

**VA MEDICAL CENTER  
CORRECT FAÇADE DEFICIENCIES**

**SPECIFICATIONS**

**PROJECT #558-10-111FCA  
RGG #11-45**

**FINAL CONSTRUCTION DOCUMENTS**

**VA MEDICAL CENTER  
DURHAM, NORTH CAROLINA**

February 15, 2012

**RGG Architects, PLLC**  
*Architecture & Planning*

**Sutton-Kennerly & Associates, Inc.**  
*Mechanical, Plumbing & Electrical*



VA Medical Center  
Correct Façade Deficiencies  
Project #558-10-111FCA  
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Final  
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**SECTION 01 00 00**  
**GENERAL REQUIREMENTS**

**1.1 GENERAL INTENTION**

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing materials, and furnish labor and materials and perform work for the Correct Façade Deficiencies project as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the Medical Center Engineering Officer.
- C. Offices of RGG Architects, PLLC, as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- D. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.
- E. Prior to commencing work, general contractor shall provide proof that a OSHA certified "competent person" (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the work site whenever the general or subcontractors are present.
- F. Training:
  - 1. All employees of general contractor and subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by VA CP with input from the ICRA team.
  - 2. Submit training records of all such employees for approval before the start of work.

**1.2 STATEMENT OF BID ITEM(S)**

- A. Item I, General Construction:  
Work includes repairs to exterior façade on Building 1 and Wings A, B, C, D and E. Repairs include but are not limited to reworking, replacing copings, repair of cracked brick and joints, installation of brick ties, repointing of brick joints, replacing sealants, exposing and repairing embedded steel angles and supports, replacing expansion joints, cleaning and painting steel mechanical stands, and application of masonry sealers at designated locations.
- B. Base Bid Unit Quantities:  
In addition to work shown on drawings, contractor shall include the following unit quantities in base bid:
  - 1. Replace cracked or broken brick .....250 EA
  - 2. Repoint deteriorated mortar joints.....1750 SF
  - 3. Rebuild large areas of masonry, including flashing.....300 SF
  - 4. Replace deteriorated shelf angle .....75 LF
  - 5. Crack repairs in stone, rout and seal.....750 LF
  - 6. Concrete patching, up to 2" deep repair.....50 SF
  - 7. Install mechanical retro-fit masonry wall ties.....50 EA
  - 8. Replace deteriorated roofing.....50 SF
  - 9. Limestone patching, up to 2" deep repair.....25 SF
  - 10. Remove abandoned lintels at elevator tower.....35 LF

- 11. Perform three course brick flashing repairs.....250 LF
- 12. Replace exterior glazing gaskets in aluminum window  
frame. Remove and replace glass as necessary... ..6 EA

C. Alternate Bid Unit Quantities for F Wing:

In addition to work shown on drawings, contractor shall include the following unit quantities in the Alternate Bid. If the Alternate is selected, the following quantities shall be added to the Base Bid quantities:

- 1. Replace cracked or broken brick .....50 EA
- 2. Repoint deteriorated mortar joints.....75 SF
- 3. Rebuild large areas of masonry, including flashing.....50 SF
- 4. Replace deteriorated shelf angle .....0 LF
- 5. Crack repairs in stone, rout and seal.....750 LF
- 6. Concrete patching, up to 2" deep repair.....250 SF
- 7. Install mechanical retro-fit masonry wall ties.....50 EA
- 8. Replace deteriorated roofing.....0 SF
- 9. Limestone patching, up to 2" deep repair.....0 SF
- 10. Remove abandoned lintels at elevator tower.....0 LF
- 11. Perform three course brick flashing repairs.....250 LF
- 12. EIFS Repairs.....50 SF

D. Unit Pricing:

Provide unit pricing for the following items. Work may be added or deducted from base bid and selected alternates per unit pricing.

- 1. Replace cracked or broken brick .....\$\_\_\_\_\_ EA
- 2. Repoint deteriorated mortar joints.....\$\_\_\_\_\_ SF
- 3. Rebuild large areas of masonry, including flashing....\$\_\_\_\_\_ SF
- 4. Replace deteriorated shelf angle .....\$\_\_\_\_\_ LF
- 5. Crack repairs in stone, rout and seal.....\$\_\_\_\_\_ LF
- 6. Concrete patching, up to 2" deep repair.....\$\_\_\_\_\_ SF
- 7. Install mechanical retro-fit masonry wall ties.....\$\_\_\_\_\_ EA
- 8. Replace deteriorated roofing.....\$\_\_\_\_\_ SF
- 9. Limestone patching, up to 2" deep repair.....\$\_\_\_\_\_ SF
- 10. Remove abandoned lintels at elevator tower.....\$\_\_\_\_\_ LF
- 11. Perform three course brick flashing repairs.....\$\_\_\_\_\_ LF
- 12. EIFS Repairs.....\$\_\_\_\_\_ SF
- 13. Replace exterior glazing gaskets in aluminum window  
frame. Remove and replace glass as necessary .....\$\_\_\_\_\_ EA
- 14. Unit Price E-1: Lightning System Repair, per each  
existing air terminal location provide the  
following: Remove existing air terminal from  
masonry coping to allow coping repair. Provide new  
air terminal and attachment bracket, minimum 10  
inches from top of coping to top of air terminal.  
Attach air terminal to repaired coping. Provide  
vertical adjustment in cable from air terminal to  
main horizontal cables at extended parapet  
locations. Attachment location and method to  
coping shall be as agreed upon by structural  
engineer. All work and materials shall be per UL  
96A .....\$\_\_\_\_\_ EA
- 15. Unit Price E-2: Lightning System Repair, provide  
unit price for removal of existing cable in 25 foot  
increment to allow repair of coping and air

terminal relocation. Reinstall same cable at adjusted elevation to new air terminals as identified in unit price E-1. Fasten cable to repaired coping. Attach cable ends to existing cable that remains. Attachment location and method to coping shall be as agreed upon by structural engineer. All work and materials shall be per UL 96A .....\$\_\_\_\_\_ EA

**1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR**

- A. AFTER AWARD OF CONTRACT, the Contractor can download PDF files of the contract drawings and specifications for his use and distribution to Subcontractors.

**1.4 CONSTRUCTION SECURITY REQUIREMENTS**

- A. Security Plan:
  - 1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
  - 2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.
- B. Security Procedures:
  - 1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
  - 2. For working outside the "regular hours" as defined in the contract, The General Contractor shall give 3 day's notice to the Contracting Officer so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
  - 3. No photography of VA premises is allowed without written permission of the Contracting Officer.
  - 4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.
- C. Key Control:
  - 1. The General Contractor shall provide duplicate keys and lock combinations to the Chief Engineer for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.
  - 2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation. See Section 08 71 00, DOOR HARDWARE and coordinate.
- D. Document Control:
  - 1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
  - 2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This

information shall be shared only with those with a specific need to accomplish the project.

3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
  - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
  - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

E. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. Separate permits shall be issued for General Contractor and its employees for parking in off-site designated areas only.

**1.5 ROOF AND VERTICLE WORKSAFETY**

Contractor is responsible for providing safe working conditions at all times. Work performed on roof and vertical elevations of building shall comply with OSHA regulations and VA Safety Office.

**1.6 FIRE SAFETY**

- A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.
  1. American Society for Testing and Materials (ASTM):
    - E84-2009.....Surface Burning Characteristics of Building Materials
  2. National Fire Protection Association (NFPA):
    - 10-2010.....Standard for Portable Fire Extinguishers
    - 30-2008.....Flammable and Combustible Liquids Code
    - 51B-2009.....Standard for Fire Prevention During Welding, Cutting and Other Hot Work
    - 70-2011.....National Electrical Code
    - 241-2009.....Standard for Safeguarding Construction, Alteration, and Demolition Operations
  3. Occupational Safety and Health Administration (OSHA):
    - 29 CFR 1926.....Safety and Health Regulations for Construction
- B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic



status reports, and submit to Chief Engineer and Facility Safety Officer for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the general contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, etc. Documentation shall be provided to the Chief Engineer that individuals have undergone contractor's safety briefing.

- C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- E. Temporary Construction Partitions:
  - 1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas and the areas that are described in phasing requirements and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C,  $\frac{3}{4}$  hour fire/smoke rated doors with self-closing devices.
  - 2. Install two-hour fire-rated temporary construction partitions as shown on drawings to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.
  - 3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.
- F. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- G. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Chief Engineer and facility Safety Officer.
- H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Chief Engineer and facility Safety Officer.
- I. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- J. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- K. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers.
- L. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately

under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with Chief Engineer and facility Safety Officer. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the Chief Engineer.

- M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Chief Engineer and facility Safety Officer.
- N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Chief Engineer. Obtain permits from facility Safety Officer at least 36 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Chief Engineer and facility Safety Officer.
- P. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.
- Q. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- R. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.
- S. If required, submit documentation to the Chief Engineer that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

#### **1.7 OPERATIONS AND STORAGE AREAS**

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or

- sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.
- D. Working space and space available for storing materials shall be as determined by the Chief Engineer.
  - E. Workmen are subject to rules of Medical Center applicable to their conduct.
  - F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by Chief Engineer where required by limited working space.
    - 1. Do not store materials and equipment in other than assigned areas.
    - 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.
    - 3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
  - G. Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of fire protection systems or communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Chief Engineer. All such actions shall be coordinated with the Utility Company involved:
    - 1. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
  - H. Phasing: To insure such executions, Contractor shall furnish the Chief Engineer with a schedule of approximate phasing dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. In addition, Contractor shall notify the Chief Engineer two weeks in advance of the proposed date of starting work in each specific area of site, building or portion thereof. Arrange such phasing dates to insure accomplishment of this work in successive phases mutually agreeable to Medical Center Director, Chief Engineer and Contractor.
  - I. Building will be occupied during performance of work but immediate areas of alterations will be vacated.
 

Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment.

- Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.
- J. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Chief Engineer.
1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of Chief Engineer. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, for additional requirements.
  2. Contractor shall submit a request to interrupt any such services to Chief Engineer, in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
  3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
  4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the Chief Engineer.
  5. In case of a contract construction emergency, service will be interrupted on approval of Chief Engineer. Such approval will be confirmed in writing as soon as practical.
  6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
- K. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.
- L. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles.

2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the Chief Engineer.
- M. Coordinate the work for this contract with other construction operations as directed by Chief Engineer. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

#### 1.8 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the Chief Engineer areas of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both, to the Contracting Officer. This report shall list by rooms and spaces:
  1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of building.
  2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
  3. Shall note any discrepancies between drawings and existing conditions at site.
  4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and Chief Engineer.
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of Chief Engineer, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and Chief Engineer together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
  1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.
- D. Protection: Provide the following protective measures:
  1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
  2. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
  3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately

protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

#### **1.9 INFECTION PREVENTION MEASURES**

- A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. ICRA Group may monitor dust in the vicinity of the construction work and require the Contractor to take corrective action immediately if the safe levels are exceeded.
- B. Establish and maintain a dust control program as part of the contractor's infection preventive measures in accordance with the guidelines provided by ICRA Group. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to Chief Engineer for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
  - 1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- C. Medical center Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality. In addition:
  - 1. The RE and VAMC Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in the patient-care rooms are appropriate for their settings. The requirement for negative air pressure in the construction zone shall depend on the location and type of activity. Upon notification, the contractor shall implement corrective measures to restore proper pressure differentials as needed.
  - 2. In case of any problem, the medical center, along with assistance from the contractor, shall conduct an environmental assessment to find and eliminate the source.
- D. In general, following preventive measures shall be adopted during construction to keep down dust and prevent mold.
  - 1. Dampen debris to keep down dust and provide temporary construction partitions in existing structures where directed by Chief Engineer. Blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.
  - 2. Do not perform dust producing tasks within occupied areas without the approval of the Chief Engineer. For construction in any areas that will remain jointly occupied by the medical Center and Contractor's workers, the Contractor shall:
    - a. Provide dust proof one-hour fire-rated temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. Barriers shall be sealed and made presentable on hospital occupied side. Install a self-closing rated door in a metal frame, commensurate with the partition, to allow worker access. Maintain negative air at all times. A fire retardant polystyrene, 6-mil thick or greater plastic barrier meeting local fire codes may be used where dust control is the only hazard, and

an agreement is reached with the Chief Engineer and Medical Center.

- b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.
  - c. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm (24" x 36"), shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
  - d. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as they are created. Transport these outside the construction area in containers with tightly fitting lids.
  - e. The contractor shall not haul debris through patient-care areas without prior approval of the Chief Engineer and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
  - f. Using a HEPA vacuum, clean inside the barrier and vacuum ceiling tile prior to replacement. Any ceiling access panels opened for investigation beyond sealed areas shall be sealed immediately when unattended.
  - g. There shall be no standing water during construction. This includes water inequipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
  - h. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.
- E. Final Cleanup:
- 1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
  - 2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
  - 3. All new air ducts shall be cleaned prior to final inspection.

#### **1.10 DISPOSAL AND RETENTION**

- A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:
1. Reserved items which are to remain property of the Government are identified by attached tags or noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by Chief Engineer.
  2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.
  3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.

#### **1.11 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS**

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.
- C. Refer to FAR clause 52.236-7, "Permits and Responsibilities," which is included in General Conditions. A National Pollutant Discharge Elimination System (NPDES) permit is required for this project. The Contractor is considered an "operator" under the permit and has extensive responsibility for compliance with permit requirements. VA will make the permit application available at the (appropriate medical center) office. The apparent low bidder, contractor and affected subcontractors shall furnish all information and certifications that are required to comply with the permit process and permit requirements. Many of the permit requirements will be satisfied by completing construction as shown and specified. Some requirements involve the Contractor's method of operations and operations planning and the Contractor is



responsible for employing best management practices. The affected activities often include, but are not limited to the following:

- Designating areas for equipment maintenance and repair;
- Providing waste receptacles at convenient locations and provide regular collection of wastes;
- Locating equipment wash down areas on site, and provide appropriate control of wash-waters;
- Providing protected storage areas for chemicals, paints, solvents, fertilizers, and other potentially toxic materials; and
- Providing adequately maintained sanitary facilities.

#### **1.12 RESTORATION**

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the Chief Engineer. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the Chief Engineer before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are indicated on drawings and which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

#### **1.13 LAYOUT OF WORK**

- A. The Contractor shall lay out the work from Government established base lines and bench marks, indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

#### **1.14 AS-BUILT DRAWINGS**

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the Chief Engineer's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the Chief Engineer within 15 calendar days after each completed phase and after the acceptance of the project by the Chief Engineer.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

#### **1.15 USE OF ROADWAYS**

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the Chief Engineer, such temporary roads which are necessary in the performance of contract work. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.
- B. When new permanent roads are to be a part of this contract, Contractor may construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.

#### **1.16 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT**

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to compliance with the following provisions:
  - 1. Permission to use each unit or system must be given by Chief Engineer. If the equipment is not installed and maintained in accordance with the following provisions, the Chief Engineer will withdraw permission for use of the equipment.
  - 2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
  - 3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
  - 4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
  - 5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.
  - 6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned,

- maintained and inspected prior to acceptance by the Government. Boilers, pumps, feedwater heaters and auxiliary equipment must be operated as a complete system and be fully maintained by operating personnel. Boiler water must be given complete and continuous chemical treatment.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
  - C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.

#### **1.17 TEMPORARY USE OF EXISTING ELEVATORS**

- A. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:
  - 1. Contractor makes all arrangements with the Chief Engineer for use of elevators. The Chief Engineer will ascertain that elevators are in proper condition and determine hours of use.
  - 2. Contractor covers and provides maximum protection of following elevator components:
    - a. Entrance jambs, heads soffits and threshold plates.
    - b. Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
    - c. Finish flooring.
  - 3. Government will accept hoisting ropes of elevator and rope of each speed governor if they are worn under normal operation. However, if these ropes are damaged by action of foreign matter such as sand, lime, grit, stones, etc., during temporary use, they shall be removed and replaced by new hoisting ropes.
  - 4. If brake lining of elevators are excessively worn or damaged during temporary use, they shall be removed and replaced by new brake lining.
  - 5. All parts of main controller, starter, relay panel, selector, etc., worn or damaged during temporary use shall be removed and replaced with new parts, if recommended by elevator inspector after elevator is released by Contractor.
  - 6. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer.

#### **1.18 TEMPORARY TOILETS**

- A. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workmen. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

#### **1.19 AVAILABILITY AND USE OF UTILITY SERVICES**

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract.
- B. Contractor shall install meters at Contractor's expense and furnish the Medical Center a monthly record of the Contractor's usage of electricity as hereinafter specified.

- C. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:
  - 1. Obtain heat by connecting to Medical Center heating distribution system.
    - a. Steam is available at no cost to Contractor.
- D. Electricity (for Construction and Testing): Furnish all temporary electric services.
  - 1. Obtain electricity by connecting to the Medical Center electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices providing temporary heat. Electricity for all other uses is available at no cost to the Contractor.
- E. Water (for Construction and Testing): Furnish temporary water service.
  - 1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection. Water is available at no cost to the Contractor.
  - 2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes will be cause for revocation (at Chief Engineer's discretion) of use of water from Medical Center's system.
- F. Steam: Furnish steam system for testing required in various sections of specifications.
  - 1. Obtain steam for testing by connecting to the Medical Center steam distribution system. Steam is available at no cost to the Contractor.
  - 2. Maintain connections, pipe, fittings and fixtures and conserve steam-use so none is wasted. Failure to stop leakage or other waste will be cause for revocation (at Chief Engineer's discretion), of use of steam from the Medical Center's system.

#### **1.20 TESTS**

- A. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- B. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- C. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire complex which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a complex which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.

- D. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonably short period of time during which operating and environmental conditions remain reasonably constant.
- E. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

#### **1.21 INSTRUCTIONS**

- A. Contractor shall furnish Maintenance and Operating manuals and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals (four copies each) for each separate piece of equipment shall be delivered to the Chief Engineer coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.
- C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the Chief Engineer and shall be considered concluded only when the Chief Engineer is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the Chief Engineer, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

#### **1.22 GOVERNMENT-FURNISHED PROPERTY**

- A. Contractor shall coordinate and schedule installation of government supplied equipment.
- B. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by

Government. Arrangements will then be made by the Government for delivery of equipment.

1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.

**1.23 RELOCATED EQUIPMENT AND ITEMS**

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and items indicated by symbol "R" or otherwise shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the Chief Engineer.
- C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, air, vacuum and/or electrical, whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".
- D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- E. Contractor shall employ services of an installation engineer, who is an authorized representative of the manufacturer of this equipment to supervise assembly and installation of existing equipment, required to be relocated.
- F. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

**END OF SECTION**

**SECTION 01 33 23**  
**SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**

- 1-1. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in Section 00 72 00, GENERAL CONDITIONS.
- 1-2. For the purposes of this contract, samples, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1-3. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
  - A. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;
  - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
  - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1-4. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Allow 20 working days for review by Government. Delays attributable to untimely and rejected submittals will not serve as a basis for extending contract time for completion.
- 1-5. Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by Chief Engineer on behalf of the Contracting Officer.
- 1-6. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1-7. The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefor by Contracting Officer, adjustment in contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.
- 1-8. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect-Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.

- 1-9. Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.
  - A. Submit samples required by Section 09 06 00, SCHEDULE FOR FINISHES, in quadruplicate. Submit other samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
  - B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
    1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
    2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
    3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
  - C. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.
  - D. Approved samples will be kept on file by the Chief Engineer at the site until completion of contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.
  - E. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
    1. For each drawing required, submit one legible photographic paper or vellum reproducible.
    2. Reproducible shall be full size.
    3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's



- number, reference to contract drawing number, detail Section Number, and Specification Section Number.
4. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
  5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
  6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
  7. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.
- 1-10. Samples shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to Chief Engineer.

**END OF SECTION**

**SECTION 01 45 29  
TESTING LABORATORY SERVICES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained and paid for by Contractor.

**1.2 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):  
     C1324.....Examination and Analysis of Hardened Masonry Mortar  
     E329.....Agencies Engaged in Construction Inspection and/or Testing  
     E543.....Agencies Performing Non-Destructive Testing

**1.3 REQUIREMENTS**

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E 329, C 1077, D 3666, D3740, A 880, E 543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by COTR. When it appears materials furnished, or work performed by Contractor fails to meet construction contract requirements, Testing Laboratory shall direct attention of COTR to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to COTR, Contractor, unless other arrangements are agreed to in writing by the COTR. Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to COTR immediately of any irregularity and follow up in writing as soon as possible following verbal notice.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 MASONRY**

- A. Mortar Tests:
  - 1. Examination and analysis of hardened mortar:
    - a. Comply with ASTM C1324.
    - b. Obtain a minimum 10 g sample of hardened mortar for each type of mortar used. Differentiate mortar that is for repointing.
  - 2. One tests for each batch of mortar prepared during first week of operation at other random times as directed by Architect or Engineer.

**3.2 TYPE OF TEST**

**A. Masonry:**

Examination and Analysis of Hardened Masonry Mortar (ASTM C1324): one per batch for the first week of masonry installation, then once per week on a random basis. If proportions of mortar mix are outside of the mix design requirements, testing frequency will be modified to daily. Work that was installed with the mortar that does not meet the specified proportion requirements may be rejected or require remedial action by Contractor with no additional cost or time extensions granted.

**END OF SECTION**

**SECTION 02 41 00.01**  
**SELECTIVE DEMOLITION**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Demolition and removal of selected portions of building or structure.

**1.3 DEFINITIONS**

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

**1.4 SUBMITTALS**

- A. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.
  - 5. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other VA personnel and occupants affected by selective demolition operations.
  - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
  - 7. Means of protection for items to remain and items in path of waste removal from building.
- B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- C. Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Comply with Division 1 Section "Photographic Documentation." Submit before Work begins.
- D. Temporary Shoring Plans: The condition of the existing shelf angles are unknown and shall not be used or relied upon for temporary bracing of the brick masonry. Sealed drawings and calculations shall be submitted and returned approved prior to beginning ANY demolition.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
  - 1. Comply with submittal requirements in Division 1 Section "Construction Waste Management."

**1.5 QUALITY ASSURANCE**

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1.
- E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1. Review methods and procedures related to selective demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 5. Review areas where existing construction is to remain and requires protection.

**1.6 PROJECT CONDITIONS**

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
  - 1. Comply with requirements specified in Division 1.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify COTR of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify COTR. Owner will remove hazardous materials under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

**1.7 WARRANTY**

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify that utilities have been marked and will not be disrupted.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to COTR.
- E. Survey of Existing Conditions: As directed by VA COTR.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

### **3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS**

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
  - 1. Comply with requirements for existing services/systems interruptions specified in Division 1.

### **3.3 PREPARATION**

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Comply with requirements for access and protection specified in Division 1.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 3. Cover and protect furniture, furnishings, and equipment that have not been removed.
  - 4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  - 1. Submit temporary shoring plans and calculations prior to beginning ANY demolition. Plans and calculations shall be sealed by a licensed professional engineer.
  - 2. Strengthen or add new supports when required during progress of selective demolition.

### **3.4 SELECTIVE DEMOLITION, GENERAL**

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools

- or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
  5. Maintain adequate ventilation when using cutting torches.
  6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  8. Dispose of demolished items and materials promptly. Comply with requirements in Division 1 Section "Construction Waste Management."
- B. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area as designated by Owner.
  5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by COTR, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- 3.5 DISPOSAL OF DEMOLISHED MATERIALS**
- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  3. Remove debris from elevated portions of building by method and route approved by Contracting Officer, and that will convey debris to grade level in a controlled manner.
  4. Comply with requirements specified in Division 1.

- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and dispose of legally.

**3.6 CLEANING**

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

**END OF SECTION**



**SECTION 03 74 00  
CONCRETE REPAIR MORTARS AND GROUTS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES:** Prepackaged polymer modified concrete mortars and grouts for repairing defects in the top and the face of the surface of the existing concrete. Non-polymer modified cementitious material may be used as approved by the Engineer.

**1.2 RELATED SECTIONS**

- A. Selective Demolition (Section 02 40 00.01)

**1.3 QUALITY ASSURANCE**

- A. For the purpose of designating type and quality for the work of this section, drawings and specifications are based on manufactured products which meet the criteria as listed in Part 2 of this section. Equal products for use on this project by other manufacturers are acceptable provided these products meet all the requirements of these specifications and are approved by the Engineer.
- B. Standard References
  - 1. The current edition of the following standards is considered a part of this specification except as specified herein: ACI-548R, "Polymers in Concrete" as reported by ACI Committee 548.
  - 2. No provision of any referenced standard specification, manual, or code (whether or not specifically incorporated by reference in the contract documents) shall be effective to change the duties and responsibilities of Owner, Contractor, or Engineer or any of their consultants, agents, or employees from those set forth in the contract documents, nor shall it be effective to assign to Engineer or any of Engineer's consultants, agents, or employees any duty or authority to supervise or direct the furnishing or performance of the work or authority to undertake any responsibilities for safety precautions or programs incidental to safety, nor for the Contractor's failure to perform work in accordance with the contract documents.
- C. Applicator Qualifications
  - 1. Each applicator of materials listed in this section must meet the following criteria:
    - a. Applicator shall have completed a minimum of 5 projects of similar size and purpose in which the proposed applicator installed identical or very similar materials.
    - b. Applicator shall be certified by the manufacturer (where applicable) to install the proposed materials.
    - c. General Contractor must submit each proposed Applicator's name, address, and phone number along with applicable certifications and a list of five projects of similar size and purpose in which the proposed applicator installed identical or very similar materials. For each project listed, the dates of application, size of the project, reference information (Owner, Architect, or Engineer with adequate contact information) along with a brief description of the project and work performed.

**1.4 SUBMITTALS**

- A. Submit copies of information, certifications and project lists for chosen applicator of materials demonstrating compliance with the requirements of this specification.
- B. Submit certificate stating materials for work of this section meet requirements of the contract documents.
- C. Submit manufacturer's printed instructions for surface preparation, mixing, application, and curing of materials specified for use in work of this section.
- D. Submit copies of test reports of materials showing compliance with the requirements of this specification.
- E. Submit Material Safety Data Sheet (MSDS) on all products of this Section.

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

- A. Materials shall be delivered to the project site in manufacturer's original packaging containers with labels intact and seals unbroken. Materials shall be pre-proportioned where appropriate.
- B. Store materials under cover in a dry place off the ground and away from damp surfaces. Store and maintain at temperatures recommended by the manufacturer.

## **PART 2 - PRODUCTS**

### **2.1 PRODUCT**

- A. Products will be acceptable for use on the project, when approved by the Engineer and the results of all tests meet all the requirements of these specifications. The following manufacturers produce products which may comply with this specification:
  - 1. For "form and pour" concrete repairs, minimum 1" thick:
    - a. Conproco Corporation (One Shot AG)
    - b. BASF Building Systems (Emaco Masterbuilder S-66 CI)
    - c. Sika Corporation (Sikacrete 211)
    - d. Sto Corporation (Sto Full Depth repair Mortar CR-311, extended with aggregate as required)
    - e. Approved equals
  - 2. For vertical and overhead concrete repairs, minimum 1/4" thick, maximum 1.5" per lift:
    - a. Conproco Corporation (Conpro Set)
    - b. BASF Building Systems (Masterbuilder Emaco R350 CI)
    - c. Sika Corporation (SikaTop 123 Plus)
    - d. Sto Corporation (Sto Overhead Repair Mortar CR-702)
    - e. Approved equals

### **2.2 REPAIR MORTARS**

- A. Repair Mortars shall be a one-component or a two-component prepackaged cementitious mortar that is recommended for horizontal, vertical and, where appropriate, overhead application. System shall not produce a vapor barrier and shall be thermally compatible with the concrete.
- B. If the material is a two-component material, component "B" shall be a blend of selected Portland cement, specially selected and graded aggregate, and admixture to control setting time and workability. Type, size, proportions, and gradation of the aggregate cement and admixture shall meet the recommended standards of the manufacturer for the thickness and type of application required.
- C. If the material is a one-component material, the dry materials shall contain all materials blended with only the addition of water required in the field.
- D. Aggregate may be added to extend the mortar to stiffen the mix, reduce shrinkage, or for use in thicknesses greater than non-extended manufacturer's limitations if so approved by the Engineer and Manufacturer and in accordance with the specified procedures.
- E. Polymer modified repair mortars shall be formulated specifically for the type of use and application specified and shown on the Contract Drawings.
- F. A single manufacturer shall provide all repair mortars to be used throughout the entire project. All repair mortars shall be compatible with all coatings and surface treatments to be applied to the repaired surface. Where requested by the Engineer, the Contractor shall obtain documentation from manufacturers to certify compatibility of products used.

**2.3 Properties:** Epoxy bonding adhesive shall be compatible with and manufactured by the same manufacturer as the repair mortar or shall be specified by the manufacturer of the repair mortar in writing to be acceptable for use with the repair mortar. Bonding adhesive shall be used for concrete repairs unless a scrub coat of repair mortar is approved. The epoxy bonding adhesive shall meet or exceed the following minimum properties:

- A. Properties of the mixed epoxy resin/portland cement adhesive.
  - 1. Pot Life: 75-105 minutes
  - 2. Contact Open Time: 24 hours
- B. Properties of the cured epoxy resin/portland cement adhesive.
  - 1. Compressive Strength (ASTM C-109) - 28 day: 8,700 psi min.
    - a. Flexural Strength (ASTM C-348) - 1100 psi min.
    - b. Bond Strength (ASTM C-882 modified) at 14 days - 24 hrs. open time: 1700 psi min.
    - c. The epoxy resin/portland cement adhesive shall not produce a vapor barrier.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Prior to placement of the grout and mortar, the surfaces receiving the mortar shall be inspected by the Contractor and the Engineer or his representative. Any existing surface treatments that may affect the bond or performance of the new material shall be identified. Additional steps for preparation or removal shall be issued by the Engineer.
- B. The work in this section shall be coordinated with that of other trades.

#### **3.2 PREINSTALLATION CONFERENCE:** Prior to the installation of the repair materials, the Contractor shall schedule a conference at the job site. The conference shall be attended by representatives of the General Contractor and the Subcontractor(s) involved in the work of this section, the manufacturer's representative for the supplier of the repair materials, and the Engineer. The procedures for the installation and quality control shall be reviewed.

#### **3.3 PREPARATION AND INSTALLATION**

- A. Surface Preparation: Concrete surfaces to receive the grout shall be sound and thoroughly clean. Remove all unsound concrete. Distressed or difficult areas that cannot be adequately cleaned shall have all unsound, loose, and delaminated materials removed from the surface with small electric or pneumatic chipping tools or with hand tools. Hammers shall be equipped with pointed bits. Areas that are to receive repair mortar shall be abrasion blasted after the surfaces are inspected. Closely inspect surfaces for fractured material and remove with hand tools. Clean all rust and other materials from sections of exposed reinforcing steel by abrasive blasting. Surface profile shall be obtained as required by the manufacturer's written requirements.
- B. Pretreatment: Where saturated surface dry conditions are specified, maintain the surface wet for a minimum of 12 hours prior to repair. Do not allow the surface to dry at any time. Remove standing water with oil free compressed air immediately before application of the bonding agent or repair mortar. Apply bonding agent and/or scrub coat as specified.
- C. Mixing and Application: Mix and apply, in strict accordance with the manufacturer's printed instructions, to a uniform consistency. Place and consolidate repair grout in sections after other parts of the work required prior to the application of the repair mortar are complete. Place and consolidate the repair mortar. Compact against vertical surfaces at edges. Screed to the required slopes. Allow grout to set to desired stiffness, then finish with a wood or sponge float unless otherwise noted on the drawings.
- D. Curing: Unless otherwise specified, cover the entire surface with wet burlap and clear polyethylene cure for 48 hours by keeping the burlap continuously wet. Do not allow the surface to dry at any time.

- 3.4 HOT & COLD WEATHER APPLICATION:** Contractor shall comply with all hot and cold weather application requirements provided by the manufacturer. In general, Contractor shall not install materials when ambient or surface temperatures are less than 45-50 degrees (F) and rising or if ambient temperatures are greater than 85 degrees (F). If conditions are marginal, Contractor must contact the manufacturer's technical services before installing materials to obtain and follow all specific directions and recommendations regarding hot and cold weather applications.
- 3.5 WORKMANSHIP:** Work which does not conform to the specified requirements shall be corrected and/or replaced as directed by the Engineer at the Contractor's expense. Strict adherence is required to the procedures and limitations as provided in the Contract Documents and Manufacturer's Guidelines. Delamination or cracks greater than widespread tight micro cracks are grounds for replacement of the repair.

END OF SECTION

**SECTION 03 74 10  
COLORED CEMENT BASED MORTAR**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 WORK INCLUDED IN THIS SECTION**

- A. Furnishing all labor, materials, tools and equipment for the application of prepackaged cement based repair mortar bonded to cleaned and prepared surfaces of existing concrete or limestone members.

**1.3 RELATED WORK SPECIFIED ELSEWHERE**

- A. Selective Demolition (Section 02 41 00-01)

**1.4 QUALITY ASSURANCE**

- A. All materials shall be furnished by a single source manufacturer who has been in the business of manufacturing specialty construction materials for a minimum of fifteen (15) years.
- B. Provide notarized certificate stating that the repair material meets the specified requirements and the manufacturer's current printed literature on the product specified.

**1.5 SUBMITTALS**

- A. Submit certificates stating materials for work of this section meet the requirements of the Contract Documents.
- B. Submit manufacturer's printed instructions for surface preparation, mixing, application and curing of materials specified in this Section.
- C. Submit copies of test reports of materials showing compliance with the requirements of this Specification.
- D. Submit Material Safety Data Sheet (MSDS) on all products specified in this Section.

**1.6 DELIVERY, STORAGE AND HANDLING**

- A. Materials shall be delivered to the project site in manufacturer's original packaging and pre-proportioned containers with labels intact and seals unbroken.
- B. Store materials under cover in a dry place off the ground and away from damp surfaces. Store and maintain at temperatures recommended by the manufacturer.

**1.7 ENVIRONMENTAL CONDITIONS**

- A. Do not apply when it is raining or snowing or if rain or snow appear to be imminent.
- B. Do not apply when surface temperatures are below 45°F or predicted to fall below 45°F within 48 hours after placement.
- C. Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified repair material.

**PART 2 - PRODUCTS**

**2.1 PRODUCTS**

- A. Products will be acceptable for use in this project when approved by the Engineer and the products meet or exceed the performance criteria specified herein.

**2.2 ACCEPTABLE MANUFACTURERS**

- A. Products of the following manufacturers will be acceptable for use on the project when approved by the Engineer and the results of all tests meet all the requirements of these specifications.

1. Jahn Restoration Mortar by Cathedral Stone Products, Inc.
2. Custom System 45 by Edison Chemical Systems, Inc.
3. Mimic/Matrix by Conproco

**2.3 MATERIALS**

- A. Project shall be a colored cement based repair mortar having the following characteristics:
1. Shall be capable of color matching mortar to one or more similar shades of onsite material colors.
  2. Shall be capable of application to up to 4" thickness in one or more lifts.
  3. Shall contain no polymers or leachable constituents.
  4. Shall contain no chloride.
  5. Shall be capable of being troweled or carved while damp following initial curing.

**2.4 COLOR**

- A. Color shall match the adjacent existing material.
- B. Contracting Officer and Architect shall approve color of repair mortar.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Prior to placement of the repair mortar, the surfaces receiving the mortar shall be inspected and accepted by the Contractor and the Engineer or his representative.
- B. The work in this section shall be coordinated with that of other trades.

**3.2 PRE-INSTALLATION CONFERENCE:** Prior to the installation of the repair mortar, the Contractor shall schedule a conference at the job site. The conference shall be attended by representatives of the General Contractor and the Subcontractor(s) involved in the work of this Section, the manufacturer's representative for the supplier of the repair materials, and the Engineer. The procedures for the installation and quality control shall be reviewed.

**3.3 SURFACE PREPARATION**

- A. Concrete surfaces to receive the repair mortar shall be sound, thoroughly clean. The method of cleaning and surface preparation shall completely remove unsound materials and leave the coarse aggregate exposed and produce a surface profile roughness equal to CSP5 as defined in Technical Guidelines 03732 published by the ICRI. The method of surface preparation shall be either a dry abrasive blast or ultra-high pressure water jetting.
- B. Immediately prior to application of the repair mortar, saturate the surfaces with clean water. Substrate must be SSD with no standing water when the scrub coat of repair mortar is applied.

**3.4 MIXING**

- A. Mix manually or mechanically in accordance with manufacturer's recommendations.

**3.5 APPLICATION**

- A. At the time of application, the substrate should be saturated surface dry with no standing water. A bond coat of the mortar shall be scrubbed into substrate filling all pores and voids. While the scrub coat is still plastic, force additional material against edge of repair, working toward center on horizontal surface or from bottom to top on vertical applications. Each successive application must be completely consolidated into the previous application. Build the mortar to 1/8" to 1/4" above the finish profile. When the repair mortar has achieved initial set, shave the excess using the trowel or miter rod.

**3.6 CURING**

- A. Provide moist cure with wet burlap and polyethylene and a fine mist of water where possible. Moist curing should commence immediately after finishing. If necessary, protect newly applied material from rain. Tape thin polyethylene over patch to retain moisture where wet burlap and polyethylene is not practical. Moist curing shall be continuous for 48 hours after placement. Setting time is dependent on temperature and humidity.

**3.7 WORKMANSHIP**

- A. Adhere to all limitations and cautions for the colored cement based mortar on the manufacturer's printed technical data sheets and literature.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillover onto adjacent areas.
- C. Work that does not conform to the specified requirements shall be corrected and/or replaced as directed by the Engineer at the Contractor's expense.

**END OF SECTION**

**SECTION 04 01 20  
REPAIR OF UNIT MASONRY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies the requirements for the repair of unit masonry work as shown on Drawings and as specified herein.

**1.2 RELATED SECTIONS**

A. Sealants and sealant installation: Section 07 92 00, JOINT SEALANTS.

**1.3 QUALITY ASSURANCE**

- A. References: Some products and execution are specified in this section by reference to published specifications and standards of the following (with respective abbreviations used):
  - 1. American Society for Testing and Materials (ASTM)
  - 2. Brick Industry Association (BIA)
  - 3. International Masonry Industry All-Weather Council (IMIAC)
  - 4. American Concrete Institute (ACI)
- B. Standard References:
  - 1. Current edition of the following standard references shall apply to the work of this section as indicated. Suffixes indicating issue date are omitted from reference numerals elsewhere in text. Masonry work shall comply with the following standards and codes except as indicated otherwise on Drawings or herein.
    - a. IMIAC Recommended Practices and Guide Specifications for Cold Weather Masonry Construction
    - b. BIA Publications of the Brick Industry Association
    - c. ACI 530 Building Code Requirements for Masonry Structures
    - d. ACI 530.1 Specifications for Concrete Masonry Construction
  - 2. Building Code: The North Carolina State Building Code, latest edition with all current amendments.
- C. Qualifications of Workmen:
  - 1. Use skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
  - 2. Provide one skilled journeyman mason who shall be present at all times during execution of this portion of the work, who shall personally direct all work performed under this section, and who shall be familiar with the project requirements included in these project specifications.

**1.4 SUBMITTALS**

- A. Certificates: Obtain new masonry units from the same source. Submit certificate stating masonry units supplied by the Contractor to meet requirements of Contract Documents. Certificate shall be on company letterhead of manufacturer of masonry units, and shall be signed by an officer of the company.
- B. Product Data: Submit manufacturer's printed technical and physical data of materials required in this section.
- C. Submit manufacturer's printed test reports on masonry mortar prepared from premixed masonry cement. Tests shall have been performed and reports prepared by an independent testing laboratory.



- D. Submit manufacturer's printed technical data and mixing data for premixed masonry mortars and mortar color additive.
- E. Submit mortar design mix, including admixture limitations.
- F. Samples: Submit samples of mortar prepared with sand approved for use on the project. Color of mortar shall match the color of the existing mortar. Samples shall be submitted on a board between pieces of masonry to be installed in the project, with mortar joint width to match that to be used on the job. The samples shall indicate the color range to be expected. Secure approval of mortar, masonry cement and aggregate prior to formulating masonry cement for the project.
- G. Masonry Cleaner: Submit methods, materials, MSDS sheets and equipment for cleaning the masonry units.
- H. Sample Panel: Upon approval of the masonry and mortar to be used on this project, construct two panels of the mortar and masonry being used on the project. One panel shall utilize newly selected masonry units and one shall utilize the pointing mortar at separate locations. The panels shall be 2'-0" x 2'-0" and constructed at a location specified by the Engineer close to an area of existing wall to be matched where the masonry is to be replaced. The panels shall contain the blend and color range of masonry and color of mortar to be used on the project and, if approved, shall become the standard for the masonry work to be installed in the project. If initial panel is not acceptable, additional panels shall be constructed until subsequent samples are approved.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Materials shall be delivered to the project site in manufacturer's original, unopened containers with manufacturer's brand name clearly marked thereon.
- B. Containers shall show formulation of the mixture.
- C. Store materials under cover in a dry place. Cement, lime, and air-setting mortars shall be stored in watertight sheds with elevated floors. Protect cement from dampness to minimize warehouse set.
- D. Aggregate: Stockpile in a manner that will prevent segregation of sizes, and the inclusion of dirt and other foreign material.
- E. Masonry Units: Stack masonry units at site in a manner to avoid chipping. Protect masonry units from freezing and thawing, wetting, staining, soiling, and physical damage. Keep masonry units covered to prevent soaking by rain.

**1.6 ENVIRONMENTAL CONDITIONS**

- A. Do not lay masonry when temperature is 40°F and falling, or when freezing weather is predicted within ensuing 24 hours unless suitable means are provided to heat materials, protect work from cold and frost, and insure that mortar will harden without freezing. No antifreeze or accelerators shall be used.
- B. Hot and Cold Weather Requirements: Shall meet requirements of "Building Code Requirements for Masonry Structures (ACI 530/ ASCE 5/ TMS 402)" and "Specifications for Masonry Structures (ACI 530.1/ ASCE 6/ TMS 602)".

**1.7 PROTECTION**

- A. Protect facing materials against staining. Keep top of exposed walls covered with non-staining waterproof coverings when work is not in progress.
- B. Maintain protective boards at exposed external corners.

**1.8 QUALITY CONTROL**

- A. Unless specifically shown otherwise on the Drawings or specified otherwise herein, all masonry work shall be installed in strict accordance with the printed instructions of the Brick Industry Association as documented in their Technical Notes.

**PART 2 - PRODUCTS**

**2.1 MATERIALS (Mortar)**

- A. Acceptable Manufacturers of Mortar: Products of the following manufacturers similar to those specified herein will be acceptable for use on project when approved (in writing) by Project Engineer:
  - 1. Keim Mineral Coatings of America, Inc.
  - 2. Giant Portland Cement Company
  - 3. Roanoke Cement Company
  - 4. Holcim Group
  - 5. Lehigh Cement
  - 6. Lafarge
  - 7. ESSROC Group
- B. Source: Products for use on this project shall be of one manufacturer unless noted specifically otherwise herein.
- C. Prepackaged Masonry Cement and Mortar:
  - 1. Premixed masonry cement and premixed mortar shall be approved by Engineer. Test for water retention and compressive strength shall be as required in ASTM C270.
  - 2. The mortar cement shall contain Portland cement, hydrated lime, plasticizing admixtures, and/or hydraulic hydrated lime. Mortar cements which contain other materials, including ground limestone, ground slag or other cementitious and non-cementitious materials, are not acceptable.

**2.2 MATERIALS (Cement)**

- A. Cementitious Materials:
  - 1. Masonry Cement: ASTM C91, Type II.
  - 2. Portland Cement: ASTM C150, Type I or II.
- B. Hydrated Lime: ASTM C207, Type S or SA.
- C. Fine Aggregate: Sand for masonry mortar shall conform to requirements of ASTM C144.
- D. Water: Clean and free from deleterious amounts of acids, calcium chloride, alkalis, or organic materials which would affect set of cement or would corrode metal reinforcement.
- E. Admixtures:
  - 1. The use of admixtures containing calcium chloride or corrosive agents is prohibited.
  - 2. Use of admixtures is not permitted unless authorized (in writing) by the Engineer.

**2.3 MATERIALS (Masonry Units)**

- A. Face Brick:
  - 1. Typical brick shall be style, size, shape, color, blend and texture to match the existing brick as closely as possible.
  - 2. Sizes shall be the same as the existing exterior face brick. Special sizes and shapes shall be provided as required to match existing.
  - 3. Brick shall meet the requirements of ASTM C216, Type FBS, Grade SW.
  - 4. Provide solid units where core holes would be visible (i.e. rowlock, corbels, etc.) in the finish work or would allow water penetration.

5. Extremes in the color range shall be culled if it would be detrimental to the appearance of the finished wall.
6. Obtain face brick from one manufacturer of uniform color and appearance for the entire project.

#### **2.4 Masonry Cleaners**

- A. Approved cleaners shall be composed primarily of detergents, wetting agents and buffering agents. The use of any of the cleaning agents shall first be approved in writing by the Engineer. Cleaners shall be tested prior to use and approved by the Engineer.
- B. Cleaners to be tested to include the following products by Prosoco, Inc. or equal:
  1. Sure Klean 766 Limestone & Masonry Prewash and Sure Klean Limestone & Masonry Afterwash.
  2. Light Duty Restoration Cleaner.
  3. BioKlean system.
  4. BioWash.

#### **2.5 MIXES**

- A. Mortar for Repointing Masonry and Installation of New Masonry:
  1. Quantities shall be as follows (by volume) to produce Type N mortar as required in ASTM C270:
    - a. 1 part Portland Cement
    - b. 1 part hydrated lime
    - c. Sand in the proportion of 3 times the sum of the volumes of cements.
  2. Mortar shall provide compressive strength of not less than 750 psi at 28 days and have a maximum air volume of 16%.
  3. Mortar color to match existing.

#### **2.6 MORTAR MIXING**

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270 or ASTM C476.
- B. Do not use anti-freeze compounds or accelerators to lower the freezing point of mortar.
- C. Do not measure quantities by shovel.
- D. Use minimum amount of water to produce a workable consistency.
- E. If water is lost by evaporation, retemper as specified in Part 3.

#### **2.7 MASONRY ACCESSORIES:** Accessories by one manufacturer are specified to indicate type. Similar products by Hohmann & Barnard, Inc., Heckman Building Products, Inc., Masonry Reinforcing Corporation of America, Dur-O-Wal, or other manufacturers may be used if equivalent and if approved by the Engineer.

- A. Brick Vents: Cell vent weep-hole ventilators shall be Dur-O-Wal Cell Vents manufactured of flexible ultra violet resistant polypropylene co-polymer.
- B. Wall Ties: Wall ties for securing new brick veneer to existing shelf angles, concrete, or concrete masonry units directly above the existing steel angles shall be Pos-I-Tie self-drilling screw and Pos-I-Tie Drill-It screws with wire ties as manufactured by Heckman Building Products, Inc. Barrel section shall be fabricated from a 92% zinc alloy. Screws shall be zinc electroplated, coated twice and baked with STALGARD. Wire ties shall be hot dipped galvanized. Sizes and shapes shall be as required to fit existing as-built dimensions and as indicated on the details.

### **PART 3 - EXECUTION**

#### **3.1 LOCATION**

- A. Type N Mortar: Use for all new masonry installed and all repointing of existing masonry walls.

#### **3.2 INSTALLATION**

- A. Install as specified in Repointing Procedure Notes on the drawings and as specified herein.

- B. **Mixing:** Mortar shall be proportioned by methods that will insure accurate proportion of all ingredients. **It shall be mixed by power-driven mixer until entire batch is homogeneous and of proper consistency. Mix for a minimum period of five minutes.**
- C. **Retempering:** All mortar shall be used within two hours of initial mixing. No mortar shall be used after it has begun to set. Retempering of mortar in which setting has started will not be permitted. Mortar, however, may be retempered (except as above qualified) as often as necessary to keep it plastic.

### 3.3 EXAMINATION

- A. Contractor shall examine areas to receive unit masonry, and shall examine conditions under which units will be installed. Installer shall notify Contractor and Engineer in writing of conditions detrimental to proper and timely completion of work of this section.
- B. During installation, Contractor shall immediately notify the Engineer of any variances in color or texture from approved brick.
- C. Work of this section shall not proceed until unsatisfactory conditions have been corrected.

### 3.4 PREPARATION

- A. Miscellaneous items which will be required to be built into masonry construction shall be installed as part of work of this section.
- B. Contractor shall be responsible for delivery of required materials to project site before start of masonry work so as not to delay work of this section.
- C. Verify items provided by other sections of work are properly sized and located.
- D. Establish lines, levels, and coursing to match existing lines, levels, and coursing. Protect from disturbance.
- E. Provide temporary bracing during demolition of existing masonry work as required. Maintain in place until new sections of masonry are completed.

### 3.5 TESTING AND QUALITY CONTROL

- A. Materials and installed work may require testing and retesting, as directed by Engineer, at any time during progress of the work.
- B. Quality control testing during construction shall be done at Owner's expense by an independent testing laboratory. All mortar shall be subject to sampling and testing for quality control during placement of mortar as follows:
  - 1. **Proportion Verification:** Hardened samples shall be analyzed to ensure conformance with proportion requirements of the specific mix design. Retesting due to failure of products during initial testing shall be at the expense of the Contractor.
- C. Evaluation and acceptance of mortar shall be based on ASTM C270.

### 3.6 LAYING UNIT MASONRY

- A. **Cutting of Units:** Where cutting is necessary, make all cuts with a motor driven masonry saw. Units with chips, or with irregular cuts, will not be accepted. All cuts shall be made using a wet cut.
- B. **Coursing:** Masonry work shall be laid out on a nominal uniformly wide joint to match existing masonry. Work shall course vertically so as to coincide with existing adjacent coursing.
- C. Masonry shall be reinstalled in an alignment that is consistent with and blends with the existing adjacent veneer. All existing architectural features in masonry shall be reinstalled per current Code and applicable Industry Standards.
- D. **Mortar:** Shall be prepared as noted above and on Contract Drawings. Remove excess mortar.

- E. Weep Holes: Install weep hole by omitting mortar in full head joint and installing weep cell ventilators where specified on the drawings (24" on center).
- F. Wetting of Brick:
  - 1. All brick shall be thoroughly wetted as necessary to reduce the rate of absorption of water at time of laying to not more than 0.7 of an ounce (20 grams per minute) per brick when placed on its flat side in 1/4 inch of water for one minute. Existing brick surfaces where new mortar will be bonded to the face shall also be pre-wetted.
- G. Brick Laying Technique:
  - 1. All joints between brick shall be completely filled with mortar. Brick shall be laid in a full, lightly furrowed bed of mortar with the head joints completely filled by placing sufficient mortar on the end of the brick so that when the brick is shoved into place, the head joint will be filled. **Buttering of face edge and then slushing will not be permitted.** All joints shall be cut flush. Install brick units so that cavity is clean and not clogged with mortar.
- H. Disturbed Units:
  - 1. Do not temp or disturb brick after laying.
  - 2. Where bricks are disturbed or must be moved after the mortar has begun to lose its moisture, the brick and all adjacent mortar shall be removed and reset completely.
- I. Tooling:
  - 1. **All joints shall be tooled to a uniform configuration to match existing joints.** All joints shall be tooled at approximately the same degree of moisture content and firmness to achieve a uniform color and texture and to close all hairline cracks and crevices.

### 3.7 CONSTRUCTION TOLERANCES AND ALIGNMENT

- A. Blending alignment of new masonry with the alignment of existing masonry shall be a highest priority. Where this goal does not conflict with the following and/or where possible, the following tolerances shall be adhered to:
  - 1. Variation from Plumb: For vertical lines and surfaces of external corners and other conspicuous lines, do not exceed 1/4" in any story. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 1/2" maximum.
  - 2. Variation from Level: For bed joints and other conspicuous lines, do not exceed 1/4" in any bay of 20' maximum.
  - 3. Variation in Mortar Joint Thickness: Match existing joint sizes. Do not exceed a tolerance of  $\pm 1/8$ ".

### 3.8 BUILT-IN WORK

- A. Make provisions for installation of other work in order to avoid cutting and patching. Build in work specified under other sections of specifications as the work progresses. Work shall be plumb and level.

### 3.9 MASONRY CLEANING

- A. While laying the brick, good workmanship and job housekeeping practices shall be used so as to minimize the need for cleaning the brick. Protect the base of the wall from mortar droppings, protect the wall by setting scaffolds so that mortar is not deflected onto the wall, and at the end of each work day, set the scaffolding boards so that they do not deflect rainfall onto newly laid masonry.

The bricklaying technique shall be such that mortar does not run down the face of the wall, or smear the mortar onto the brick face. After the joints are tooled, cut off mortar tailings with the trowel and brush excess mortar burrs and dust from the face of the brick. Do not bag or sack the wall, but use a bricklayer's brush made with medium soft bristles.

- B. Remove all large mortar particles with a hardwood scraper.
- C. If after using the above outlined techniques, additional cleaning of the walls is found necessary, allow the walls to cure three weeks prior to initiating further cleaning processes.
- D. Saturate the wall with clean water. The wall shall be thoroughly saturated prior to and at the time cleaning solution is applied.
- E. Clean the wall only with an approved cleaning solution applied with a brush, starting at the top of the wall. Approved cleaners shall be composed primarily of detergents, wetting agents and buffering agents. The addition of muriatic acid to the cleaning solution will be considered only as a last resort and may be used only with the written approval of the Engineer. The use of any of the cleaning agents shall first be approved in writing by the Engineer. The concentration, method of application of the cleaning solution, and method of scraping shall be as outlined on the container by the manufacturer.
- F. High pressure water shall not be used for cleaning except with the written approval of the Engineer.
- G. Abrasive blasting shall not be allowed.
- H. Immediately after cleaning a small area, the wall shall be rinsed thoroughly with sufficient amounts of water.
- I. Protect adjacent surfaces and materials during brick cleaning operations.
- J. After the walls are cleaned, take necessary precautions to ensure that other contractors and subcontractors do not damage or soil the walls.

### **3.10 POINTING**

- A. On completion of newly constructed masonry walls, point up all exposed masonry, fill all holes and joints; remove loose mortar; cut out defective joints; and repoint where necessary.
- B. Existing masonry shall be repointed in accordance with procedures on the drawings.

### **3.11 REPOINTING**

- A. Repoint existing head and bed joints at locations indicated on the drawings and as directed by the Engineer to restore the integrity of the joint.
- B. Materials for repointing shall be as specified above.
- C. Add sufficient water to the mortar mix that will produce a damp mix that will retain its shape when pressed into a ball by hand. Let mortar stand for not less than one hour nor more than 1-1/2 hours for prehydration. After prehydration, add sufficient water to bring mortar to proper consistency for repointing, slightly drier than used for laying of units.
- D. See details and procedures on drawings.

- 3.12 WORKMANSHIP:** Masonry work which does not conform to specified requirement, including tolerances and finishes, shall be corrected and/or replaced as directed by Engineer at Contractor's expense, without extension of time. Contractor shall also be responsible for cost of corrections to any work affected by or resulting from correction to masonry work.

**END OF SECTION**

**SECTION 05 15 00  
ADHESIVE ANCHORS**

**PART 1 - GENERAL****1.1 DESCRIPTION: THIS SECTION SPECIFIES THE FOLLOWING:**

- A. Furnishing and installing adhesive anchors with washers and nuts into holes drilled into the existing concrete members as indicated on the drawings and as specified herein.
- B. Furnishing and installing adhesive anchored reinforcing bars into holes drilled into the existing concrete members as indicated on the drawings and as specified herein.
- C. Equipment required for drilling the holes and for locating the existing embedded reinforcing steel.
- D. Equipment required for mixing, proportioning and dispensing the epoxy gel into holes drilled for adhesive anchors.
- E. Items of testing, quality control, and evaluation of in-place adhesive anchors.

**1.2 RELATED WORK**

- A. Section 03 74 00 Repair Mortar

**1.3 QUALITY ASSURANCE**

- A. References: Some products and execution are specified in this section by reference to published specifications or standards of the following (latest edition, with respective abbreviations used):
  - 1. American Society for Testing and Materials (ASTM)
  - 2. American Institute of Steel Construction (AISC)
  - 3. American Concrete Institute (ACI)
- B. Standard Specifications and Codes: The following latest edition of the specification and codes form a part of this specification where reference is made to a specific paragraph or section of the specific standard or code:
 

ACI 503.1	"Standard Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive"
ACI 318	Building Code Requirements for Reinforced Concrete
ACI 349	Appendix 'B' "Steel Embedments"
ASTM E488	"Standard Test Methods for Strengths of Anchors in Concrete and Masonry"
AISC	"Specification for the Fabrication and Erection of Structural Steel for Buildings"

**1.4 SUBMITTALS**

- A. Submit test results performed by an Independent Testing Laboratory certifying tensile, bond, and shear strength of anchors specified herein or shown on the contract drawings. Tests of anchors shall be made on nearly identical materials, embedment lengths, and conditions indicated on the drawings. Tests shall be made in accordance with ASTM E488 "Standard Test Methods for Strength of Anchors in Concrete and Masonry".
- B. Anchors acceptable for use on this project shall have the following minimum allowable loads (with factor of safety of 4.0) when tested with materials and conditions nearly identical to those on this project and with the embedment lengths indicated below. Values are based upon steel anchors tested in concrete having a minimum compressive strength of 2000 psi.

Anchor Diameter	Min. Embedment Depth	Allowable Loads in Pounds	
		Bond	Shear
3/8"	3-3/8"	2100	1500
1/2"	4-1/2"	3600	2200
5/8"	5-5/8"	5700	4100
3/4"	6-3/4"	8200	5000
7/8"	7-7/8"	9400	7500

Allowable tensile loads shall be based upon the tensile stress area of the rod per AISC Section 1.5 =  $0.33 F_u$   
 Allowable tensile loads for bond strengths shall be based on the following formulas:

$$\frac{F_t - 2SX}{3} \quad \text{Where } F_t = \text{Average allowable bond load determined by tests}$$

$$SX = 10\% \times F_t$$

Allowable shear loads shall be based on the following formulas:

$$\frac{F_s - 2(SX)}{3} \quad \text{Where } F_s = \text{Average allowable shear load determined by tests}$$

$$SX = 10\% \times F_s$$

- C. Permanent Anchor Testing: (This testing may be waived by the Engineer on certain products or where anchors are not of a critical nature.) After review of the test data on the anchors submitted, if anchors are to be permanently installed into the structure the anchor manufacturer shall verify and confirm the test data by conducting tests on selected sections of the existing structure to verify the adequacy of the anchor and the submittals to meet the safe allowable loads specified. Prior to approval of the anchors, a minimum of four tests each for bond and shear will be required for each size of anchor specified in the Contract Documents. The results of these tests shall certify that the anchor meets all the requirements of these specifications for the anchor to be acceptable for use on this project. These tests shall be performed by an independent testing laboratory at the Owner's expense.
  - D. Temporary Anchor Testing: Anchors temporarily installed into concrete shall not require testing. Anchors temporarily installed into brick or concrete masonry shall be tested as specified in 1.04C.
  - E. Submit three copies of the manufacturer's written instructions for installation of the adhesive anchors specified.
  - F. Submit type of equipment to be used for drilling the holes in the concrete for the adhesive anchors.
  - G. Submit type of equipment to be used for proportioning, mixing, and dispensing the epoxy gel adhesive.
  - H. Certification that the epoxy resin will not be affected by the alkalinity of the cement and that there is no shrinkage of the resin, and that the creep coefficients are insignificant.
- 1.5 **QUALIFICATIONS**
- A. Manufacturer: Epoxy resin for bonding the anchors into the existing concrete shall be of one manufacturer unless specifically noted otherwise herein.
- 1.6 **PRODUCT HANDLING**
- A. Delivery and Storage: Deliver all materials of this section to the job site in original unopened containers with all labels intact. Store only under conditions recommended by the manufacturer. Do not retain on the job site any material that has exceeded the shelf life recommended by the manufacturer.
  - B. Replacement: In the event of damage, replace as necessary to the approval of the Engineer at no additional cost to the Owner.

## **PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS:** Products meeting the requirements of this specification will be acceptable for use on this project upon approval by the Engineer. All epoxy gel, epoxy grout and epoxy mortars used on the project shall be provided by a single manufacturer.

- A. Simpson Strong Tie of Pleasanton, CA
- B. Hilti, Inc., of Tulsa, OK
- C. Sika Corp of New Jersey

## **2.2 MATERIALS**

- A. Threaded Anchor Rods: Shall be composed of AISI 316 stainless steel and shall meet the mechanical requirements of ASTM F-593 (condition CW).



- Anchor rods shall have minimum depth of embedment as indicated on details. Anchor rods shall have threads for their full length.
- B. Nuts shall be manufactured from stainless steel conforming to ASTM A594. Stainless steel washers shall be manufactured to conform to ANSI B18.22.1.
  - C. Adhesive for Epoxy Mortar: Sikadur 35 by Sika Corp
  - D. Adhesive for Anchored Bars and Rods:
    - 1. Solid concrete and solid grout filled cells:
      - a. HIT RE500 by Hilti
      - b. SET by Simpson Strong Tie.
    - 2. Cementitious substrates with voids:
      - a. HIT HY-20 by Hilti
      - b. SET by Simpson Strong Tie.
  - E. Use screens as approved and required by the manufacturers where installing anchors in substrates with voids.
  - F. Drilling Equipment: Shall be an electric percussion type rotary hammer drill using carbide bits. Drilling equipment shall be the type recommended by the manufacturer of the adhesive and shall be capable of drilling the holes to the required depth and diameter leaving a clean hole with minimal side wall residue. Air operated drilling equipment shall not discharge air into the holes while drilling unless the equipment is equipped to provide oil-free air at discharge.
  - G. Equipment for Dispensing:
    - 1. Bulk Mix and Dispensing:
      - a. Type: The equipment used to meter and mix the two injection adhesive components and inject the mixed adhesive into the hole or void shall be portable, positive displacement type pumps with interlock to provide positive ratio control of exact proportions of the two components at the nozzle. The pumps shall be electrically powered to supply the logic controller and air powered to drive the individual pumps, and shall provide in-line mixing.
      - b. Operating Pressure: Air input pressure from compressor is limited to 100 psi maximum. Pump shall have a 50 to 1 mechanical advantage ratio, thus giving up to 5000 psi discharge pressure when input pressure reaches 100 psi. Face shields and gloves are mandatory for operator of pump during operation of pump. 40 psi is standard operating pressure of compressor. At higher temperatures, line pressure can be reduced.
      - c. Ratio Tolerance: The equipment shall have the capability of maintaining the volume ratio for the injection adhesive prescribed by the manufacturer of the adhesive within a tolerance of + 5% by weight at any volume delivery and discharge pressure. Pump shall be adjustable ratio from 1:1 to 3:1 within 5% accuracy by weight.
    - 2. Hand Mix and Dispensing:
      - a. Mixing: Measuring and mixing for small quantity dispensing may be accomplished by measuring correct amounts of adhesive components into a container and mixing as directed by the adhesive manufacturer.
      - b. Dispensing: Properly mixed adhesive shall be loaded into a bulk caulking gun and dispensed into the holes. The nozzle of the caulking gun shall be long enough to begin dispensing the adhesive into the hole beginning at the bottom or rear of the hole.
    - 3. Hand held dual cartridge dispensers shall be permitted only with the specific prior approval of the project engineer. The location of epoxy dispensed from each cartridge shall be recorded. A sample of the mixed epoxy from each cartridge shall be kept and accurately recorded to include the location of application.
    - 4. Hand held circular partitioned single cartridge dispensers shall be permitted if approved by the Engineer.

**PART 3 - EXECUTION**

**3.1 PROJECT EXAMINATION:**

- A. Prior to the installation of any adhesive anchors, a qualified technical representative of the epoxy manufacturer and Contractor shall examine the site and all concrete surfaces and members to receive the anchors which adversely affect the execution of the work. Prior to beginning this work, the technical representative of the manufacturers shall provide on site instructions and technical assistance to the personnel installing the anchors on the procedures for drilling and installing the anchors. Only a contractor or subcontractor who has been trained and approved by the epoxy manufacturer will be permitted to install the epoxy gel and anchors on this project.
- B. Do not proceed with work until all unsatisfactory conditions have been corrected and the personnel have been properly trained on drilling and installing the anchors.

**3.2 HOLES FOR ANCHORS:**

- A. Locating Existing Reinforcing Steel, Conduits, Pipes, etc.: Prior to drilling the holes for anchors, the location of the existing reinforcing steel, conduits, pipes, etc. shall be accurately located with a pachometer, M-scope or other type of magnetic detecting device. The cost of locating the holes with a pachometer shall be borne by the Contractor. The Contractor shall either obtain a pachometer for his own use or shall retain a testing laboratory to locate the existing reinforcing steel with a pachometer. Where the existing reinforcing steel is located too close for the pachometer to be accurate, chip and remove the existing concrete from the surface to expose the reinforcing steel. The original drawings of the concrete showing the required location of the reinforcing steel in all the columns and beams will be made available to the Contractor. Where directed, pilot holes shall be drilled prior to drilling the holes for the anchors.
- B. Locating Holes: All holes shall be accurately located and as near as possible to the location shown on the contract drawings to miss the existing reinforcing steel. Where holes have to be shifted due to job conditions more than 1" from the location shown, notify the Engineer.

**3.3 EXECUTION OF THE WORK:**

- A. Drilling of Holes: All holes shall be drilled using only the manufacturer recommended and approved equipment to the specified depth and diameter recommended by the manufacturer for the size of anchor specified. Use a depth gage to drill hole to the specified depth. Holes shall be clean with minimal side wall residue. All holes shall be thoroughly clean of all dust, debris, and other bond inhibiting contaminants using methods and procedures recommended by the manufacturer. Holes shall be cleaned using oil-free compressed air and wire brushes. Holes shall be approved prior to installing the adhesive gel.
- B. All holes shall be inspected and approved by the Engineer or a representative of the testing laboratory prior to the installation of the anchor. Acids shall not be permitted for cleaning.
- C. After cleaning, epoxy adhesive and anchor bolts shall be placed immediately to prevent contamination of the concrete and metal.
- D. Holes that are drilled and abandoned shall be filled with a moisture insensitive epoxy mortar. Where exposed, tint the epoxy mortar to match the mortar color of the adjacent surfaces.
- E. Dispensing of epoxy adhesive shall begin at bottom or back of hole or void. Upon filling the hole with adhesive, the adhesive shall displace the fitting and pipe nozzle from the hole, without travel of adhesive past the fitting. Use screens as approved and required by the manufacturers where installing anchors in substrates with voids.
- F. Anchor bolt holes shall be filled to half to three-quarters the depth of the hole to ensure full depth contact of adhesive and anchor bolt.

- G. Placing of the anchor bolt should be done with one continuous stroke. Turn the bolt 360 degrees as it is placed to ensure that all surfaces will be in intimate contact with the epoxy adhesive. The anchor bolt shall not be moved back and forth, as this will entrap air, as does excessive turning of the anchor bolt
- H. Once the anchor bolt is installed, wooden shims shall be placed below the bolt to keep it centered in the hole. In addition to shimming, wrap the lead end of the anchor bolt with wire to keep it centered in the back of the hole.
- I. Holes drilled into brick, clay tile or concrete masonry units (CMU) shall be drilled with rotary action only. **Do not use hammer action while drilling in brick, clay tile or CMU.**

**3.4 FIELD QUALITY CONTROL:**

**A. Ratio Test:**

- 1. Method: The mixing head of the injection equipment shall be pumped simultaneously into separate calibrated containers. The amounts discharged into the calibrated containers simultaneously during the same time period shall be compared to determine that the volume discharged conforms to the manufacturer's recommended ratio for the appropriate material on a weight basis.
- 2. Frequency of Ratio Test: The ratio test shall be run for each dispensing pump at the beginning of a shift and after every meal break of every shift.

**B. Proof of Ratio Test:**

- 1. At all times during the course of the work, the Contractor shall keep complete and accurate records available to the Engineer of the ratio test specified above.
- 2. In addition, the Engineer at any time without prior notification of the Contractor, may request the Contractor to conduct the tests specified above in the presence of the Engineer.

**C. Tensile Test:**

- 1. At random the Engineer may select installed anchors for tensile testing. Anchors will be tested to 2 times design service load.
- 2. The cost of random testing shall be borne by the Owner. The first 50 anchors installed in each type of substrate shall have 20% of the anchors tested. If results are satisfactory, 5% of all additional anchors within each substrate shall be tested.

**3.5 CURING:** Curing for all anchors shall be as recommended by the manufacturer for the environmental condition at the time the anchor is installed.

**3.6 WORKMANSHIP:** Remove and replace any anchor that does not meet all the requirements of these specifications at no additional cost to the Owner.

END OF SECTION

**SECTION 05 50 00  
METAL FABRICATIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.
- B. Items specified.
  - 1. Loose Lintels
  - 2. Shelf Angles

**1.2 RELATED WORK**

- A. Colors, finishes, and textures: to be selected by Architect.
- B. Prime and finish painting: Section 09 91 00, PAINTING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
  - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
  - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
  - 3. Provide templates and rough-in measurements as required.
- C. Manufacturer's Certificates:
  - 1. Anodized finish as specified.
  - 2. Live load designs as specified.
- D. Design Calculations for specified live loads including dead loads.
- E. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

**1.4 QUALITY ASSURANCE**

- A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each product type shall be the same and be made by the same manufacturer.
- C. Assemble product to the greatest extent possible before delivery to the site.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

**1.5 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
  - B18.6.1-81(R1997).....Wood Screws
  - B18.2.2-87(R2005).....Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
  - A36/A36M-05.....Structural Steel
  - A123-02.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - A167-99(R2004).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
  - A307-07.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
  - A653/A653M-07.....Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
  - A786/A786M-05.....Rolled Steel Floor Plate

- C1107-07.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- D3656-04.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
- F436-07.....Hardened Steel Washers
- F468-06.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
- F593-02.....Stainless Steel Bolts, Hex Cap Screws, and Studs
- F1667-05.....Driven Fasteners: Nails, Spikes and Staples
- D. American Welding Society (AWS):
  - D1.1-04.....Structural Welding Code Steel
  - D1.3-98.....Structural Welding Code Sheet Steel
- E. National Association of Architectural Metal Manufacturers (NAAMM)
  - AMP 500-505-1988.....Metal Finishes Manual
  - MBG 531-00.....Metal Bar Grating Manual
  - MBG 532-00.....Heavy Duty Metal Bar Grating Manual
- F. Structural Steel Painting Council (SSPC):
  - SP 1-05.....No. 1, Solvent Cleaning
  - SP 2-05.....No. 2, Hand Tool Cleaning
  - SP 3-05.....No. 3, Power Tool Cleaning
- G. Federal Specifications (Fed. Spec):
  - RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

## **PART 2 - PRODUCTS**

### **2.1 DESIGN CRITERIA**

- A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.

### **2.2 MATERIALS**

- A. Structural Steel: ASTM A36 sized to match existing.
- B. Primer Paint: As specified in Section 09 91 00, PAINTING.
- C. Grout: ASTM C1107, pourable type.

### **2.3 HARDWARE**

- A. Fasteners:
  - 1. Bolts with Nuts:
    - a. ASME B18.2.2.
    - b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
    - c. ASTM F468 for nonferrous bolts.
    - d. ASTM F593 for stainless steel.
  - 2. Screws: ASME B18.6.1.
  - 3. Washers: ASTM F436, type to suit material and anchorage.

### **2.4 FABRICATION GENERAL**

- A. Material
  - 1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
  - 2. Use material free of defects which could affect the appearance or service ability of the finished product.
- B. Size:
  - 1. Size and thickness of members as shown.
  - 2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.
- C. Connections
  - 1. Except as otherwise specified, connections may be made by welding, or bolting.
  - 2. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
  - 3. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.

4. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
  5. Use bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
  6. Use stainless steel connectors for removable members machine screws or bolts.
- D. Fasteners and Anchors
1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
  2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
  3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
  4. Fasteners for securing metal fabrication to existing construction shall be adhesive type anchors.
- E. Workmanship
1. General:
    - a. Fabricate items to design shown.
    - b. Furnish members in longest lengths commercially available within the limits shown and specified.
    - c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
    - d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
    - e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
    - f. Prepare members for the installation and fitting of hardware.
    - g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
    - h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
  2. Welding:
    - a. Weld in accordance with AWS. Utilize semi-automatic welding where possible.
    - b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
    - c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
    - d. Finish welded joints to match finish of adjacent surface.
  3. Joining:
    - a. Miter or butt members at corners.
    - b. Where frame members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
  4. Anchors:
    - a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
    - b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
  5. Cutting and Fitting:
    - a. Accurately cut, machine and fit joints, corners, copes, and miters.

- b. Fit removable members to be easily removed.
  - c. Design and construct field connections in the most practical place for appearance and ease of installation.
  - d. Fit pieces together as required.
  - e. Fabricate connections for ease of assembly and disassembly without use of special tools.
  - f. Joints firm when assembled.
  - g. Conceal joining, fitting and welding on exposed work as far as practical.
  - h. Do not show rivets and screws prominently on the exposed face.
  - i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.
- F. Finish:
- 1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
  - 2. Steel and Iron: NAAMM AMP 504.
    - a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
    - b. Surfaces exposed in the finished work:
      - 1) Finish smooth rough surfaces and remove projections.
      - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
    - c. Shop Prime Painting:
      - 1) Surfaces of Ferrous metal:
        - a) Items not specified to have other coatings.
        - b) Galvanized surfaces specified to have prime paint.
        - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
        - d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
        - e) After cleaning and finishing, apply one coat of primer as specified in Section 09 91 00, PAINTING.
      - 2) Non ferrous metals: Comply with MAAMM-500 series.
- G. Protection:
- 1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
  - 2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

## 2.5 SUPPORTS

- A. General:
- 1. Fabricate ASTM A36 structural steel shapes as shown.
  - 2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
  - 3. Field connections may be welded or bolted.

## 2.6 SHELF ANGLES

- A. Fabricate from steel angles of size shown.
- B. Fabricate angles with horizontal slotted holes for 19 mm (3/4 inch) bolts spaced at not over 900 mm (3 feet) on centers and within 300 mm (12 inches) of ends.
- C. Provide adjustable malleable iron inserts for embedded in concrete framing.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION, GENERAL**

- A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Items set into concrete or masonry.
  - 1. Provide temporary bracing for such items until concrete or masonry is set.
  - 2. Place in accordance with setting drawings and instructions.
  - 3. Build strap anchors into masonry as work progresses.
- C. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.
- D. Field weld in accordance with AWS.
  - 1. Design and finish as specified for shop welding.
  - 2. Use continuous weld unless specified otherwise.
- E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.
- F. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.
- G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.
- H. Secure escutcheon plate with set screw.

#### **3.2 INSTALLATION OF SUPPORTS**

- A. Anchorage to structure.
  - 1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
  - 2. Secure supports to concrete inserts by bolting or continuous welding as shown.
  - 3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts unless shown otherwise.
  - 4. Secure steel plate or hat channels to studs as detailed.

#### **3.3 STEEL LINTELS**

- A. Use lintel sizes and combinations shown or specified.
- B. Install lintels with longest leg upstanding, except for openings in 150 mm (6 inch) masonry walls; install lintels with longest leg horizontal.
- C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

#### **3.4 SHELF ANGLES**

- A. Anchor shelf angles with 19 mm (3/4 inch) bolts unless shown otherwise in adjustable malleable iron inserts; set level at elevation shown.
- B. Provide expansion space at end of members.

#### **3.5 CLEAN AND ADJUSTING**

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed, prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protect from damage until completion of the project.

END OF SECTION



**SECTION 07 60 00  
FLASHING AND SHEET METAL**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Formed sheet metal work for wall and roof flashing, copings, roof edge metal, fascias, drainage specialties, and formed expansion joint covers are specified in this section.

**1.2 RELATED WORK**

- A. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- B. Paint materials and application: Section 09 91 00, PAINTING.

**1.3 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. Aluminum Association (AA):
  - AA-C22A41.....Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick
  - AA-C22A42.....Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick
  - AA-C22A44.....Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class I Architectural, 0.7-mil thick finish
- C. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
  - ANSI/SPRI ES-1-03.....Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems
- D. ASTM International (ASTM):
  - A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
  - A653/A653M-09.....Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process
  - D1187-97(R2002).....Asphalt Base Emulsions for Use as Protective Coatings for Metal
  - D4586-07.....Asphalt Roof Cement, Asbestos Free
- E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.
- F. National Association of Architectural Metal Manufacturers (NAAMM):
  - AMP 500-06.....Metal Finishes Manual
- G. Federal Specification (Fed. Spec):
  - A-A-1925A.....Shield, Expansion; (Nail Anchors)
  - UU-B-790A.....Building Paper, Vegetable Fiber
- H. International Code Commission (ICC): International Building Code, Current Edition

**1.4 PERFORMANCE REQUIREMENTS**

- A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
  - 1. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 lbf/sq. ft.): 2.87-kPa (60-lbf/sq. ft.) perimeter uplift force, 4.31-kPa (90-lbf/sq. ft.) corner uplift force, and 1.44-kPa (30-lbf/sq. ft.) outward force.
  - 2. Wind Zone 2: 1.48 to 2.15 kPa (31 to 45 lbf/sq. ft.): 4.31-kPa (90-lbf/sq. ft.) perimeter uplift force, 5.74-kPa (120-lbf/sq. ft.) corner uplift force, and 2.15-kPa (45-lbf/sq. ft.) outward force.

3. Wind Zone 3: 2.20 to 4.98 kPa (46 to 104 lbf/sq. ft.): 9.96-kPa (208-lbf/sq. ft.) perimeter uplift force, 14.94-kPa (312-lbf/sq. ft.) corner uplift force, and 4.98-kPa (104-lbf/sq. ft.) outward force.

#### **1.5 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: For all specified items, including:
  1. Flashings
- C. Manufacturer's Literature and Data: For all specified items, including:
  1. Two-piece counterflashing
  2. Through-wall flashing
  3. Expansion joint cover, each type
  4. Nonreinforced, elastomeric sheeting
- D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

### **PART 2 - PRODUCTS**

#### **2.1 FLASHING AND SHEET METAL MATERIALS**

- A. Stainless Steel: ASTM A167, Type 304, dead soft temper.
- B. Aluminum: ASTM B289, Type 3883-14, pre-finish - color to be selected by Architect.

#### **2.2 FLASHING ACCESSORIES**

- A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.
- B. Aluminum Termination Bar: 0.125 inch minimum with continuous caulk tray.
- C. Bituminous Paint: ASTM D1187, Type I.
- D. Fasteners:
  1. Use stainless steel.
- E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.
- G. Roof Cement: ASTM D4586.

#### **2.3 SHEET METAL THICKNESS**

- A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:
- B. Concealed and exposed locations (Built into Construction):
  1. Stainless steel: 26 gage minimum (0.018 inch).
- C. Thickness of aluminum is specified with each item.

#### **2.4 FABRICATION, GENERAL**

- A. Jointing:
  1. Jointing of stainless steel shall be done by lapping, and sealing as shown in Drawings.
  2. Flat and lap joints shall be made in direction of flow.
- B. Expansion and Contraction Joints:
  1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
  2. Space joints as shown or as specified.
  3. Space expansion and contraction joints for stainless steel at intervals not exceeding 7200 mm (24 feet).
  4. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
- C. Cleats:
  1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.

2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

D. Drips:

1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

**2.5 FINISHES**

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
- C. Finish exposed metal surfaces as follows, unless specified otherwise:
  1. Stainless Steel: Finish No. 2B or 2D.

**2.6 THROUGH-WALL FLASHINGS**

- A. Form through-wall as follows and as indicated on the drawings.
  1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths unless noted otherwise on drawings.
  2. Fabricate so keying nests at overlaps.
- B. For Masonry Work When Concealed Except for Drip:
  1. Stainless steel.
  2. Form exposed portions of flashing with drip, approximately 1/2 inch projection beyond wall face.
- C. For Masonry Work When Exposed Edge Forms a Receiver for Counterflashing:
  1. Use same metal and thickness as counterflashing.
  2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
  3. Form exposed portion as snap lock receiver for counterflashing upper edge.
- D. For Flashing at Architectural Precast Concrete Panels or Stone Panels.
  1. Use plan flat sheet of stainless steel.
  2. Form exposed portions with drip as specified or receiver.
- E. Window Lintel Flashing:
  1. Use stainless steel.
  2. Fabricate flashing at ends with folded corners to turn up 2 inches in first vertical masonry joint a minimum of 4 inches beyond end of lintel.
  3. Form exposed portion with drip as specified or receiver.

**2.7 COUNTER-FLASHING (CAP FLASHING OR HOODS)**

- A. Stainless steel, unless specified otherwise.
- B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:
  1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
  2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
  3. Two-piece, lock in type flashing may be used in-lieu-of one piece counterflashing.
  4. Manufactured assemblies may be used.

5. Where counterflashing is installed at new work, use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
6. Where counterflashing is installed at existing work, use surface applied type, formed to provide a space for the application of sealant at the top edge.
- C. One-piece Counterflashing:
  1. Back edge turned up and fabricated to lock into reglet in concrete.
  2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).
- D. Two-Piece Counterflashing:
  1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
  2. Counterflashing upper edge designed to snap lock into receiver.
- E. Surface Mounted Counterflashing; one or two piece:
  1. Use at existing or new surfaces where flashing cannot be inserted in vertical surface.
  2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counterflashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.
  3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.
- F. Pipe Counterflashing:
  1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
  2. Fabricate 100 mm (4 inch) over lap at end.
  3. Fabricate draw band of same metal as counterflashing. Use 0.6 Kg (24 oz) copper or 0.33 mm (0.013 inch) thick stainless steel or copper coated stainless steel.
  4. Use stainless steel bolt on draw band tightening assembly.
  5. Vent pipe counterflashing may be fabricated to omit draw band and turn down 25 mm (one inch) inside vent pipe.
- G. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. General:
  1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
  2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
  3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
  4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate.

5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.

### **3.2 THROUGH-WALL FLASHING**

#### **A. General:**

1. Install continuous through-wall flashing as shown.
2. Where exposed portions are used as a counterflashing, lap base flashings at least 150 mm (6 inches) and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counterflashing as specified.
4. Terminate exterior edge beyond face of wall approximately 1/2 inch with drip edge as shown in Drawings.
5. Lap end joints at no less than 150 mm (6 inches). Seal laps with sealant.
6. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
7. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.
8. Where ends of flashing terminate, turn ends up 2 inches and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
9. Turn flexible flashing up not less than 200 mm (8 inch) behind exterior veneer.

- #### **B. Flashing at Cavity Wall Construction:** Where flashing occurs in cavity walls, turn vertical portion up against backup under waterproofing, if any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint.

#### **C. Flashing at Veneer Walls:**

1. Install where shown.
2. Turn up against sheathing.
3. At concrete backing, extend flashing into reglet as specified.
4. Coordinate with installation of waterproofing for lap over top of flashing.

#### **D. Lintel Flashing (when not part of shelf angle flashing):**

1. Install flashing full length of lintel to nearest vertical joint a minimum of 4 inches past the end of the lintel in masonry over veneer.
2. Turn ends up 2 inches and fold corners to form dam and extend end to face of wall.
3. Install flexible flashing a minimum of 8 inches up the backup wall; terminate back edge as specified for back-up wall.

### **3.3 COUNTERFLASHING (CAP FLASHING OR HOODS)**

#### **A. General:**

1. Install counterflashing over and in conjunction with installation of base flashings, except as otherwise specified or shown.
2. Install counterflashing to lap base flashings not less than 100 mm (4 inch).
3. Install upper edge or top of counterflashing not less than 225 mm (9 inch) above top of the roofing.
4. Lap joints not less than 150 mm (6 inch). Stagger joints with relation to metal base flashing joints.

5. Use surface applied counterflashing on existing surfaces and new work where not possible to integrate into item.
  6. When fastening to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. Use screws to wood and sheet metal. Set fasteners in mortar joints of masonry work.
- B. Two-Piece Counterflashing:
1. Where receiver is installed at new masonry, coordinate to insure proper height, embed in mortar, and lap.
  2. Surface applied type receiver:
    - a. Secure to face construction in accordance with manufacturer's instructions.
    - b. Completely fill space at the top edge of receiver with sealant.
  3. Insert counterflashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.
- C. When counterflashing is a component of other flashing, install as shown.

**END OF SECTION**

**ROOF ACCESSORIES  
SECTION 07 72 00**

**PART I GENERAL**

**1.1 SUMMARY**

- A. Provide and install freestanding, non-penetrating roof edge fall protection system, including pipe railings, uprights, bases, counterweights, fittings and delivery to site.

**1.2 REFERENCE**

- A. OSHA: REGULATION 29 CFR 1910.23 (E) (1); (E) (3) (IV)
- B. OSHA REGULATION 29 CFR 1926.502 (B) (1) - (B) (14)
- C. All applicable state, local and regional codes.

**1.3 FINISH**

- A. Pipe for handrails, mid-rails, uprights and counterweight connection is to be galvanized mill finish to the requirements of ASTM A53.
- B. Fittings shall be galvanized to meet ASTM A153.

**1.4 DESIGN REQUIREMENTS**

- A. Railing shall consist of top rails, mid rails, uprights, counterweights and connections.
- B. All pipe connections to be structural pipe fittings manufactured to the requirements of ASTM A47.
- C. Railing assembly shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail. Test in accordance with OSHA Regulation 29 CFR 1910.23 (e) (1); (e) (3) (iv).

**1.5 SUBMITTALS**

- A. Shop drawing: Indicate profiles, sizes, connections, size and type of fasteners and accessories.
  - 1. Shop drawings shall be sealed by a Professional Engineer registered in the State of North Carolina.

**1.6 FIELD MEASUREMENTS**

- A. Verify field measurements prior to assembly and/or ordering.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- A. Pipe: ASTM A53 1-1/2 inch schedule 40, galvanized.
- B. Rails and Posts: 1-1/2 inch diameter steel pipe, galvanized.
- C. Fittings: Elbows, Crossovers, Wall flanges, Tees, Couplings, galvanized.
- D. Mounting Bases: Steel bases shall be galvanized and supplied with a rubber pad on underside of the component.
- E. Counterweights: Steel or UV Resistant PVC Counterweights supplied with a rubber pad on the underside of the component.
- F. Fasteners: All Fasteners shall be 304 or 305 stainless steel.

**2.2 ACCEPTABLE MANUFACTURER**

- A. Kee Safety, Inc., Buffalo, NY; P: 800-851-5181, F: 716-896-5696  
Web: [www.keesafety.com](http://www.keesafety.com)
- B. BlueWater Mfg., Inc., Chaska, MN 55318; Toll Free Tel: 866-933-2935; Tel: 952-448-2935; Fax: 952-448-3685; Web: [www.bluewater-mfg.com](http://www.bluewater-mfg.com)

**PART 3 EXECUTION**

**3.1 INSTALLATION**

1. Placement of uprights and counterweights to meet manufacturer's written installation instructions and specifications.
2. Terminate the run as stated in the manufacturer's written installation instructions and specifications.

**3.2 SCHEDULES**

- A. Freestanding counterweighted guardrail system with 42" nominal height to provide a pedestrian egress barrier on the roof which withstands a minimum load of 200 lbs. in any direction applied to the top rail per OSHA: Regulation 29 CFR 1910.23 (e) (1); (e) (3) (iv), OSHA Regulation 29 CFR 1926.502 (b) (1) - (b) (14).

**END OF SECTION**



**SECTION 07 92 00**  
**JOINT SEALANTS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Section covers all sealant and caulking materials and their application, wherever required for complete installation of building materials or systems.

**1.2 RELATED WORK**

- A. Masonry control and expansion joint.
- B. Perimeter Sealant Joints at windows, doors, and louvers.
- C. At joints in pre-cast concrete, limestone, and other stone.

**1.3 QUALITY CONTROL**

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
  - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
  - 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
  - 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:
  - 1. Locate test joints where indicated or, if not indicated, as directed by Engineer or Contracting Officer.
  - 2. Conduct field tests for each application indicated below:
    - a. Each type of elastomeric sealant and joint substrate indicated.
  - 3. Notify COTR seven days in advance of dates and times when test joints will be erected.
  - 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
- E. VOC: Silicone sealants shall have less than 50g/l VOC content.
- F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
  - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this section.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.

D. Manufacturer's Literature and Data:

1. Primers
2. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

**1.5 PROJECT CONDITIONS**

A. Environmental Limitations:

1. Do not proceed with installation of joint sealants under following conditions:
  - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 °C (40 °F).
  - b. When joint substrates are wet.

B. Joint-Width Conditions:

1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions:

1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

**1.6 DELIVERY, HANDLING, AND STORAGE**

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures exceeding 32° C (90° F) or less than 5° C (40° F).

**1.7 DEFINITIONS**

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Back-up Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

**1.8 WARRANTY**

- A. Warranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be extended to ten years.
- B. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

**1.9 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  1. C509.....Elastomeric Cellular Preformed Gasket and Sealing Material.
  2. C612.....Mineral Fiber Block and Board Thermal Insulation.
  3. C717.....Standard Terminology of Building Seals and Sealants.
  4. C920.....Elastomeric Joint Sealants.
  5. C1021.....Laboratories Engaged in Testing of Building Sealants.
  6. C1193.....Standard Guide for Use of Joint Sealants.

- 7. C1330.....Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- 8. D1056.....Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.
- 9. E84.....Surface Burning Characteristics of Building Materials.
- C. Sealant, Waterproofing and Restoration Institute (SWRI).  
The Professionals' Guide

## **PART 2 - PRODUCTS**

### **2.1 SEALANTS**

- A. For all exterior sealant joint installation:
  - 1. ASTM C920, low dirt pick-up silicone, neutral cure.
  - 2. Type S.
  - 3. Class: Joint movement range of plus 50 percent to minus 50 percent.
  - 4. Grade NS.
  - 5. Shore A hardness of 35.
  - 6. Minimum elongation of 900 percent.

### **2.2 COLOR**

- A. Sealants used with exposed masonry shall match color of mortar joints.
- B. Sealants used with unpainted concrete shall match color of adjacent concrete.
- C. Color of sealants for other locations shall be approved by Architect.

### **2.3 JOINT SEALANT BACKING**

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
  - 1. Type C: Closed-cell material with a surface skin.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

### **2.4 FILLER**

- A. Mineral fiber board: ASTM C612, Class 1.
- B. Thickness same as joint width.
- C. Depth to fill void completely behind back-up rod.

### **2.5 PRIMER**

- A. As recommended by manufacturer of sealant material.
- B. Stain free type.

### **2.6 CLEANERS - NON POUROUS SURFACES**

Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION**

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

### 3.2 PREPARATIONS

- A. Prepare joints in accordance with manufacturer's instructions and SWRI.
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
  - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
  - 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
    - a. Metal.
    - b. Glass.
    - c. Glazed surfaces of ceramic tile.
    - d. Granite.
- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
  - 1. Apply primer prior to installation of back-up rod or bond breaker tape.
  - 2. Use brush or other approved means that will reach all parts of joints.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

### 3.3 BACKING INSTALLATION

- A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
- D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.
- E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

### 3.4 SEALANT DEPTHS AND GEOMETRY

- A. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface. See typical details for additional information.

### 3.5 INSTALLATION

#### A. General:

1. Apply sealants and caulking only when ambient temperature is between 5° C and 38° C (40° and 100° F).
2. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
3. Apply sealing compound in accordance with manufacturer's printed instructions.
4. Avoid dropping or smearing compound on adjacent surfaces.
5. Fill joints solidly with compound and finish compound smooth.
6. Tool joints to concave surface unless shown or specified otherwise.
7. Apply compounds with nozzle size to fit joint width.
8. Test sealants for compatibility with each other and substrate. Use only compatible sealant.

B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.

### 3.6 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as recommended by sealant manufacturer:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
  - a. Perform 10 tests for first 300 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
  - b. Perform one test for each 300 m (1000 feet) of joint length thereafter or one test per each floor per elevation.

B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

C. Inspect tested joints and report on following:

1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
2. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
3. Whether sealants filled joint cavities and are free from voids.
4. Whether sealant dimensions and configurations comply with specified requirements.

D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

**3.7 CLEANING**

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.
- B. After filling and finishing joints, remove masking tape.
- C. Leave adjacent surfaces in a clean and unstained condition.

**END OF SECTION**

**SECTION 09 91 00  
PAINTING**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED:** Furnish all materials, labor and equipment to provide painting of new structural steel shapes and existing steel shapes exposed during masonry repairs.

**1.2 QUALITY CONTROL**

- A. References: Some products and execution are specified in the Section by reference to published Specifications or Standards of the following (with respective abbreviation used):
  - 1. American Society for Testing and Materials (ASTM)
  - 2. The Corrosion Society (NACE)
  - 3. The Society for Protective Coatings (SSPC)
- B. Standard References: Current edition of the following Standards shall apply to all work included in this Section. All materials, application of materials, and surface preparation shall comply with these references and codes (unless otherwise excepted in the Drawings or Specifications.)
  - 1. SSPC PA-1 Shop, Field, and Maintenance Painting of Steel
  - 2. SSPC SP-1 Solvent Cleaning
  - 3. SSPC VIS3 SP-3/PWB/SD/NG
  - 4. SSPC SP-3 Power Tool Cleaning
  - 5. SSPC SP-6 Commercial Blast Cleaning
  - 6. ASTM D4414 Practice for Measurement of Wet Film Thickness by Notch Gages
  - 7. ASTM D3359 Test Method for Measuring Adhesion by Tape Test

**1.3 DEFINITIONS:** "Paint" (as used in this Section) means all coating systems and materials (including primers, emulsions, enamels, sealers, fillers and other materials) used as prime, intermediate and finish coats.

**1.4 SUBMITTALS**

- A. List of Materials: Submit list of all materials proposed for use for work of this Section, including Manufacturer's name, brand name, and catalog number.
- B. Submit Manufacturer's printed product data and MSDS on each material proposed for use for work of this Section. Product data shall state technical, physical and performance data; recommended sealers and prime coats; recommended intermediate and finish coats; recommended dry-film thickness per coat; solids by volume; and coverage per gallon per thickness (dry film).
- C. Submit manufacturer's printed instructions for surface preparation, cleaning, application, and drying time for products for use in work of this section.
- D. Samples:
  - 1. Contractor shall submit a set of color selection chips for use in selecting colors.
  - 2. Before any work is performed at the site, Architect will furnish Contractor with approved colors from color chips submitted.
  - 3. Before any work is performed, the Contractor shall provide actual paint samples on an 8" square panel. Panels shall be as follows:
    - a. Step coats on sample to show each coat required for the specified system.
    - b. Label each coat.

**1.5 DELIVERY, STORAGE AND HANDLING**

- A. Materials shall be delivered to project site in Manufacturer's original sealed packages, with labels intact and legible, and with seals unbroken.

- B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45° F.
- C. Maintain containers in clean condition, free from foreign materials and residue.
- D. Remove and dispose of rags and waste from storage area on a daily basis.
- E. Materials shall be handled and used in accordance with SSPC PA-1 Sections 5.1. Containers for primer and finish paints shall be no larger than 5 gallons and containers for repair (touch-up) paints shall be no larger than 1 gallon.

**1.6 ENVIRONMENTAL CONDITIONS**

- A. No work shall be performed under conditions which are unsuitable for production of good results.
- B. Do not apply paint when temperatures of substrates or of ambient air are below 50°F or when surface temperatures exceed 95°F.
- C. Do not apply paint in space where dust is being generated that would speck finish or apply paint on exterior in damp, rainy weather. Do not paint when relative humidity is above 85% or when temperatures are less than 5°F ± above the dew point.

**1.7 PROJECT CONDITIONS AND PROTECTION**

- A. No work shall be performed under conditions that are unsuitable for production of good results or violate the conditions recommended by SSPC PA-1 Section 16.
- B. Unless the Manufacturer's recommendations (or SSPC PA-1) are more restrictive, do not apply paint when temperatures of substrates or of ambient air are below 50°F or when surface temperatures exceed 120°F. Do not paint when relative humidity is above 90%.
- C. Do not apply paint in space where dust is being generated that would speck finish or apply paint on exterior in damp, rainy weather.
- D. Do not apply paint under conditions that violate any of the written requirements or limitations established by the paint Manufacturer.
- E. Contractor shall provide ample protection for and take particular care to protect adjoining surfaces, equipment, hardware, fixtures, and materials of all kinds. Contractor shall provide ample protection for and take particular care to protect building occupants and visitors including their personal property such as automobiles, etc.
- F. Scaffolding and staging required for the proper execution of the work shall be erected, maintained, and removed by the Contractor in a safe and careful manner using ladders or metal staging as required. Extreme care shall be taken in fastening, bracing, and handling the staging or scaffolding to avoid scratching or damaging interior walls, floors, furnishings or exterior walls, gutters, roof surfaces or equipment, etc.

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Approved Manufacturer: Except as specified otherwise, brand name products of one Manufacturer are named herein to establish quality and design standards for painting materials.
- B. Acceptable Manufacturers:
  - 1. Benjamin Moore & Company
  - 2. Duron Paints & Wall Coverings
  - 3. Glidden Professional
  - 4. Sherwin-Williams Company
  - 5. International Protective Coatings
  - 6. MAB Paints
  - 7. Carboline Company
  - 8. Tnemec Company



## 2.2 MATERIALS

- A. All materials shall be from same Manufacturer and designed for use as a total system for the indicated substrate.
- B. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials Manufacturers. Materials not displaying Manufacturer's identification as a standard, best-grade product will not be acceptable.
- C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
- D. Provide materials for use within each paint system that are compatible with one another and substrates indicated under conditions of service and application as demonstrated by the Manufacturer based on testing and field experience.
- E. For each coat in paint system, provide products recommended in writing by the Manufacturer of topcoat for use in paint system and on substrate indicated.

## 2.3 PAINT SCHEDULE

- A. Coating System for New Steel - Exterior Exposed Steel (Shelf Angles): Shall be shop-applied for permanent structural plates and shapes shall be equivalent to products by Sherwin-Williams Company as follows:
  - 1. One coat of Zinc Clad II LV shop applied primer at 5.0 mils WFT minimum (3.0 mils DFT minimum).
  - 2. Prior to field application of topcoat, prepare and coat all damaged areas and weld with: 1 coat of Zinc Clad III HS field applied primer at 8.0 mils WFT minimum (4.5 mils DFT minimum).
  - 3. One coat of Fast Clad HB Acrylic field applied topcoat at 17.0 mils WFT minimum (6.5 mils DFT minimum).
- B. Field-applied coating for existing steel where existing steel is exposed during repairs and is found to be corroded or the existing coating is damaged. Field-apply as follows:
  - 1. Primer: Apply two (2) coats of Omnithane Series 530 by Tnemec Company, Inc. at 3 mils DFT each coat. This coating can be applied with a brush. This coating is a one-component, aluminum pigmented, corrosion inhibitive, surface tolerant, Moisture-Cured Aromatic Urethane primer having a minimum of 51% solids by volume. Where painted surface is enclosed within the wall, no topcoat is required.
  - 2. Topcoat: Where painted surface with Omnithane Series 530 is exposed to view (underside of shelf angles), topcoat with two (2) coats of Endura-Shield Series 73 by Tnemec Company, Inc. at 3 mils DFT each coat. Topcoat primer within 24 hours or scarify surface per manufacturer's directions prior to applying topcoat. Color to be selected by Architect.
- C. Field-applied coating for existing louvers. Field-apply as follows:
  - 1. Apply two (2) coats of DTM Acrylic Primer/Finish, B66W1, by Sherwin-Williams Company or approved equal at 5.0 mils DFT each coat.

## 2.4 TOUCH-UP PAINTING

- A. Provide touch-up in the field on all steel and weld surfaces that are nicked or abraded during shipping, handling and erection and all surfaces that are field welded. Clean welds and other surfaces requiring touch-up in accordance with SSPC-SP3, "Power Tool Cleaning". Use appropriate touch-up for paint specified above.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Contractor must examine areas and conditions under which painting work is to be applied and notify Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed

with work until unsatisfactory conditions have been corrected in a manner acceptable to Contractor and Architect.

- B. Starting of painting work will be construed as Contractor's acceptance of surfaces and conditions within any particular area.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.
- D. Verify suitability of substrate, including surface conditions and compatibility with existing finishes and primers.
- E. Allow proper cure of newly installed sealant prior to installing specified primer.

### 3.2 SURFACE PREPARATION

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified for each particular substrate condition. The contractor shall not paint over any contaminated surface or loosely adhering paint (paint that does not meet a 3A-ASTM D 3359 rating for exterior steel or a 2A-ASTM D3359 for wood).
- B. Steel Substrates: Existing steel exposed during repairs shall be cleaned in accordance with the more stringent requirements of 1) SSPC-SP3, "Power Tool Cleaning" or 2) the Paint Manufacturer's written requirements. Prior to applying topcoats, clean damaged areas and welds in accordance with the more stringent requirements of 1) SSPC-SP3, "Power Tool Cleaning" or 2) the Paint Manufacturer's written requirements. Adhesion shall be confirmed to be a 3A - ASTM D 3359 rating or better prior to installation of field coating.
- C. Mix and prepare painting materials in accordance with manufacturer's directions.
- D. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- E. Stir materials before application to produce a mixture of uniform density and stir as required during application. Do not stir surface film into material. Remove film and if necessary strain material before using.

### 3.3 APPLICATION

- A. General: Apply paint in accordance with Manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
  - 1. Provide finish coats which are compatible with prime paints used.
  - 2. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
  - 3. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges and corners, receive a dry film thickness equivalent to that of flat surfaces.
  - 4. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, or other surface imperfections. Cut in sharp lines and color breaks.
- B. Minimum Coating Thickness: Apply materials at not less than Manufacturer's recommended spreading rate to establish a total dry film thickness as indicated, or if not indicated, as recommended by coating Manufacturer.

**3.4 CLEAN-UP AND PROTECTION**

- A. Clean-up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each workday.
- B. Upon completion of painting work, clean window glass and other paint-splattered surfaces. Remove splattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by the Engineer. Leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

**SECTION 09 97 30**  
**SOL SILICATE STAIN**

**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

A. Drawings and general provisions of the Contract, including General Conditions, Division 01 - GENERAL REQUIREMENTS, and other applicable specification sections in the Project Manual apply to the work specified in this Section.

**1.2 SUMMARY**

A. Section Includes: This is a specification for the products of the KEIM Concretal system in a common workflow for the maintenance or restoration of masonry.

B. Related Sections: Related sections include the following:

1. Section 04012 - Repair of Unit Masonry

**1.3 REFERENCES**

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

B. ASTM (ASTM):

1. ASTM E 96, "Standard Test Methods for Water Vapor Transmission of Materials."
2. ASTM E 514, "Standard Test Method for Water Penetration and Leakage through Masonry."
3. ASTM G 154, "Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials."
4. ASTM E84-05, "Standard Test Method for Surface Burning Characteristics of Building Materials."

C. Deutsches Institut für Normung (DIN), European Standard (EN), and International Organization for Standardization (ISO):

1. DIN 18 363 2.4.1, manufacturing standard for silicate dispersion paint.
2. DIN EN 13 300, manufacturing standard for interior silicate dispersion paint.
3. DIN EN 1062, manufacturing standard for sol silicate dispersion paint.
4. ISO 11998, "Paints and varnishes - Determination of wet-scrub resistance and cleanability of coatings."
5. ISO 6504-3, "Paints and varnishes - Determination of hiding power - Part 3: Determination of contrast ratio of light-colored paints at a fixed spreading rate."
6. ISO 2813, "Paints and varnishes - Determination of specular gloss of non-metallic paint films at 20 degrees, 60 degrees and 85 degrees."
7. EN 1062-3, "Paints and varnishes - Coating materials and coating systems for exterior masonry and concrete - Part 3: Determination of liquid water permeability."
8. DIN EN 1504-2, "Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity - Part 2: Surface protection systems for concrete."
9. DIN EN ISO 7783-2, "Coating materials and coating systems for exterior masonry and concrete - Part 2: Determination and classification of water-vapor transmission rate (permeability)."
10. DIN 4102-A2, "Fire Behavior of Building Materials and Building Components - Part 2: Building Components; Definitions, Requirements and Tests."
11. DIN 18363, "Construction Contract Procedures (VOB) Part C: General Technical Specifications in Construction Contracts (ATV) Painting and Varnishing."

12.DIN EN 998-1, Manufacturing standard for mortar for masonry - Part 1: Rendering and plastering mortar.

13.DIN V 18550, Strength standard for render and rendering systems.

D. WTA, acronym for International Association for Science and Technology of Building Maintenance and Monuments Preservation, [www.wta.de/en](http://www.wta.de/en).

1. Technical Bulletin 3-11-97/D, Natural stone restoration after WTA III: Filling of blocks with restoration mortar/stone substitutes.

#### 1.4 DEFINITIONS

A. Water repellency, silane based: Solvent-free silane-based water repellency applied to masonry surfaces prior to over-coating with a silicate stain base coat for weathering protection.

B. Application Ratio: A mixture of silicate stain and dilution expressed as a ratio of one to the other to achieve the proper color translucency for the silicate stain base and top coats.

C. Silicate Stain, base coat: The first applied coat of the sol silicate stain.

D. Silicate Stain, top coat: The second applied coat of the sol silicate stain.

E. Coating: Silicate coating, coatings, and stain refer to the Silicate Stain.

F. Backer Rod: A water-repellent, closed-cell foam rod.

G. Bond Breaker Tape: A polyethylene tape.

H. Caulk: A flexible joint material.

#### 1.5 SYSTEM DESCRIPTION

A. A materials-compatible highly vapor permeable mineral restoration system offering severe weathering protection and long life for exterior exposure. Install over mineral surfaces.

1. Water Repellency, silane based: Solvent-free liquid silane water repellency applied to mineral substrates. Provides weathering protection when over-coated within four hours with a silicate stain. Silicate stain protects repellency from UV degradation. Does not impede vapor permeability. Will not change appearance of treated surfaces.

2. Silicate Stain: An incombustible two coat system with UV and alkaline resistant inorganic pigments comprising one sol silicate mineral stain base coat and one sol silicate mineral stain top coat mixed in the specified dilution-to-stain ratio and color. Stain penetrates the surface and in a chemical reaction with the substrate results in covalent and mechanical bonding forming a hard amorphous microporous layer with extremely high vapor permeability that is unaffected by acids, UV exposure, or air-borne pollutants.

3. Backer Rod, Bond Breaker Tape, and Caulk: An installation of an appropriate diameter closed-cell foam rod that fits tightly against the sides and bottom of a gap between two indifferent elements of a wall to provide an even depth and support for the Caulk. The balance of the gap is filled flush to the surface with a flexible caulk that adheres to the sides of the gap to create a water-tight and air-tight seal. For joints too shallow for backer rod, bond breaker tape is placed at the bottom of the gap. Caulking will not stick to the backer rod or bond breaker tape preventing 3-point contact thereby allowing free and independent movement of the building materials.

#### 1.6 SUBMITTALS

A. General: Submit under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Provide published documentation describing materials, characteristics, and limitations.

## C. Samples:

1. Submit samples for initial color and/or texture selection. Submit samples of each specified finish. Submit samples in form of manufacturer's color charts showing full range of colors and finishes available. Where finishes involve normal color variations, include samples showing the full range of variations expected.
2. Submit samples for verification purposes. Additional samples may be required to show fabrication techniques and workmanship.

D. Manufacturer's Instructions: Submit manufacturer's instructions including technical data sheets, material safety data sheets, mixing instructions, application requirements, special procedures, and conditions requiring special attention.

**1.7 QUALITY ASSURANCE**

## A. Qualifications:

1. Manufacturer Qualifications: Provide evidence that Manufacturer is a firm engaged in the manufacture of the required products, and whose products have been in satisfactory use in similar service for a minimum of ten years.
2. Applicator Qualifications: Provide evidence Applicator is a firm having a minimum of three years of successful application experience with projects similar in type and scope to that required for this Project, and approved by the manufacturer.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

C. Mock-Ups: Prior to application of the work, fabricate and erect mock-ups for each type of finish and application required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of work. Locate mock-ups on site in location and of size indicated or, if not indicated, as directed by the Architect. Demonstrate the proposed range of aesthetic effects and workmanship to be expected in the completed work. Obtain the Architect's acceptance of mock-ups before start of final unit of work.

1. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of work.

a. Accepted mock-ups in undisturbed condition at time of Substantial Completion may become part of completed unit of work.

D. Pre-Application Conference: Prior to commencing the application, meet at the Project site to review the material selections, application procedures, and coordination with other trades. Review mock-ups during the pre-application conference. Coordinate with the Owner and the Architect to establish the date and time of the pre-application conference with the Contractor, the Applicator, manufacturer's representatives, and any trade that requires coordination with the work.

**1.8 DELIVERY, STORAGE, AND HANDLING**

A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

**1.9 PROJECT CONDITIONS**

- A. Environmental Requirements: Do not apply silicate stain until surfaces are cleaned, substrate repairs are complete and cured, and wet work is completed and nominally dry.
1. Substrate and ambient air temperature must be between 41 °F (5 °C) and 86 °F (30 °C). Maintain temperature during and after application.
  2. Protect surfaces from rain, high winds, and solar heating from direct sun during application.

**1.10 WARRANTY**

- A. Special Warranty: Contractor warrants the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for the period indicated below. Provide a special warranty extending the one year period of limitations contained in the General Conditions countersigned by the Applicator and the manufacturer.
1. Warranty Period: Warranty period from date of Substantial Completion is 1 year for all listed products with exception for the silicate stain which has a warranty period of 15 years from date of Substantial Completion.
- B. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Basis of Design: Items specified establish a standard of quality for design, function, compatibility, and appearance that comprise a compatible system for performance and warranty. Substitutions are not allowed. To ensure quality assurance, the Architect shall be the sole judge of a substitution request.
- B. KEIM Mineral Coatings of America, Inc., 10616 Texland Blvd. #600, Charlotte, North Carolina 28273. Telephone 704-588-2811. Email keim-info@keim.com.

**2.2 MATERIALS**

- A. Water Repellency, silane based: A silane based solvent-free water repellency with 100% active ingredients. Produces a silica gel micro-coating within the capillaries of the substrate by a chemical reaction with the humidity of the air and of the substrate. The silica gel coating breaks surface tensions preventing water and salts migration yet maintains water vapor diffusion of substrate. May be over-coated to further protect from UV degradation with a silicate stain or coating for additional weathering protection. Will not change appearance of treated surfaces. No VOC.
1. Basis of Design: "KEIM Silan 100", KEIM Mineral Coatings of America, Inc.
- B. Silicate Stain, Base Coat and Top Coat: Sol silicate based stain in the specified color, conforming to DIN EN 1504-2/2.2. No biocides. Meets Non-flammable standard DIN 4102-A2. ASTM E 96 Vapor Permeability - 77 perms, ASTM G 154 Accelerated Weathering - no fading, cracking, peeling, ASTM E 514 62-MPH Wind-Driven Rain Test - no water penetration. Less than 1 g/l VOC.
1. Basis of Design: "KEIM Concretal Lasur", KEIM Mineral Coatings of America, Inc.

C. Dilution for Silicate Stain: Provide sol silicate dilution that is designed for the sol silicate stain system. Meets Non-flammable standard DIN 4102-A2. Less than 1g/l VOC.

1. Basis of Design: "KEIM Concretal Dilution", KEIM Mineral Coatings of America, Inc.

## **2.3 EQUIPMENT**

A. Tools:

1. Water Repellency: Apply by natural bristle brush, roller, or low pressure Hudson-type sprayer. Clean with white spirits or benzene immediately after use.
2. Silicate Stain: Mix with typical paint mixing equipment. Apply by natural bristle oval Lasur brush, professional roller, or professional airless spray equipment with automated pot stirrer and back-roll as required for even distribution. Clean up with water.

## **2.4 FINISHES**

A. Water Repellency: Apply full coverage wet coats sponging off material that is not absorbed.

B. Silicate Stain; Base and Top Coats: Apply evenly to a smooth mineral matte finish without voids, "holidays", or drips.

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

A. Verification of Conditions: Examine areas and conditions under which the work is to be applied, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Verify substrate is secure, sound, dry, and absorbent, and free of dust, dirt, grease, salts, oil based paints, release agents, and other bond breakers.
2. Verify substrate has no pretreatments or priming materials applied.
3. Verify materials to be coated are fully cured to manufacturer recommendations.
4. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Applicator.

## **3.2 PREPARATION**

A. Protection: Lay ground cloths and take measures as necessary to protect surfaces subject to contact by products specified by this Section.

B. Substrate: Prepare using products or materials described in the MATERIALS Article.

## **3.3 APPLICATION**

A. Conform to reviewed product data, manufacturer's written instructions, and provisions of the Contract Documents.

B. Plan the work properly.

1. Do not apply water repellency over damp substrate or on sun heated substrate.
2. Work ahead of the sun on shaded facades.
3. Work to logical stopping points (corners, seams, architectural features, etc.).
4. Apply stains maintaining a wet edge to desired finish as indicated in FINISHES Article.
5. Unless otherwise stated below, protect from wind and rain prior to, during, and for a minimum 24 hours after application.

C. Determine Application Ratio:

1. Prepare sample material of silicate stain and silicate dilution in a ratio as directed by KEIM representative for equalization test. Stir well for one minute using 600-800 RPM mixing equipment.



2. Apply sample material to substrate to evaluate equalizing effect. Adjust ratio as determined to obtain Application Ratio. Test by trial application to achieve desired optical equalization in two coats applied minimum 24 hours apart. Evaluate to approve result after final coat has cured minimum 12 hours.

D. Water Repellency, silane based:

1. Note special application condition: Do not apply water repellency to an area larger than can be over-coated within 4 hours with the silicate base stain. Refer to product manufacturer's representative.
2. Verify surfaces to be treated are dust free, dry, and absorbent.
3. Apply to saturation by flooding over substrate. Repeat application after 4 hours to 24 hours. Wipe unabsorbed material from substrate.
4. Allow 4 hours for repeat application of repellency to penetrate and immediately begin application of silicate stain base coat.

E. Silicate Stain:

1. Base Coat: Prepare base coat material using approved Application Ratio to determine mixture of silicate stain and silicate dilution.
2. Stir well by hand or 600-800 RPM mixing equipment to ensure color is uniform throughout the material. Keep mixture stirred during application.
  - a. Apply base coat of silicate stain.
  - b. Allow minimum 24 hours drying time.
3. Top Coat: Prepare top coat material using approved Application Ratio to determine mixture of silicate stain and silicate dilution. Stir well by hand or 600-800 RPM mixing equipment to ensure color is uniform throughout the material. Keep mixture stirred during application.
  - a. Apply top coat of silicate stain.

F. Caulk:

1. Clean and dimension joints to accept a caulk bead measuring approximately 3/16 inch to 1/4 inch wide and a depth of one-half the width.
2. Clean and prime surfaces as required for bonding with the caulk. Ensure all debris and soiling is removed.
3. Insert backer rod to a depth that is one-half the width of the gap to receive the caulk. Use backer rod 25 percent greater diameter than gap width.
4. For caulk joints that are too shallow to receive both backer rod and caulk, place bond breaker tape at bottom of joint.
5. Place caulk in joint flush and smooth with surface.
6. Allow to fully cure 7 to 21 days depending on temperature and humidity.

### 3.4 FIELD QUALITY CONTROL

- A. Testing: The Owner reserves the right to invoke test procedures at any time and as often as the Owner deems necessary during the period when coatings are being applied. Tests include, but are not limited to, material analysis and coating thickness.
1. The Owner may engage the services of an independent inspecting and testing agency to sample the material being used. Samples of material delivered to the Project may be taken, identified, sealed, and certified in the presence of the Contractor.
  2. The inspecting and testing agency will perform appropriate tests for listed characteristics as required by the Owner.

3. The Owner may direct the Contractor to stop the work if test results show material being used does not comply with specified requirements. The Contractor is responsible to remove non-complying product from the site, pay for testing, and recoat surfaces previously coated with the rejected material. If necessary, the Contractor may be required to remove rejected material from previously coated surfaces if, on recoating with specified material, the two coatings are incompatible.
  - B. Repairs: Correct deficiencies in or remove work that does not comply with requirements, repair substrates, and reapply coating.
  - C. Additional Testing: Additional testing performed to determine compliance of corrected work with requirements shall be at the Contractor's expense.
- 3.5 CLEANING**
- A. Clean tools, spills, and accidental drips immediately with plenty of water.
  - B. Leave applications clean and premises free from residue and debris from work of this Section.
- 3.6 PROTECTION**
- A. Provide final protection and maintain conditions in a manner acceptable to the Applicator to ensure silicate stains are without damage at time of Substantial Completion.

END OF SECTION

**SECTION 26 05 11**  
**REQUIREMENTS FOR ELECTRICAL INSTALLATIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section applies to all sections of Division 26.
- B. Furnish and install electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings.
- C. Aluminum conductors are prohibited.

**1.2 MINIMUM REQUIREMENTS**

- A. References to the International Building Code (IBC), National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL) and National Fire Protection Association (NFPA) are minimum installation requirement standards.
- B. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.

**1.3 TEST STANDARDS**

- A. All materials and equipment shall be listed, labeled or certified by a nationally recognized testing laboratory to meet Underwriters Laboratories, Inc., standards where test standards have been established. Equipment and materials which are not covered by UL Standards will be accepted provided equipment and material are listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.
- B. Definitions:
  - 1. Listed; Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed equipment or materials or periodic evaluation of services, and whose listing states that the equipment, material, or services either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
  - 2. Labeled; Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
  - 3. Certified; equipment or product which:
    - a. Has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.
    - b. Production of equipment or product is periodically inspected by a nationally recognized testing laboratory.
    - c. Bears a label, tag, or other record of certification.
  - 4. Nationally recognized testing laboratory; laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

**1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)**

- A. Manufacturer's Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.

B. Product Qualification:

1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
2. The Government reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

**1.5 APPLICABLE PUBLICATIONS**

Applicable publications listed in all Sections of Division are the latest issue, unless otherwise noted.

**1.6 MANUFACTURED PRODUCTS**

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts shall be available.
- B. When more than one unit of the same class or type of equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
  1. Components of an assembled unit need not be products of the same manufacturer.
  2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
  3. Components shall be compatible with each other and with the total assembly for the intended service.
  4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Testing Is Specified:
  1. The Government shall have the option of witnessing factory tests. The contractor shall notify the VA through the Resident Engineer a minimum of 15 working days prior to the manufacturers making the factory tests.
  2. Four copies of certified test reports containing all test data shall be furnished to the Resident Engineer prior to final inspection and not more than 90 days after completion of the tests.
  3. When equipment fails to meet factory test and re-inspection is required, the contractor shall be liable for all additional expenses, including expenses of the Government.

**1.7 EQUIPMENT REQUIREMENTS**

Where variations from the contract requirements are requested in accordance with Section 00 72 00, GENERAL CONDITIONS and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

**1.8 EQUIPMENT PROTECTION**

- A. Equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
  1. Store equipment indoors in clean dry space with uniform temperature to prevent condensation. Equipment shall include but not be limited to switchgear, switchboards, panelboards, transformers, motor control centers, motor controllers, uninterruptible power systems, enclosures, controllers, circuit protective devices, cables, wire, light fixtures, electronic equipment, and accessories.
  2. During installation, equipment shall be protected against entry of foreign matter; and be vacuum-cleaned both inside and outside before

testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.

3. Damaged equipment shall be, as determined by the Resident Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
5. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

#### **1.9 WORK PERFORMANCE**

- A. All electrical work must comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J, OSHA Part 1910 subpart S and OSHA Part 1910 subpart K in addition to other references required by contract.
- B. Job site safety and worker safety is the responsibility of the contractor.
- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:
  1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
  2. Electricians must wear personal protective equipment while working on energized systems in accordance with NFPA 70E.
  3. Before initiating any work, a job specific work plan must be developed by the contractor with a peer review conducted and documented by the Resident Engineer and Medical Center staff. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used and exit pathways.
  4. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the Resident Engineer.
- D. For work on existing stations, arrange, phase and perform work to assure electrical service for other buildings at all times. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.
- E. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.
- F. Coordinate location of equipment and conduit with other trades to minimize interferences.

#### **1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS**

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working spaces shall not be less than specified in the NEC for all voltages specified.
- C. Inaccessible Equipment:
  1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
  2. "Conveniently accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

#### **1.11 EQUIPMENT IDENTIFICATION**

- A. In addition to the requirements of the NEC, install an identification sign which clearly indicates information required for use and maintenance of

items such as switchboards and switchgear, panelboards, cabinets, motor controllers (starters), fused and unfused safety switches, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.

- B. Nameplates for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Nameplates for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 1/2 inch [12mm] high. Nameplates shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.
- C. Install adhesive arc flash warning labels on all equipment as required by NFPA 70E. Label shall indicate the arc hazard boundary (inches), working distance (inches), arc flash incident energy at the working distance (calories/cm<sup>2</sup>), required PPE category and description including the glove rating, voltage rating of the equipment, limited approach distance (inches), restricted approach distance (inches), prohibited approach distance (inches), equipment/bus name, date prepared, and manufacturer name and address.

#### 1.12 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. The Government's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.
- C. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Government to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
  - 1. Mark the submittals, "SUBMITTED UNDER SECTION \_\_\_\_\_".
  - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
  - 3. Submit each section separately.
- E. The submittals shall include the following:
  - 1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
  - 3. Elementary and interconnection wiring diagrams for communication and signal systems, control systems and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
  - 4. Parts list which shall include those replacement parts recommended by the equipment manufacturer.
- F. Manuals: Submit in accordance with Section 01 00 00, GENERAL REQUIREMENTS.
  - 1. Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of systems or equipment test, and furnish the remaining manuals prior to contract completion.
  - 2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in

- the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
  4. The manuals shall include:
    - a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
    - b. A control sequence describing start-up, operation, and shutdown.
    - c. Description of the function of each principal item of equipment.
    - d. Installation instructions.
    - e. Safety precautions for operation and maintenance.
    - f. Diagrams and illustrations.
    - g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers and replacement frequencies.
    - h. Performance data.
    - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
    - j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.
  - G. Approvals will be based on complete submission of manuals together with shop drawings.
  - H. After approval and prior to installation, furnish the Resident Engineer with one sample of each of the following:
    1. A 300 mm (12 inch) length of each type and size of wire and cable along with the tag from the coils of reels from which the samples were taken.
    2. Each type of conduit coupling, bushing and termination fitting.
    3. Conduit hangers, clamps and supports.
    4. Duct sealing compound.
    5. Each type of receptacle, toggle switch, occupancy sensor, outlet box, manual motor starter, device wall plate, engraved nameplate, wire and cable splicing and terminating material, and branch circuit single pole molded case circuit breaker.
- 1.13 SINGULAR NUMBER**  
Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.
- 1.15 ACCEPTANCE CHECKS AND TESTS**  
The contractor shall furnish the instruments, materials and labor for field tests.
- 1.16 TRAINING**
- A. Training shall be provided in accordance with Article 1.25, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.
  - B. Training shall be provided for the particular equipment or system as required in each associated specification.
  - C. A training schedule shall be developed and submitted by the contractor and approved by the Resident Engineer at least 30 days prior to the planned training.

END OF SECTION

**SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies the general grounding and bonding requirements for electrical equipment and operations to provide a low impedance path for possible ground fault currents.
- B. "Grounding electrode system" refers to all electrodes required by NEC, as well as made, supplementary, and lightning protection system grounding electrodes.
- C. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- B. Section 26 41 00, FACILITY LIGHTNING PROTECTION: Requirements for lightning protection.

**1.3 QUALITY ASSURANCE**

Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 SUBMITTALS**

- A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Shop Drawings:
  - 1. Clearly present enough information to determine compliance with drawings and specifications.
  - 2. Include the location of system grounding electrode connections and the routing of aboveground and underground grounding electrode conductors.
- C. Test Reports: Provide certified test reports of ground resistance.
- D. Certifications: Two weeks prior to final inspection, submit four copies of the following to the Resident Engineer:
  - 1. Certification that the materials and installation are in accordance with the drawings and specifications.
  - 2. Certification by the contractor that the complete installation has been properly installed and tested.

**1.5 APPLICABLE PUBLICATIONS**

Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

- A. American Society for Testing and Materials (ASTM):
  - B1-07.....Standard Specification for Hard-Drawn Copper Wire
  - B3-07.....Standard Specification for Soft or Annealed Copper Wire
  - B8-04.....Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
  - 81-1983.....IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
  - C2-07.....National Electrical Safety Code
- C. National Fire Protection Association (NFPA):
  - 70-08.....National Electrical Code (NEC)
  - 99-2005.....Health Care Facilities
- D. Underwriters Laboratories, Inc. (UL):
  - 44-05 .....Thermoset-Insulated Wires and Cables



83-08 .....Thermoplastic-Insulated Wires and Cables  
 467-07 .....Grounding and Bonding Equipment  
 486A-486B-03 .....Wire Connectors

## **PART 2 - PRODUCTS**

### **2.1 GROUNDING AND BONDING CONDUCTORS**

- A. Equipment grounding conductors shall be UL 44 or UL 83 insulated stranded copper, except that sizes No. 10 AWG [6 mm<sup>2</sup>] and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG [25 mm<sup>2</sup>] and larger shall be identified per NEC.
- B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG [6 mm<sup>2</sup>] and smaller shall be ASTM B1 solid bare copper wire.
- C. Conductor sizes shall not be less than shown on the drawings, or not less than required by the NEC, whichever is greater.

### **2.2 GROUND RODS**

- A. Steel or copper clad steel, 0.75 in [19 mm] diameter by 10 ft [30 M] long, conforming to UL 467.
- B. Quantity of rods shall be as required to obtain the specified ground resistance, as shown on the drawings.

### **2.3 GROUND CONNECTIONS**

- A. Below Grade: Exothermic-welded type connectors.
- B. Above Grade:
  - 1. Bonding Jumpers: Compression-type connectors, using zinc-plated fasteners and external tooth lockwashers.
  - 2. Connection to Building Steel: Exothermic-welded type connectors.
  - 3. Ground Busbars: Two-hole compression type lugs, using tin-plated copper or copper alloy bolts and nuts.
  - 4. Rack and Cabinet Ground Bars: One-hole compression-type lugs, using zinc-plated or copper alloy fasteners.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Ground in accordance with the NEC, as shown on drawings, and as specified herein.
- B. System Grounding:
  - 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
  - 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
- C. Equipment Grounding: Metallic structures, including ductwork and building steel, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, shall be bonded and grounded.

### **3.2 INACCESSIBLE GROUNDING CONNECTIONS**

Make grounding connections, which are normally buried or otherwise inaccessible (except connections for which access for periodic testing is required), by exothermic weld.

### **3.3 MEDIUM VOLTAGE EQUIPMENT AND CIRCUITS**

- A. Lightning Arresters: Connect lightning arresters to the equipment ground bus or ground rods as applicable.

### **3.4 SECONDARY VOLTAGE EQUIPMENT AND CIRCUITS**

- A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.
- B. Metallic Piping, Building Steel, and Supplemental Electrode(s):

1. Provide a grounding electrode conductor sized per NEC between the service equipment ground bus and all metallic water pipe systems, building steel, and supplemental or made electrodes. Provide jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to UL 467.
2. Provide a supplemental ground electrode and bond to the grounding electrode system.
- C. Service Disconnect (Separate Individual Enclosure): Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.
- D. Switchgear, Switchboards, Unit Substations, Panelboards, Motor Control Centers and Panelboards, Engine-Generators, and Automatic Transfer Switches:
  1. Connect the various feeder equipment grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
  2. For service entrance equipment, connect the grounding electrode conductor to the ground bus.
  3. Provide ground bars, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.
  4. Connect metallic conduits that terminate without mechanical connection to the housing, by grounding bushings and grounding conductor to the equipment ground bus.
- E. Transformers:
  1. Exterior: Exterior transformers supplying interior service equipment shall have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
  2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from the transformer to the nearest component of the grounding electrode system.

### 3.5 RACEWAY

- A. Conduit Systems:
  1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.
  2. Non-metallic conduit systems, except non-metallic feeder conduits that carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment, shall contain an equipment grounding conductor.
  3. Conduit that only contains a grounding conductor, and is provided for its mechanical protection, shall be bonded to that conductor at the entrance and exit from the conduit.
  4. Metallic conduits which terminate without mechanical connection to an electrical equipment housing by means of locknut and bushings or adapters, shall be provided with grounding bushings. Connect bushings with a bare grounding conductor to the equipment ground bus.
- B. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders and power and lighting branch circuits.
- C. Boxes, Cabinets, Enclosures, and Panelboards:
  1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes (except for special grounding systems for intensive care units and other critical units shown).
  2. Provide lugs in each box and enclosure for equipment grounding conductor termination.

### **3.6 CORROSION INHIBITORS**

When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

### **3.7 CONDUCTIVE PIPING**

- A. Bond all conductive piping systems, interior and exterior, to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.
- B. In operating rooms and at intensive care and coronary care type beds, bond the gases and suction piping at the outlets directly to the room or patient ground bus.

### **3.8 LIGHTNING PROTECTION SYSTEM**

Bond the lightning protection system to the electrical grounding electrode system.

### **3.9 GROUND RESISTANCE**

- A. Grounding system resistance to ground shall not exceed 5 ohms. Make any modifications or additions to the grounding electrode system necessary for compliance without additional cost to the Government. Final tests shall ensure that this requirement is met.
- B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not fewer than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
- C. Services at power company interface points shall comply with the power company ground resistance requirements.
- D. Below-grade connections shall be visually inspected by the Resident Engineer prior to backfilling. The contractor shall notify the Resident Engineer 24 hours before the connections are ready for inspection.

### **3.10 GROUND ROD INSTALLATION**

- A. For outdoor installations, drive each rod vertically in the earth, until top of rod is 24 in [609 mm] below final grade.
- B. Where permanently concealed ground connections are required, make the connections by the exothermic process, to form solid metal joints. Make accessible ground connections with mechanical pressure-type ground connectors.
- D. Where rock prevents the driving of vertical ground rods, install angled ground rods or grounding electrodes in horizontal trenches to achieve the specified resistance.

END OF SECTION

**SECTION 26 41 00**  
**FACILITY LIGHTNING PROTECTION**

**PART 1 - GENERAL****1.1 DESCRIPTION**

This section specifies the furnishing and installation of a complete master labeled lightning protection system, complying with NFPA 780, UL 96 and UL 96A.

**1.2 RELATED WORK**

- A. Section 07 60 00, FLASHING AND SHEET METAL: penetrations through the roof.

**1.3 QUALITY ASSURANCE**

Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.4 SUBMITTALS**

- A. In accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, submit the following:
- B. Shop Drawings:
1. Isometric and plan views showing layout and connections to the required metal surfaces.
  2. Show the methods of mounting the system to the adjacent construction.
- C. Qualifications: Submit proof that the installer of the lightning protection system is a certified Lightning Protection Institute (LPI) installer, and has had suitable and adequate experience installing other lightning protection systems, and is capable of installing the system as recommended by the manufacturer of the equipment.
- D. Certification: Two weeks prior to final inspection, submit four copies of the following certifications to the Resident Engineer:
1. Certification that the lightning protection system has been properly installed and tested.
  2. Certification that the lightning protection system has been inspected by a UL representative and has been approved by UL without variation.

**1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. National Fire Protection Association (NFPA):
- 70.....National Electrical Code (NEC)
- 780.....Standard for the Installation of Lightning Protection Systems
- C. Underwriters Laboratories, Inc. (UL):
- 96.....Lightning Protection Components
- 96A.....Installation Requirements for Lightning Protection Systems
- UL 467.....Standard for Grounding and Bonding Equipment

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Attach master labels to each item by its manufacturer as evidence that the materials have been manufactured in conformance with the UL Standards for master label lightning protection materials.
- B. In addition to conformance to UL 96, the component material requirements are as follows:
1. Conductors: Electrical grade copper. Conductors shall be in accordance with NFPA 780 and UL 96 for Class I, Class II, or Class II modified materials as applicable.
  2. Air terminals: Solid copper, 18 inches long, not less than 3/8 inch [9mm] diameter, with sharp nickel-plated points.
  3. Ground rods: //Copper clad steel// //steel// //stainless steel// //solid copper//, not less than 1/2 inch [13mm] diameter by 8 feet [2400mm] long. Rods made of copper-clad steel shall conform to UL 467

and galvanized ferrous rods shall conform to IEEE C135.30. Ground rods of copper-clad steel, steel, stainless steel, galvanized ferrous, and solid copper shall not be mixed on the project.

SPEC WRITER NOTE: Designer will determine type and number of ground rods to be used; based on local conditions, earth resistivity data, and on the size and type of the electrical installation. Copper clad steel rods will typically be specified for normal conditions. Galvanized coated steel or stainless steel rods will be typically used where low soil resistivities are encountered and galvanic corrosion may occur between adjacent underground metallic masses and the copper-clad rods. Stainless steel rods have a longer life than the zinc coated steel, but use must be justified based on the higher cost. In high resistivity soils, 3.048 m (10 foot) sectional rods may be used to obtain the required resistance to ground; however where rock is encountered, additional rods, a counterpoise, or ground grid may be necessary. Coordinate and standardize rod selection for individual facilities with other specification sections.

4. Ground plates: Solid copper, not less than 1/16 inch [2mm] thick.

5. Tubing: Stiff copper or brass.

- C. Anchors and fasteners: Bolt type which is most suitable for the specific anchor and fastener installations. Clamp-type connectors for splicing conductors shall conform to UL 96, class as applicable, and, Class 2, style and size as required for the installation. Clamp-type connectors shall only be used for the connection of the roof conductor to the air terminal and to the guttering. All other connections, bonds, and splices shall be done by exothermic welds or by high compression fittings. The exothermic welds and high compression fittings shall be listed for the purpose. The high compression fittings shall be the type which requires a hydraulically operated mechanism to apply a minimum of 10,000 psi.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Installation shall be coordinated with the roofing manufacturer and installer.
- B. Install the conductors as inconspicuously as practical and with the proper bends.
- C. Install the vertical conductors within the concealed cavity of exterior walls. Run the conductors to the exterior at elevations below the finished grade and make the ground connections to the earth outside of the building or stack perimeter.
- D. Make connections of dissimilar metal with bimetallic type fittings to prevent electrolytic action.
- E. Use the exothermic welding type connections that form solid metal joints in the main vertical and horizontal conductors, and for connections that are not exposed in the finish work.
- F. Protect copper conductors with stiff copper or brass tubing, which enclose the conductors from the top to the bottom of the tubing, between one foot [300mm] below and seven feet [2100mm] above the finished grade. The conductor shall be bonded to the top and bottom of the tubing.
- G. Sheath copper conductors, which pass over cast stone, cut stone, architectural concrete and masonry surfaces, with not less than a 1/16 inch

[2mm] thickness of lead to prevent staining of the exterior finish surfaces.

- H. For the earth connections, install ground rods and ground plates, and the conductor connections to them and the main water pipes in the presence of the Resident Engineer. For the conductors located outside of the building or stack, install the conductors not less than two feet [600mm] below the finished grade.
- I. For structural steel buildings, connect the steel framework of the buildings to the main water pipe near the water system entrance to the building.

SPEC WRITER NOTE: A/E shall determine which equipment is required to be bonded, and which equipment requires an air terminal(s), depending on metal thickness.

- J. Connect lightning protection cables to all metallic projections, equipment, and components above the roof as indicated on the drawings.
- K. Connect exterior metal surfaces, located within three feet [900mm] of the lightning protection system conductors, to the lightning protection system conductors to prevent flashovers.
- L. Maintain horizontal or downward coursing of main conductor and insure that all bends have at least an 8-inch radius and do not exceed 90 degrees.
- M. Conductors shall be rigidly fastened every three feet [900mm] along the roof and down to the building to ground.
- N. Air terminals shall be secured against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces permanently and rigidly attached to the building or structure. Install air terminal bases, cable holders and other roof-system supporting means without piercing roof metal.
- O. Use through-roof connectors for down-conductor attachment to roof system. Provide flashing in accordance with Section 07 60 00, FLASHING AND SHEET METAL.
- P. Down-conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel or the structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 100 feet [30m].
- Q. A counterpoise, where shown, shall be of No. 1/0 copper cable or equivalent material having suitable resistance to corrosion and shall be laid around the perimeter of the structure in a trench not less than 2 feet [600mm] deep at a distance not less than 3 feet [900mm] nor more than 8 feet [2.5m] from the nearest point of the structure.
- R. Grounding: Test the ground resistance to earth by standard methods and conform to the ground resistance requirements specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- S. Where shown, use the structural steel framework or reinforcing steel as the main conductor:
  - 1. Weld or bond the non-electrically-continuous sections together and make them electrically continuous.
  - 2. Verify the electrical continuity by measuring the ground resistances to earth at the ground level, at the top of the building or stack, and at intermediate points with a sensitive ohmmeter. Compare the resistance readings.
  - 3. Connect the air terminals together with an exterior conductor connected to the structural steel framework at not more than 60 foot [18m] intervals.
  - 4. Install ground connections to earth at not more than 60 foot [18m] intervals around the perimeter of the building.
  - 5. Weld or braze bonding plates, not less than 8 inches [200mm] square, to cleaned sections of the steel and connect the conductors to the plates.

6. Do not pierce the structural steel in any manner. Connections to the structural steel shall conform to UL Publication No. 96A.
- //T. For smoke stacks, the following additional requirements shall apply:
  1. Extend air terminals from approximately three feet [900mm] below the top of the smoke stacks to approximately three feet [900mm] above the top of the stacks.
  2. Securely seat and rivet the vertical conductors into bronze cable connectors. Cross-connect the vertical conductors at approximately the midpoint between the top and bottom of the smoke stacks.//
- //U. For obstruction lights, the following additional requirements shall apply:
  1. Extend air terminals one foot [300mm] above the top of the light fixtures and securely clamp to the light fixture supports.
  2. Install 600 volt class lightning arresters. Connect the arresters to the lightning circuit conductors at suitable locations, and ground and bond them to the lightning protection system.//
- V. When the lightning protection systems have been installed, have the systems inspected by a UL representative. Obtain and install a UL numbered master label for each of the lightning protection systems at the location directed by the UL representative and the Resident Engineer.

END OF SECTION

- - - END OF SPECIFICATIONS - - -