings.

### E. Wood Preservative

Areas of bare wood in exterior locations prone to excessive moisture or standing water shall be treated with a commercial, fungicide, paintable water repellent/preservative. Water repellent/preservatives shall not be used on interior surfaces.

## 3.09 METAL SURFACES

Metal surfaces shall be cleaned of foreign matter. Programs for preparation of metal shall be per [SSPC PA Guide 5](#). Grease, oil, and other soluble contaminants shall be removed by solvent cleaning per [SSPC SP 1](#). Surfaces shall be free from soils and corrosion; e.g. grease, oil, solder flux, welding flux, weld spatter, sand, rust, scale, and other contaminants that might interfere with the application of the new finish. Cleaning methods shall be the gentlest possible to achieve the desired result. Metals which are soft, thin, or exhibit fine detail shall not be abrasively cleaned. Evidence of corrosion or contamination on a previously cleaned surface shall be cause for recleaning prior to painting.

### A. Ferrous Surfaces

Ferrous surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with hand tools according to [SSPC SP 2](#), power tools according to

SSPC SP 3 or by blast cleaning as allowed by Architect. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

## B. Nonferrous Metallic Surfaces

Galvanized, aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces shall be solvent-cleaned in accordance with SSPC SP 1.

### 1. Aluminum

Aluminum surfaces shall be treated per ASTM D 1730 or ASTM D 1731. Steel wool, steel brushes and uninhibited caustic etching solutions, such as sodium hydroxide, shall not be used on aluminum.

### 2. Zinc

Zinc surfaces including zinc-coated substrates, shall be cleaned prior to painting as follows: degrease, soak in a mild and inhibited alkaline cleaner, rinse with clean overflowing water, clean anodically in an acid (e.g. 0.25 to 0.75 percent sulfuric acid), and rinse with clean overflowing water.

## 3.10 TIMING

Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Unless otherwise directed, the first coat primer shall be applied within 48 hours of surface preparation.

## 3.11 SURFACES TO BE PREPARED FOR PAINTING

Surfaces shall be prepared as specified and as shown in the painting specification and as directed by the drawings.

## 3.12 CLEANING

Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Containers shall be removed from the site or destroyed in an approved manner. Preparation materials and other deposits on adjacent surfaces shall be removed and the entire job left clean and ready for painting.

If the restored building is occupied, the interior spaces will be professionally cleaned by experienced workers at the completion of the work in a particular area. All interior surfaces will be cleaned with cleaning materials recommended by the manufacturer of the material to be cleaned. Use all cleaning products in compliance with manufacturer's recommendations. Ensure that cleaning methods and materials do not remove finishes, mar surfaces, or remove protective coatings of surfaces being cleaned. Vacuum all horizontal surfaces and building contents with a HEPA vacuum to remove all dust, dirt, residual paint from sanding or scraping, etc. Leave all surfaces and building contents perfectly clean and in an unsoiled condition. See additional cleaning requirements in the Section 01710-Cleaning.

END OF SECTION



## SECTION 09 91 00

### PAINTING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Surface preparation and field application (non-factory applied) of paints and coatings.

##### 1.02 SYSTEM DESCRIPTION

- A. Finish Materials: Conform to applicable code for flame/smoke rating requirements.

##### 1.03 ENVIRONMENTAL REQUIREMENTS

- A. Store and apply materials in environmental conditions required by manufacturer's instructions.

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

- A. Manufacturers:
  - 1. ***Sherwin Williams – Promar 200, unless a specific product is recommended by the manufacturer of a particular product or stated otherwise in the schedule at the end of this section.***
  - 2. or Approved Equal
- B. Coatings: Ready mixed except field catalyzed coatings of good flow and brushing properties, capable of drying or curing free of streaks or sags formulated specifically for the required application.
- C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials required and/or recommended by manufacturer to achieve the finishes specified.
- D. Products: Some surfaces and materials may require a specialty (or a different line of paint). This depends on the material being coated and the variation in the line of paint products of the approved manufacturer.

##### 2.02 FINISHES

- A. Refer to schedule at end of section for surface finish schedule. Follow any additional recommendations for all products/materials being painted.
- B. See drawings and finish schedule for finishes required for specific assemblies, surfaces and areas.

#### PART 3 EXECUTION

##### 3.01 EXAMINATION AND PREPARATION

- A. Verify that substrate conditions are ready to receive work.

- B. Measure moisture content of porous surfaces using an electronic moisture meter. Do not apply finishes unless moisture content is less than 12 percent minimum; or, lower if recommended for a particular substrate or paint product being used.
- C. Correct defects and clean surfaces which affect work of this Section.
- D. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing. Clean and remove any paint that is on these items before re-installing.
- E. Gypsum Board Surfaces: Fill defects with latex compounds as recommended by the paint manufacturer for the particular application . Spot prime defects after repair.
- F. Interior Concrete Floor Surfaces Scheduled to Receive Paint Finish: Remove foreign matter. Remove oil, grease, dirt, dust, soap, wax , etc. with a solution of tri-sodium phosphate or as recommended by concrete floor paint manufacturer. Rinse well and allow to dry.
- G. Uncoated Ferrous Surfaces: Remove scale by wire brushing, sandblasting, clean by washing with solvent. Apply treatment of phosphoric acid solution. Apply primer after repairs before finish coat(s).
- H. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust, hand clean, clean surfaces with solvent. Apply primer to bare or damaged steel surfaces.
- I. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, sappy sections , etc. with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.
- J. Exterior Wood Items Scheduled to Receive Paint (including dormer siding, roof soffits, windows and trim, doors and trim, louvers, and standing and running trim, etc.): Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections, etc. with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Otherwise, prepare as recommended by primer manufacturer.
- K. Portland Cement Plaster (Stucco): Allow freshly applied stucco to cure for the number of days recommended by stucco paint (coating) manufacturer. Clean existing stucco surfaces thoroughly, removing all dust, dirt and loose mortar with wire brush. Treat any mildew or efflorescence per paint manufacturer's instructions. All surfaces must be free of oil and grease.
- L. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove foreign matter and debris. Remove all oil, grease, wax, etc. with a solution of tri-sodium phosphate , or a preparation product recommended by primer/paint manufacturer, rinse well and allow to dry.
- M. For all materials, surfaces objects: follow the manufacturer's recommendations for surface preparation for the material being painted taking into consideration the given (existing) conditions. Follow all preparation steps; verify that all conditions are as required. Make all necessary corrections as recommended, and use all recommended accessory materials in order to properly prepare the surfaces.

### 3.02 APPLICATION

- A. Apply products in accordance with manufacturer's instructions on surfaces prepared per manufacturer's instructions. Follow all manufacturers' environmental recommendations (temperature, humidity, etc.) Protect equipment, fixtures, machinery, adjacent finishes, etc. from overspray, splatter, and fall out. Clean all affected work as requested.
- B. Sand transparent finishes lightly between coats to achieve required finish.
- C. Where clear finishes are required, tint fillers to match wood.
- D. Where painted finishes are required on interior millwork, wainscot, moulding assemblies, and other interior wood details; all coats of primer and paint and these surfaces will be spray applied.
- E. When "dry fall" paints are approved to be used (typically to paint exposed structure and/or other areas to be masked or "blackened out") as with all coatings, the manufacturers recommendations are to be followed for preparation. Note that "dry fall" paint is particularly affected by temperature and humidity and the manufacturer's guidelines should be followed closely. It is the Contractor's responsibility to protect all finishes, fixtures, and equipment from the fall out from this paint. Clean up all dry fall as recommended so that it does not accumulate and affect any other materials or surfaces.

### 3.03 CLEANING

- A. As work proceeds, promptly remove finishes where spilled, splashed, or spattered.

### 3.04 SCHEDULE - EXTERIOR SURFACES

- A. Steel - Shop Primed:
  - 1. Touch-up with alkyd primer.
  - 2. Two coats of alkyd enamel, semi-gloss.
- B. Steel - Unprimed:
  - 1. One coat alkyd primer.
  - 2. Two coats alkyd enamel, semi-gloss.
- C. Wood:
  - 1. Seal any knots or traces of sap.
  - 2. Prime with one coat of approved oil-based (alkyd) primer.
  - 3. Finish with two coats of semi-gloss, exterior acrylic enamel.
- D. Concrete and Unit Masonry:
  - 1. First coat: "Loxon XP" waterproofing System, A24 Series
  - 2. Second coat: "Loxon XP" waterproofing System, A24 Series, brush- or roller-applied.
- E. Portland Cement Plaster (Stucco)
  - 1. Two coats UGL "Drylok" stucco paint.
- F. See finish schedule, other specification sections and drawings for additional information and specific information.

### 3.05 SCHEDULE - INTERIOR SURFACES

- A. Wood – Opaque (paint) finish:
  - 1. Filler coat after any required patching (open grained wood only).
  - 2. One coat latex primer.
  - 3. One coat latex.
- B. Wood - Transparent:
  - 1. Filler coat (for open grained wood only).
  - 2. Two coats of stain.
  - 3. One coat of sealer.
  - 4. Two coats of varnish, satin.
- C. Steel - Unprimed:
  - 1. One coat alkyd primer.
  - 2. Two coats alkyd enamel, semi-gloss.
- D. Steel - Primed:
  - 1. Touch-up with original primer.
  - 2. Two coats alkyd enamel, semi-gloss.
- E. Portland Cement Plaster (Stucco)
  - 1. Two coats UGL “Drylok” stucco paint.
- F. Concrete Floors:
  - 1. First coat: “Drylok” concrete floor paint, brush-applied; semi-gloss.
  - 2. Second coat: “Drylok” concrete floor paint, brush- or roller-applied; semi-gloss.
- G. Gypsum Board:
  - 1. 1 coat of latex primer.
  - 2. 2 coats of interior latex,  
(eggshell for typical application, semi-gloss for restrooms, janitor, wet areas, etc.)
- H. Concrete Masonry Units:
  - 1. 1 coat of interior masonry primer
  - 2. 2 coats of interior latex, typically semi gloss
- I. See finish schedule, other specification sections and drawings for additional information and specific instructions.
- J. Review of all wall surfaces will be from a proximity close to 39” from surface, holidays, streaks, drips, ghosting, debris in paint, dirt, scuffs, and over rolling to adjacent surfaces will not be allowed.

END OF SECTION 09 91 00

SECTION 32 92 00  
LAWNS AND GRASSES

PART 1 – GENERAL

1.1 SUMMARY

- A. This work shall consist of ground preparation and hydro-seeding to establish a permanent ground cover of grass on all areas where the natural vegetative cover has been removed by the construction activities and the covering of all seeded areas with an erosion control mat.
- B. Sub-grade Elevations: Excavation, filling and grading required to establish sub-grade elevations required by drawings are not specified in this section.

1.2 PROJECT CONDITIONS

- A. Proceed with and complete this work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.
- B. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required.

1.3 WARRANTY

- A. Warrant lawns through specified maintenance period, and until final Project acceptance.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Topsoil:
  - 1. Provide new topsoil which is fertile, friable, natural loam, surface soil, free of subsoil, clay lumps, brush, weeds and other litter and without roots, stumps, gravel, and other extraneous or toxic matter harmful to plant growth.
    - a. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site.
- B. Soil Amendments:
  - 1. Lime: Natural limestone containing not less than 85% of total carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100 mesh sieve. Lime used by farms in the vicinity is acceptable.
  - 2. Commercial Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:

- a. For lawns, provide fertilizer with equal percentages of nitrogen, phosphoric acid and potassium, and which will provide not less than 1 3/4 lbs. of actual nitrogen per 1000 sq. ft. of lawn area. Provide nitrogen in a form that will be available to lawn during initial period of growth.

C. Grass Materials:

1. Grass Seed:

- a. Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Provide seed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.

- b. "Seeding Schedule" is attached at end of this section.

2. Sod: Provide strongly rooted sod, not less than 2 years old and free of weeds and undesirable native grasses. Provide only sod capable of growth and development when planted (viable, not dormant). Provide sod composed principally of either of the following:

- a. Bermuda grass (*Cynodon dactylon*).
- b. Centipedegrass (*Eremochloa ophiuroides*).

D. Tackifier:

1. Tackifier used in the hydro-seeding process shall be a liquid concentrate diluted with water, forming a transparent three-dimensional film-like crust permeable to water and air, and containing no agents toxic to seed germination. TERRR-MULCH TACKING AGENT IIII or an approved equivalent shall be used.

E. Erosion Control Mat:

1. Erosion Control Mat, Type A, shall be excelsior blanket with biodegradable net, as specified in Section 715.09.02 of MDOT Specifications, latest edition.

F. Mulch:

1. Straw mulch shall be clean out or wheat straw, well seasoned before bailing, free from manure, seed bearing stalks, or roots of prohibited or noxious weeds.
2. Mulch shall be wood or paper cellulose fiber containing no germination inhibiting or growth inhibiting agents. Characteristics shall be as follows:
  - a. Moisture Content 10% (☐ 2%)
  - b. Organic Matter 99.4% (☐ 0.2%)
  - c. Ash 0.6% (☐ 0.2%)
  - d. pH 4.8 (☐ 0.5)
  - e. Water Holding Capacity 1050 grams water / 100 grams of fiber

## PART 3 – EXECUTION

### 3.1 PREPARATION

#### A. Preparation for planting Lawns:

1. Loosen subgrade of lawn areas to a minimum depth of 4". Remove stones over 1 1/2" in any dimension and sticks, roots, rubbish and other extraneous matter.
2. Spread topsoil to minimum depth of 4 inches to meet lines, grades and elevations shown, after light rolling and natural settlement. Place approximately one half of total amount of topsoil required. Work into top of loosened sub-grade to create a transition layer and then place remainder of topsoil.
3. Apply lime immediately after application of topsoil, even though seeding may not be done until several months later. Test soil in four representative locations and apply lime as necessary to provide a pH of 6.3 to 6.5. Spread evenly and incorporate in the top 2 to 3 inches of soil.
4. Spread fertilizer not more than two weeks in advance of seeding. Incorporate into the top 2 or 3 inches of soil.
5. Grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll and rake and remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.
6. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.
7. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

### 3.2 PLANTING

#### A. Plant Establishment by Hydro-Seeding:

1. A mixture of seed, fertilizer, mulch, and tackifier in a water slurry shall be applied using hydraulic mulching equipment in the following minimum quantities:

Fertilizer	500 lbs./acre
Mulch	1200 lbs./acre
Seed	(as specified in this section)
Tackifier	30 lbs./acre (60 lbs./acre in ditches)

2. Contractor shall protect buildings, paving, plantings, and all non-seeded areas from tackifier overspray.

### 3.3 MAINTENANCE

- A. Begin maintenance immediately after planting.
- B. Maintain lawns for period required to establish an acceptable lawn, by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

### 3.4 CLEANING

- A. During landscape work, keep pavements clean and work area in an orderly condition.

### 3.5 PROTECTION

- A. Protect landscape work and materials from damage due to these operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed by Architect.

### 3.6 INSPECTION AND ACCEPTANCE

- A. When work is completed, including maintenance, Architect will, upon request, make an inspection to determine acceptability.
- B. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Architect and found to be acceptable.

### 3.7 SEEDING SCHEDULE

DATE	MIN. % PURE LIVE SEED REQUIRED	POUNDS PURE LIVE SEED PER ACRE	
-----			15Mar-
15 Sept	Common Bermuda grass (Cynodon Dactylon) hulled	85%	44#
16 Sept-14 Mar	Common Bermuda grass (Cynodon Dactylon) unhulled	85%	44#
	and Ryegrass Lolium Multiflorum	97%	76#

END OF SECTION

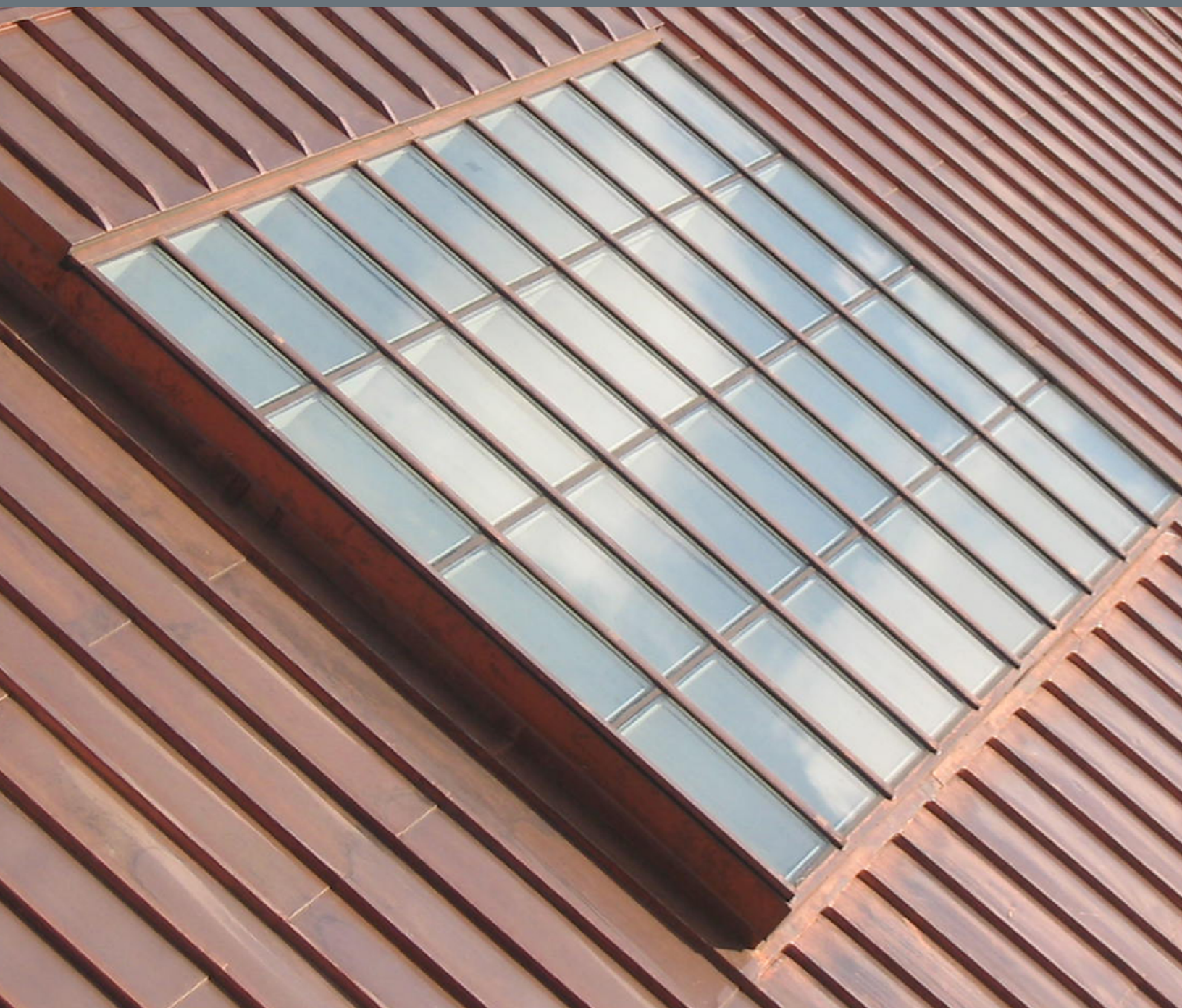




Copper Development  
Association Inc.  
Copper Alliance

# Copper In Architecture

A comprehensive compilation of designs, details and specifications





# CONTENTS

<b>INTRODUCTION</b>	<b>6</b>
<b>TECHNICAL</b>	
<b>1. FUNDAMENTALS</b>	<b>10</b>
1.1. Types of Copper and Properties	10
1.2. Dimensions of Copper	12
1.3. Architectural Considerations	13
1.4. Structural Considerations	17
1.5. Radio Frequency Shielding	18
1.6. Lightning Protection	18
1.7. Cost Effectiveness	19
1.8. Recyclability	20
<b>2. COPPER ALLOYS</b>	<b>21</b>
2.1. Introduction	21
2.2. Forming	23
2.3. Joining	25
<b>3. FINISHES</b>	<b>27</b>
3.1. Mechanical Finishes	27
3.2. Chemical Finishes	30
3.3. Protective Coatings	32
3.4. Laminated Finishes	34
3.5. Standard Finish Designations	35
3.6. Copper Alloys Color Chart	37
3.7. Finishes Tables	38
<b>4. REHABILITATION OF COPPER</b>	<b>41</b>
Maintenance	41
<b>DESIGNS</b>	
<b>5. FEATURED PROJECTS</b>	<b>43</b>
<b>ARCHITECTURAL DETAILS</b>	
AutoCAD Details	45
<b>6. GENERAL DESIGN ISSUES</b>	<b>46</b>
<b>7. BASIC DETAILS</b>	<b>48</b>
Introduction	48
Attachments	48
7.1. Attachments	49
7.2. Joints and Seams	51
Rigid Seams	51
Loose Seams	52
Expansion Seams	53
Corner Seams & Edges	54
7.3. Additional Loose Lock Seams	55

<b>8. ROOFING SYSTEMS</b>	<b>57</b>
Introduction	57
Typical Requirements	57
8.1. Special Roofing Design and Installation Considerations	58
8.2. Standing Seam Roofing	61
8.3. Batten Seam Roofing	66
8.4. Chevron Roofing	70
8.5. Flat Seam Roofing	72
8.6. Horizontal Seam Roofing	75
8.7. Mansard Roofing	79
8.8. Long Pan Systems	82
<b>9. FLASHINGS AND COPINGS</b>	<b>88</b>
Introduction	88
General Requirements	89
9.1. Through-Wall Flashing	90
9.2. Counterflashing	95
9.3. Coping Covers	99
9.4. Ridges and Hips	104
9.5. Valleys	106
9.6. Changes in Roof Slopes	108
9.7. Gravel Stops and Fascias	110
9.8. Stepped and Chimney Flashings	114
9.9. Roof Penetrations	116
9.10. Dormers	118
9.11. Eave Snow Flashing	120
9.12. Eave Conditions	122
9.13. Roof Area Divider	127
<b>10. GUTTERS AND DOWNSPOUTS</b>	<b>128</b>
10.1. Hung Gutters and Downspouts Basics	137
10.2. Hung Gutters	139
10.3. Built-in Gutter Linings	144
10.4. Water Diverters	149
10.5. Scuppers	151
10.6. Roof Sumps and Drains	154
10.7. Downspouts	155
10.8. Downspout Hangers	157
<b>11. BUILDING EXPANSION JOINTS</b>	<b>158</b>
11.1. Roof Conditions	158
11.2. Roof Edges	163
11.3. Floor Conditions	166
11.4. Wall Conditions	167

<b>12. WALL CLADDING</b>	<b>169</b>
12.1. Profiled Panels	170
12.2. Horizontal Siding	172
12.3. Beveled Systems	174
12.4. Flat Siding	176
12.5. Structural Systems	178
12.6. Diagonal Flat Lock Systems	180
12.7. Horizontal Flat Lock Systems	181
12.8. Copper Clad Honeycomb Systems	183
12.9. Copper Screen Panels	185
12.10. Curtain Wall Systems	187

<b>13. DOMES, SPIRES AND VAULTS</b>	<b>189</b>
13.1. Circular Dome with Diagonal Flat Seam System	190
13.2. Circular Dome with Standing Seam System	193
13.3. Circular Dome with Flat Seam System	196
13.4. Standing Seam Roof on Conical Spire	198
13.5. Flat Seam Roofing on Octagonal Spire	201
13.6. Arched Barrel Vault with Standing Seam	203
13.7. Barrel Vault With Flat Seam	206
13.8. Steps for Dome Panel Layout	209

## SPECIFICATIONS AND TESTS

<b>14. ARCHITECTURAL SPECIFICATIONS</b>	<b>214</b>
14.1. Antimicrobial Copper	215
14.2. Copper Wall Cladding	230
14.3. Copper Roofing	242
14.4. Manufactured Copper Roofing Specialties	255
14.5. Copper Flashing and Trim	263
14.6. Copper Gutters and Downspouts	273
14.7. Copper Expansion Joint Cover Assemblies	281

<b>15. STRUCTURAL TEST REPORTS</b>	<b>289</b>
15.1. Standing Seam Roof Panel Test	290
15.2. Batten Seam Roof Panel Test	292
15.3. Uplift Resistance of Roof Assemblies Test-Standing Seam	294
15.4. Uplift Resistance of Roof Assemblies Test-Flat Locked Seam	296

## GLOSSARY, INDEX AND REFERENCES

<b>16. GLOSSARY</b>	<b>300</b>
<b>17. INDEX</b>	<b>305</b>
<b>18. REFERENCE SOURCES</b>	<b>308</b>



## INTRODUCTION

*Copper in Architecture - Design Handbook* is a comprehensive resource presenting as much information about copper's properties, existing technology and application to the educational design and construction field as presently exists. The handbook is part of a multi-faceted program geared to the student, architect or contractor who is involved in the design or installation of copper, brass or bronze as an architectural element.



CDA and CCBDA maintain extensive publications, catalogs and libraries available to assist architects, engineers, contractors, builders and all others who are involved in the selection and use of copper, brass and bronze products. CDA's Technical Library and CCBDA's Library provide up-to-date access to the world's technical literature on copper and its alloys. These are fundamental resources for the Associations' on-going research programs and advisory services.

Finally, the Associations administer and on-going architectural program for designers, specifiers and installers seeking aid in detailing or installing copper architectural products. This program is available to all segments of the industry via document review sessions, seminars or individualized technical sessions. This service has proven to be invaluable in ensuring good design practices leading to trouble-free installations of architectural copper and copper alloys products.

AutoCAD is a registered trademark symbol of Autodesk, Inc.

NOTICE: This Handbook has been prepared for the use of architects and other design and construction professionals. It has been compiled from information supplied by testing, research, manufacturing, standards, and consulting organizations that Copper Development Association Inc. believes to be competent sources for such data. However, recognizing that each system must be designed and installed to meet the particular circumstances, CDA assumes no responsibility or liability of any kind in connection with this handbook or its use by any person or organization, and makes no representations or warranties of any kind hereby.

Published 2016 by Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016