DATE: November 16, 2023

ADDENDUM NO. 1 TO ALL BIDDERS:

Invitation to Bid: **ITB No. 24-08-32**

Description: Roanoke City Adult Detention Center: Magistrate Office Addition

Dated: October 26, 2023

REVISED Bid Due Date and Time: At or before 2:00 p.m. local time, on December 4, 2023.

REVISED Bid Opening Date and Time: 3:00 p.m. local time, on December 4, 2023.

1. The bid due date and time is hereby changed from 2:00 p.m. local time, on November 22, 2023, to 2:00 p.m. local time, on December 4, 2023.

2. The bid opening date and time is hereby changed from 3:00 p.m. local time on November 22, 2023, to 3:00 p.m. local time, on December 4, 2023.

3. The deadline for questions and submitting a proposed substitution is hereby changed 2:00 p.m. on November 8, 2023, to 2:00 p.m. on November 20, 2023.

4. **Table of Contents, Technical Specifications, Division 32 – Exterior Improvements:** The Sheet Name/Description listed for Section 321313 is hereby changed to Concrete Pavement.

5. The Sections listed below were missing from the Technical Specs included in the Project Manual. Copies of these Sections have been attached as Attachment A to this Addendum.

    - 074243 – Composite Wall Panels
    - 313000 – Excavation, Trenching and Backfilling for Utilities
    - 321216 – Asphalt Paving
    - 321313 –Concrete Pavement
    - 334100 – Storm Drainage

6. A Pre-Bid Meeting was held on November 11, 2023, in the Purchasing Conference Room. Attached as Attachment B to this Addendum is a copy of the sign-in sheet.

7. Technical Specifications, Division 7 – Thermal and Moisture Protection, Section 078110 – Sprayed Fire-Resistive Materials; add: Please see Attachment C to this Addendum.

8. An updated full set of the drawings and revised structural drawings may be obtained at the website below. PLEASE NOTE: THE LINK MUST BE COPIED AND INSERTED INTO THE ADDRESS BAR OF YOUR INTERNET BROWER.

    https://www.dropbox.com/scl/fo/gwelaf4teumznt4hrmpvk/h?rlkey=37yjx9u67xibj0qykfk37dv5r&dl=0

9. Sheet M1.0 / Last sentence in Specification Section E.1.a: **REMOVE from Project Work requirements;** “THE THERMOSTATS AND CONTROLLERS SHALL BE INTEGRATED TO WORK AS A COMPLETE SYSTEM WITH THE BUILDING AUTOMATION SYSTEM (BAS)”.

10. Q: Can standard 8” CMU cells be filled with a fire retardant grout to achieve the required 3-hour fire rating?

    R: Yes, cells can be filled solid with an insulating grout material meeting ASTM C-33 or C-331 requirements to achieve a minimum 3-hour fire rating. In addition, control joints shall be constructed for a minimum 3-hour fire rating to comply with TMS 216.

11. Q: What color is the granite veneer façade panels?

    R: Black to match existing as close as possible. Contractor to submit a color selection board as part of submittals for review.

12. Q: Will the existing modular furniture workstations and bookshelves be removed prior to the start of the Contractor’s Work?

    R: Yes, the Magistrate Office has agreed to have the files, modular furniture, and existing shelving and furniture will be removed prior to the start of Contractor Work.

13. Q: Will traffic control measures, to include signage, be the responsibility of the City or the Contractor?

    R: Traffic control measures, to include approved signage, shall be the responsibility of the Contractor. A traffic control plan shall be submitted to the City Traffic Engineer for approval three business days prior to any traffic interruption or impact to vehicular and/or pedestrian travel.

14. Security Door 111B to have a 10” x 10” vision panel with one-way vision glass. Bottom of vision panel to be 5’-0”+/- from bottom of door. Dimensions to be verified with submittal review.

15. Interior Windows and Partitions at the Interview Rooms as indicated on the drawings shall have a ballistic resistance rating of “UL Level-3”.

Note: Bidder’s shall acknowledge the receipt of this Addendum on the Bid Form.

Thank you,

Stanley Wells

Stanley Wells
Senior Buyer
Phone: 540-853-1574

ATTACHMENT A TO ADDENDUM NO. 1 TO
ITB # 24-08-32

TECHNICAL SPECS 074243, 313000, 321216, 321313, AND 334100

SECTION 074243 - COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Aluminum-faced composite panels.
2. Miscellaneous framing and fasteners.

B. Related Sections include the following:

1. Division 7 Section – Sheet Metal, Flashing and Trim for flashing and trim.
2. Division 7 Section - Joint Sealants for sealants and caulking.
3. Division 7 Section – Weather Barriers for weather barriers installed behind composite wall panels.
4. Division 7 Section – Thermal Insulation for rigid board insulation.

1.3 SYSTEM DESCRIPTION

A. Design Requirements:

1. Design system to accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to temperature and humidity ranges reasonably anticipated.
2. Design system to accommodate tolerances of structure.

B. Performance Requirements: Submit test data witnessed by an independent testing agency for the following:

1. Structural tests for wind loads by "Chamber Method" in compliance with ASTM E72.

a. Standard test design loading: 20 psf (960 Pa) positive and negative wind load.
b. Design panel system to withstand code-imposed design loads, and a deflection limit of L/180 shall apply to positive load pressures only.

2. Air Infiltration: 0.06 cfm per square foot (32 lps per square meter) air leakage under a static pressure of 1.56 psf (7.65 kg per square meter) when tested in accordance with ASTM E283.
3. Water Penetration: No uncontrolled water penetration through the standard vertical panel and sealed joints at a static pressure of 6.24 psf (30.5 kg per square meter) when

tested in accordance with ASTM E331.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 Section – Submittals.

B. Product Data: Manufacturer's data sheets on each product used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Submit shop drawings showing layout, flashings, drainage, ventilation, vapor barriers, vapor retarders, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.

D. Initial Samples: For each finish product specified, two complete sets of color chips representing Manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 3-inches x 5-inches representing actual product, color, and patterns.

F. Quality Assurance Submittals: Submit the following:

1. Test reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates: Product certificates signed by Manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

B. Installer Qualifications:

1. Installer experienced in performing Work of this Section who has specialized in installation of Work similar to that required for the Project.
2. Panel Installer shall assume responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, Manufacturer's installation instructions, and Manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store panels horizontally, off the ground, in Manufacturer's unopened packaging until ready for installation.

B. Examine delivered materials upon receipt to ensure that no damage has occurred during shipment. Store metal-faced composite wall panels horizontally, covered with a suitable weather tight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with a positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. DO NOT allow storage space to exceed 120 deg. F.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

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

1.8 WARRANTY

A. Finish Warranty: Warranty shall commence on Date of Substantial Completion.

1. Provide twenty (20) year written Warranty with PVDF fluoropolymer finish color coated metal finish covering color fading, chalking, and film integrity.
2. Finish coating shall not peel, blister, chip, crack or check.
3. Chalking, fading or erosion of finish measured by the following tests:

    a. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D659.
    b. Finish coating shall not change color or fade in excess of 8 NBS units as determined by ASTM D2244.

B. Material and Installation Warranty: Warranty shall commence on Date of Substantial Completion.

1. Panels shall be warranted not to delaminate (separate) for a period of five (5) years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Laminators Inc., Hatfield, PA 19440. T: (877) OMEGA77; www.laminatorsinc.com. Subject to compliance with specified requirements, equal products by other manufacturers are also acceptable.

B. Basis of Design Product: Omega-Lite Aluminum-Faced Composite Panels.

1. Panel Construction: Finished aluminum sheet over a corrugated polyallomer (CPA) core with backer sheet.
2. Panel Facing: Minimum 0.021-inch thick, smooth aluminum sheet complying with ASTM B209.
3. Panel Backing: Random coated aluminum sheet, minimum 0.013-inch thick, aluminum sheet complying with ASTM B209.
4. Panel Thickness: 6 mm (1/4 inch).
5. Fire Test Performance: ASTM E84, Class A.
6. Bond Test Performance: Passes ASTM C481-A Cyclic Aging.
7. Finish: Kynar 500 - PVDF fluoropolymer paint system meeting AAMA 2605.
8. Finish Colors: As selected by Architects from manufacturers full line of PVDF - Kynar finishes.
9. Aluminum Composite Wall Panel Installation System: One-Piece Tight-Fit Extrusion.

2.2 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C645, cold-formed metallic-coated steel sheet, ASTM A653, G40 (Z120) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Base or Sill Angles Channels: 0.079-inch nominal thickness.

C. Hat-Shaped, Rigid Furring Channels:

1. Nominal Thickness: As required to meet performance requirements
2. Depth: As indicated.

D. Cold-Rolled Furring Channels: Minimum 1/2-inch wide flange.

1. Nominal Thickness: As required to meet performance requirements
2. Depth: As indicated
3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
4. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch diameter

E. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.3 ACCESSORIES

A. Manufacturer's Sealants and Accessories: Provide manufacturer's recommended sealants and accessories for product installation.

B. Flashing: Fabricate flashing materials from 0.032 inch minimum thickness aluminum sheet painted to match composite wall panel system where exposed. Provide a 12-inch-wide lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-

hardening sealant.

C. Aluminum Extrusions: ASTM B221 alloy and temper recommended by Manufacturer for type of use and finish indicated.

D. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide Manufacturer's standard concealed fasteners.

2.4 FABRICATION

A. Panels shall be fabricated and finished as required to provide material construction and performance as specified and as required by Manufacturer to comply with warranty provisions.

1. Tolerances: Length and Width plus or minus 1/16-inch; squareness (diagonals) equal within 1/8-inch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with substrate installer present for compliance with requirements for structural soundness, installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances listed below.

a. 1/4-inch in any 20 feet length vertically or horizontally.
b. 1/2-inch in any building elevation.

2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking, and that installation is within flatness tolerances required.
3. Prepare written report endorsed by panel Installer and substrate installer, listing remedy for conditions detrimental to performance of the Work.

B. Examine roughing-in for components and systems penetrating metal composite wall panels to verify actual locations of penetrations relative to seam locations before metal composite wall panel installation.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with all Manufacturer's installation instructions, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation type

selected.

1. Install metal-faced composite wall panels according to orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and sub-girts unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

    a. Commence metal-faced composite wall panel installation and install a minimum of 300 sq. ft. in the presence of a factory-authorized representative.
    b. Shim or otherwise plumb substrates receiving metal-faced composite wall panels.
    c. Flash and seal metal-faced composite wall panels at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed. Install flashing and trim as metal-faced composite wall panel work proceeds.

B. Work shall be done and completed in a thorough and workmanlike manner by mechanics skilled in their various trades.

C. Caulk Installation: Refer to Division 7 Section “Joint Sealants”.

    a. Use only approved sealants as described in manufacturers guidelines. Install sealant continuously between metal base channel (sill angle) and concrete and elsewhere is indicated or, if not indicated, as necessary for waterproofing.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3.4 CLEANING AND PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose offsite.

C. Touch-up, repair or replace damaged products prior to Substantial Completion.

END OF SECTION

SECTION 313000 - EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. Work Included: Excavation and preparation of trenches as shown on the plans and specified herein, backfilling and site restoration.

B. Related Sections: Additional Sections of the Documents which are referenced in this Section include:
   1. Section 329200 – Turf and Grasses

1.3 REFERENCES

A. General: The work shall comply with the most recent standards or tentative standards as published at the date of the contract and as listed in this specification using the abbreviation shown.

B. American Society for Testing and Materials Publications (ASTM) :
   1. D 448-Standard Classification for Sizes of Aggregate for Road and Bridge Construction
   2. D 698-Test Method for Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lb
   3. D 1556-Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
   4. D 2167-Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
   5. D 2487-Standard Classification of Soils for Engineering Purposes (unified Soil Classification System)

C. Virginia Department of Labor and Industry - Occupational Safety and Health Standards for the Construction Industry
   1. Subpart P-Excavations, Trenching, and Shoring
   2. Subpart U-Blasting and the Use of Explosives

1.4 DEFINITIONS

A. Controlled Fill: Controlled fill is required beneath all areas on which final grade is not placed on original excavated soil.

B. Classified Excavation: For the purposes of payment, material shall not be classified.

C. Satisfactory Materials: Materials classified by ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, ML, and CL are satisfactory as fill for overlot grading and are satisfactory in-situ.

D. Unsatisfactory Materials: Materials classified by ASTM D 2487 as OL, OH, MH, CH, and PT are unsatisfactory in-situ and as fill. Unsatisfactory materials also include those materials containing roots and other organic matter, trash, debris, frozen materials, and stones larger than 6 inches. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

E. Cohesionless and Cohesive Materials: Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have plasticity index of zero.

F. Degree of Compaction: Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D 698, abbreviated below as a percent of laboratory maximum density.

G. Topsoil: Material obtained from excavations, suitable for topsoils, is defined as the upper 6 inches of existing soil cover. Topsoil shall consist of friable clay loam, free from roots, stones, and other undesirable material and shall be capable of supporting a good growth of grass.

H. Rock: Rock shall consist of boulders measuring 1/2 cubic yard or more and materials that cannot be removed without systematic drilling and blasting such as rock material in ledges, bedded deposits, unstratified masses and conglomerate deposits, and below ground concrete or masonry structures, exceeding 1/2 cubic yard in volume. Pavements will not be considered as rock. All excavation is unclassified. No payment will be made for rock excavation

I. Unyielding Material: Unyielding material shall consist of rock and gravelly soils with stones greater than 18 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

J. Unstable Material: Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

K. Select Granular Material: Select granular material shall consist of well-graded sand, gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall not contain more than 10 percent by weight of material passing a No. 200 mesh sieve. The maximum allowable aggregate size shall be 1 inch, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

L. Initial Backfill Material: Initial backfill material shall consist of select granular material or satisfactory materials free from rocks 1 inch or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller.

1.5 QUALITY ASSURANCE

A. Testing Results: Copies of all laboratory and field test reports shall be submitted to the Owner and Engineer within 72 hours of the completion of the test.

PART 2 - PRODUCTS

2.1 PLASTIC MARKING TAPE

A. General: Plastic marking tape shall be acid and alkali-resistant polyethylene film, 2-inches wide with minimum thickness of 0.004-inches. The tape shall be installed directly above the pipe, at a depth of 12 to 18 inches below finished grade unless otherwise shown. The tape shall not be made of any metallic materials. Tape color shall be as specified in Table 1 and shall bear a continuous printed inscription describing the specific utility.

B. TABLE 1. Tape Color:
   1. Red: Electric
   2. Yellow: Gas, Oil, Dangerous Materials
   3. Orange: Telephone, Telegraph, Television, Police, and Fire Communications
   4. Blue: Water Systems
   5. Green: Sewer Systems (including sewer force main)

2.2 TRACER WIRE

A. General: Tracer wire shall be solid (not stranded) # 12 A.W.G. or larger insulated wire. Where insulation is compromised and will be buried, wire should be encapsulated in pure silicone caulk and wrapped with electrical tape.

PART 3 - EXECUTION

3.1 GENERAL

A. A. Classification: Excavation and material shall be unclassified for purposes of payment. No extra payment will be considered for any excavation regardless of the type of material encountered including rock.

3.2 CLEARING

A. General: Only that portion of the work area actually needed for construction shall be cleared or used by heavy equipment unless directed otherwise by the Owner. In no case shall clearing or debris from clearing operations be taken past right-of-way lines or permanent easement lines onto private property. Areas disturbed by construction operations shall be protected from erosion by suitable methods outlined in the Virginia Erosion and Sediment Control Handbook. Equipment and materials shall be stored only in approved areas.

3.3 EXCAVATION AND PREPARATION OF TRENCH

A. General: Depth of trenches shall provide a minimum of 36” cover, measured from the top of pipe, unless otherwise noted on the plans and cut sheets. Depth of cover in VDOT right-of-way may be as required by VDOT.

B. Gravity Sewer Trench: The trench shall be excavated to allow for a depth of ¼ of the pipes outside diameter or a minimum of 4 inches of ASTM D 448 #68 aggregate bedding in earth and 6 inches of aggregate bedding in rock.

C. Pressure Pipe Trench: For force main and water main, the trench shall be excavated so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground between bell holes. Bell holes shall be excavated to accommodate each bell. Any part of the bottom of the trench excavated below the specified grade shall be brought back to grade with approved material and compacted in accordance with the specifications. The finished subgrade shall be prepared accurately by means of hand tools. If PVC pressure pipe is used, 4-inches of ASTM D 448 #68 stone shall be required for bedding. Where the pipe is in rock, 6 inches of bedding, #68 stone, will be required.

D. Width: Width shall be sufficient to allow pipe installation without walking or standing on pipe. The trench width at a point 12 inches above the top of the pipe shall not be less than 6 inches not more than 12 inches on each side of the pipe's largest diameter unless otherwise directed.

E. Unsuitable Material: Wet or otherwise unsuitable soil at the subgrade shall be removed and replaced with approved sound materials at no cost to the Owner. Excess or unsuitable materials shall be disposed of by the Contractor.

F. Rock Excavation: Ledge rock, boulders, and large stones shall be removed to provide a clearance of at least 6-inches below and on each side of all pipe, manholes, valves or other appurtenances and overdepth shall be backfilled with 6-inches of ASTM D 448 #10 (PVC) or #26 (Ductile Iron) aggregate bedding.

G. Topsoil: Topsoil shall be stripped from excavation area and stockpiled separately from other backfill material in approved area until needed for finish backfill and grading.

H. Trench Protection: The Contractor shall furnish and erect such sheathing, bracing and shoring, and shall furnish necessary signs, barricades, and temporary lighting as may be pertinent for the protection of his work, employees, the public, adjacent structures, and to guard against contingencies which might give rise to delays in the work. Sheathing left in place shall be at the Contractor's expense. Responsibility for preservation of trench banks and other excavated spaces and the prevention of injury to any persons or property shall rest entirely with the Contractor. Normally, a maximum of 200 feet of trench will be allowed open at any one time. Trench construction and safety shall be governed by the Virginia Occupational Safety and Health Standards for the Construction Industry, Subpart P. No excavation within the VDOT right-of-way or otherwise will be allowed to remain open overnight unless special permission is obtained.

I. Pumping, Bailing, and Draining: The Contractor shall remove by appropriate means any water which may accumulate or be found in the trenches or other excavations and shall keep the excavations clear of water while work is being installed, unless approval to the contrary is granted by the Owner.

J. Roadway Protection: No cleated equipment shall be used on pavements. Road drainage shall not be clogged, and shoulders, ditches, roadside drainage facilities and pavement affected by

trenching operations shall be maintained in condition satisfactory to VDOT. Entrances shall not be blocked except for short periods as arranged with the property owner, and ingress and egress to adjacent property shall be maintained at all times. The Contractor shall be responsible for the repair of any damaged drainage structures. Private roads shall be restored to an equal or better condition of that prior to construction.

3.4 WORK WITHIN ROAD RIGHT-OF-WAY

A. General: Contractor shall work within VDOT right-of-way as required by the Owner and approved by VDOT. Placement of excavated material on existing pavement shall be avoided if possible. Placement of excavated material on existing pavement shall be permitted upon approval of a written request to the VDOT and provided a stone dust or sand layer is first placed on the pavement.

B. Traffic Control: All traffic control and directional signs shall be supplied by the Contractor. Typical traffic control for utility work on road rights-of-way shall comply with VDOT traffic control details. See Appendix D – VDOT Traffic Control.

C. Traffic Routing: Traffic shall not be blocked or re-routed without permission from the VDOT. Where one way traffic is permitted to be maintained, it shall be flagged 24 hours per day. Traffic shall at all times be properly protected by adequate lights, barricades and signs, and also flagmen when needed.

D. Erosion and Siltation Control: At all locations straw barriers, silt fences, silt settlement basins, brush barriers or other measures are to be utilized in prevention of erosion and siltation control.

E. Trenches: No trench within VDOT right-of-way can remain open overnight.

F. Roadway Crossings: Except where specifically noted on the plans, cutting of existing road pavement will not be allowed. All crossings of VDOT roads shall be made by boring, jacking, or tunneling unless otherwise noted. If the crossing cannot be made by any of the above methods, the permittee must contact the local VDOT Residency. In cases where the Owner is the permittee, the Contractor shall contact the Owner, and the Owner will contact VDOT. In the event of a failed bore attempt, casing shall be left in place and ends sealed with concrete, or if casing is not abandoned in place the excavation shall be pumped full with a portland cement grout. Wherever pavement is permitted to be cut, not over one-half width shall be disturbed at one time; and on crossings, the first opening shall be completely restored to satisfactory travelable condition before the second half can be opened. Where the pavement is disturbed, or deemed weakened, it, in its entirety, or such portions of it as deemed desirable by the VDOT shall be restored or replaced in a manner directed by and to the satisfaction of the VDOT. When pavement must be cut, the cuts shall be made in a straight line, parallel to the pipe, and 6-inches wider than the trench, on each side, so that an undisturbed shoulder will be provided under the new work. Sidewalks or curb and gutter disturbed by construction shall be removed and replaced at existing joints. Cutting shall be done neatly so that a uniform, straight joint will result to provide a bond with the original concrete or pavement.

G. Roadway Crossings Through Casings: When special conditions require use of casings, care shall be taken to maintain the proposed plan grade. Before pushing the pipe through casing, chocks or skids shall be attached to the pipe to keep the pipe centered in the casing and to prevent damage when installation is made. Care shall be taken to ensure that the installed pipeline is well secured to prevent movement as detailed in the project details.

3.5 UNDERGROUND UTILITIES

A. General: The Contractor shall contact the appropriate utility companies and have utilities located prior to starting construction. Locations of existing facilities should be determined by the Contractor far enough in advance of the construction to provide for modification in design, if required.

3.6 COORDINATION

A. General: The Contractor shall notify the property owner in advance of commencing work and in the event of the necessity of disrupting utility or other services to such property, he shall notify the owner or responsible person in charge of such utility or other services and arrange for the disruption and restoration or such service in a manner which will result in a minimum of inconvenience to parties concerned.

3.7 BACKFILLING

A. Materials: All backfill materials shall be free from mud, refuse, construction debris, organic material, boulders, frozen or otherwise unsuitable material, select initial backfill shall be free from stones over 1-1/2 – inch. From one foot above the top of the pipe to the original ground elevation, however, material containing stones up to 5-inches in their greatest dimension may be used, unless otherwise specified. The Contractor may backfill with the excavated material, provided it meets the conditions as stated above.

B. Gravity Sewer Bedding: Bedding shall be required on all gravity sewer lines, and shall be in accordance with the project details. Bedding material shall extend from the excavated trench bottom to the pipe springline (midpoint). Bedding material shall be compacted to 95 percent of maximum density as measured by ASTM D 698. Special care shall be taken to backfill under the pipe and to tamp this material into place to provide a firm bed. Material shall be deposited on both sides of the pipe simultaneously and compacted into place by tamping. From the centerline of the pipe to a depth of one-foot above the top of the pipe, the trench shall be backfilled with approved material in 6-inch layers and compacted in accordance with the specifications. Mechanical or pneumatic tampers must be used in this operation. Compaction equipment must not come into contact with the pipe.

C. Pressure Pipe Bedding: Bedding for ductile iron pressure pipe shall only be required when trench is in rock, unless shown otherwise on plans, and shall be in accordance with the project details. Bedding material for ductile iron pipe in rock shall be 6-inches of compacted VDOT #10 OR #26 aggregate beneath the pipe. Where PVC pressure pipe is used, bedding material shall extend from the excavated trench bottom to the pipe springline (midpoint) unless otherwise approved by the Owner. Bedding material shall be compacted to 95 percent of maximum density as measured by ASTM D 698. Special care shall be taken to backfill under

the pipe and to tamp this material into place to provide a firm bed. Material shall be deposited on both sides of the pipe simultaneously, and compacted into place by tamping. From the initial bedding to a depth of one foot above the top of the pipe, the trench shall be backfilled with approved material in 6-inch layers and compacted in accordance with the specifications. Mechanical or pneumatic tampers must be used in this operation. Compaction equipment must not come into contact with the pipe.

D. Backfilling to Grade: Initial backfill shall be with select material as stated above and compacted prior to placement of remaining backfill. Backfilling shall be carried up evenly in increments of one foot. Minimum required density shall be the density of the adjacent undisturbed material. Backfill in trenches outside of proposed pavement areas or street rights-of-way, or in other areas when allowed, shall be compacted to a dry density equal to or greater than the density of the undisturbed soil surrounding the trench. Each layer of earth shall be compacted into place by tamping before the next layer is applied. A hydro-hammer shall not be used for compaction. All pipelines shall have a minimum of 18-inches of cover before any rolling equipment is used. Care shall be taken to prevent damage to pipe or other structures during compaction. Damage to pipelines or other structures resulting from compaction shall be corrected by the Contractor without expense to the Owner.

E. Backfilling in Controlled Areas: Backfill under pavement, proposed pavement, or in areas within VDOT right-of-way shall be in layers of selected earth not more than 6-inches in thickness, and each layer shall be compacted to a minimum of 95 percent of maximum density when tested in accordance with ASTM D 698. Compaction shall be by pneumatic tampers or by hand and in accordance with instructions in this Section as modified herein. All pipelines shall have a minimum of 18-inches of cover before any rolling equipment is used. The top course of backfill directly under pavement shall consist of aggregate base material meeting the requirements of VDOT #21 A stone. The depth of this course shall be at least 12-inches, except where otherwise required by VDOT. Moisture content shall be within 20 percent of optimum.

F. Marking of Pipelines: A plastic marking tape (see PART 2 of this section) of the appropriate color shall be required on all pipe lines. The marking tape shall be buried 12 to 18-inches below the finished surface in accordance with the project details. As required by the contract drawings, a copper wire (size #12 - encased in a protective jacket to protect it from corrosion) will be installed parallel to (see 2.2 – Tracer Wire), and at the same depth as, all pipe (PVC and Ductile Iron Pipe) and looped up through all valve boxes, air release valve boxes, blow-off boxes, and around manholes with excess wire brought up to the top of the valve boxes and manholes (for use in connecting locating equipment to the wire). The copper wire shall be one continuous run with no splicing permitted unless two spools of wire are being spliced together. The wires shall be stripped on each connecting end of the protective jacket or coating, and wire ends shall be connected with appropriate sized wire nuts. Silicone shall be used to fill in the void inside the wire nut after splicing the copper wire, and the wire nut shall be wrapped with electrical tape.

G. Fill: Materials for fill areas shown on the plans shall be secured from excavation after rejection of any unsuitable materials. Rock or rocky material may be incorporated into fills if size and shape permit, if placed in lower portion of fills where the stability will not be affected, and if

placed in such a manner that the perviousness will not be increased. Material shall be spread in layers with moisture controlled and then compacted to a minimum density as stated above.

H. Finished Surfaces: Uniformly smooth grading of disturbed areas shall be required after backfill and compaction. Road shoulders shall have a minimum depth of 6-inches of VDOT #25 or #26 crusher run aggregate, compacted to a minimum of 95 percent of maximum density as measured by ASTM D 698. Ditches and gutters shall be finished to drain readily. In grass or lawn areas, the last 4-inches of compacted fill will consist of topsoil or an approved soil which will support turf growth after fertilizing and seeding. Settlement or other damage that occurs prior to acceptance of this work shall be repaired and grades satisfactorily re-established.

I. Quality Assurance: The Contractor will be responsible for and shall repair any settlement in the backfill or pavement for a period of one year after completion of the work.

3.8 BACKFILL TESTING

A. General: Normal testing frequency of compaction testing performed by an independent laboratory shall be at the expense of the Contractor. Projects initiated and/or funded by the Owner shall have compaction testing performed at the expense of the Contractor unless otherwise noted in the project contract.

B. Testing Requirements: The Contractor shall demonstrate the adequacy of backfill compaction by performing density testing of the completed trench in backfill areas as designated by the Owner. Density testing shall be performed at three depths for each test location: surface, mid-depth, and near maximum trench depth. In grass and lawn areas outside of VDOT right-of-way the testing shall be performed at two depths for each test location: under the topsoil backfill, and near the maximum trench depth. The character of the backfill material will be observed during the excavation for density testing to determine conformance with the specifications. Density testing shall be performed using nuclear field density equipment or conventional weight-volume methods. If the weight-volume method is used, volume shall be determined by using the sand replacement test (ASTM D 1556) or liquid displacement methods (ASTM D 2167). If nuclear methods are used, the trench correction effect shall be accounted for by recalibrating the nuclear gauge on its calibration block at the location of each test prior to taking the density measurement. Backfill in roadway or parking areas such as VDOT rights-of-way or in areas designated by the Owner shall be compacted to a minimum of 95% density as measured by ASTM D 698. The density of the backfill outside of VDOT right-of-way or other controlled areas shall be equal to or greater than the density of the undisturbed material in the immediate area adjacent to the area under test. The Contractor shall furnish all equipment, tools, and labor to conduct the testing. Testing shall be performed by an independent testing laboratory qualified to perform such tests and approved by the Owner. All testing shall be witnessed by the Owner. The test shall be repeated until satisfactory results are obtained. The Contractor shall be charged for all retests at the normal rates for inspection services.

1. Normal Testing Frequency: One test shall be performed within the first 500-feet of pipe installed by each crew. This test will be used as an initial evaluation of the compaction methods being used. Beyond the initial 500-feet, one test shall be performed in each 1,000-foot section of pipe installed or fraction thereof. Testing shall progress as each

1,000-foot section is completed. The location of the test within each section shall be selected by the Inspector. Testing which indicated that unacceptable material has been incorporated into the backfill, or that insufficient compaction is being obtained shall be followed by expanded testing to determine the limits of the unacceptable backfill. Normal testing shall be performed at the Contractor's expense.

2. Expanded Testing Requirements: If normal testing within a test section indicated unacceptable backfill, the Owner may require additional testing within the same test section to determine the limits of unacceptable backfill. Additional testing required by the Owner shall not exceed testing of 4 additional locations within the test section. Unacceptable backfill within the limits established by the testing shall be removed and replaced by the Contractor at no additional cost to the Owner. If the Contractor fails to schedule testing on a consistent basis (as per the satisfaction of the Owner), then payment for work performed will be withheld until such testing is completed. Additional testing beyond that required may be performed by the Contractor at his expense to further delineate limits of unacceptable backfill.
3. Additional Testing: Testing beyond the normal frequency or expanded testing required which is requested by the Owner, shall be at the Owner's expense.

3.9 SITE RESTORATION

A. Replacement of Property: The Contractor shall restore all pavement, sidewalks, curbing, gutter, fences, poles, culverts, utilities or other such property and surface structures removed or disturbed as a part of the work to a condition equal or better to that before the work began.

B. Pavement Repair and Replacement: Pavement, if disturbed, shall be repaired or replaced in accordance with the technical details.

C. Drainage Improvements: The Contractor shall restore and/or repair all drainage ways and swales including paved or concrete channels as part of this work to a condition equal to that before the work began. Damaged drainage facilities shall be replaced. Restored ditches and swales shall provide positive drainage from roadways. Drainage restoration within VDOT rights-of-way shall be to the satisfaction of the Virginia Department of Transportation.

D. Cleanup: The Contractor shall at all times keep the site cleaned to the satisfaction of the Inspector. In all cases, the Contractor shall "broom" the surfaces of paved streets immediately following backfilling. All surplus materials shall be removed and disposed of from the site of the work unless directed otherwise by the Owner. Where material is placed on the pavement, a layer of stone dust or sand shall be applied first to facilitate clean-up.

E. Seeding: Shall be in accordance with Section 329200 – Turf and Grasses.

END OF SECTION 313000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cold milling of existing hot-mix asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt paving overlay.
5. Pavement-marking paint.

B. Related Sections:

1. Division 31 Section “Earth Moving” for aggregate subbase and base courses and for aggregate pavement shoulders.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

A. Material Certificates: Provide copies of materials certificates signed by material producer and contractor, certifying that each material item complies with, or exceeds, specified requirements.

B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Comply with the publications of the following agencies to the extent referenced and applicable:

1. AASHTO “American Association of State Highway Transportation Officials”
2. ASTM “American Society of Testing and Materials”
3. OSHA “Occupational Safety and Health Act”
4. VDOT “Virginia Department of Transportation Road and Bridge Specifications”

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.

C. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material design, and extent to that indicated for this Project and with a record of successful in-service performance.

D. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

E. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
b. Review condition of subgrade and preparatory work.
c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F .
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.

4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, and not exceeding 95 deg F .

C. Grade Control: Establish and maintain required lines and elevations. Avoid ponding of drainage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations.

B. Base Course Aggregate: In accordance with Virginia Department of Transportation Road and Bridge Specifications Section 309.

C. Surface Course Aggregate: In accordance with Virginia Department of Transportation Road and Bridge Specifications Section 313.

D. Tack Coat: In accordance with Virginia Department of Transportation Road and Bridge Specifications Section 310.

E. Prime Coat: In accordance with Virginia Department of Transportation Road and Bridge Specifications Section 311.

F. Lane Marking Paint: In accordance with Virginia Department of Transportation Road and Bridge Specifications Section 704.

2.2 ASPHALT- AGGREGATE MIXTURE

A. Provide plant-mixed, hot-laid asphalt-aggregate mixture complying with ASTM D 3515 and Virginia Department of Transportation Road and Bridge Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 PAVEMENT REMOVAL

A. General: Make a straight line saw cut 12 inches beyond the edge of the excavation to a minimum depth of 2 inches for bituminous concrete pavement.

3.3 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.2 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 SUBGRADE PREPARATION

A. General: See specification Section 312000, “Earth Moving”.

B. Establishment of Grades: Establish grades and set grade stakes, make due allowances for existing improvements, proper drainage, and adjoining property rights. No gradient shall be less than one percent, unless otherwise indicated.

C. Subgrade for Driveways and Parking: Compaction shall be to at least 95 percent of maximum density at optimum moisture content. Remove spongy and unsuitable material to depth

necessary to achieve density and replace with approved material. Loosen exceptionally hard surfaces, and recompact for uniform bearing power. Maintain subgrades and properly drain until paved.

D. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted dry subbase prior to application of prime coat.

3.5 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at rate specified on plans. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at rate specified on plans.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.7 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 250 deg F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.8 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct lay-down and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average density: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.10 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.11 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.13 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow milled materials to accumulate on-site.

3.14 PROTECTION

A. Protection of Pavement: Sections of newly finished pavement shall be protected from traffic until they have become properly hardened. Erect barricades to protect pouring from traffic until mixture has cooled enough not to become marked.

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

C. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.05 INFORMATIONAL SUBMITTALS

A. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.

7. Bonding agent or epoxy adhesive.
8. Joint fillers.

B. Field quality-control reports.

1.06 QUALITY ASSURANCE

A. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

E. ACI Publications: Comply with ACI 301 unless otherwise indicated.

1.07 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.02 STEEL REINFORCEMENT

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

D. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

F. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

G. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

H. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

I. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

J. Deformed-Steel Wire: ASTM A 496/A 496M.

K. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, plain.

L. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.

M. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.

N. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

O. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

P. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

Q. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

R. Zinc Repair Material: ASTM A 780.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I or III, gray.

a. Fly Ash: ASTM C 618, Class C or F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595, Type IP, portland-pozzolan cement.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S, 4M, 1N, coarse aggregate, uniformly graded. Provide aggregates from a single source[with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials].

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:

1. Aggregate Sizes: 3/4 to 1 inch nominal.

D. Water: ASTM C 94/C 94M.

E. Air-Entraining Admixture: ASTM C 260.

F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.04 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1. Products:

a. Axim Concrete Technologies; Cimfilm.
b. Burke by Edeco; BurkeFilm.
c. ChemMasters; Spray-Film.
d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
e. Dayton Superior Corporation; Sure Film.
f. Euclid Chemical Company (The); Eucobar.
g. Kaufman Products, Inc.; Vapor Aid.
h. Lambert Corporation; Lambco Skin.
i. L&M Construction Chemicals, Inc.; E-Con.
j. MBT Protection and Repair, ChemRex Inc.; Confilm.
k. Meadows, W. R., Inc.; Sealtight Evapre.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
n. Sika Corporation, Inc.; SikaFilm.
o. Symons Corporation; Finishing Aid.
p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

1. Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoko; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation; Resi-Chem Clear.
m. Tamms Industries Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

1. Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 WP WB.
b. Burke by Edoco; Resin Emulsion White.
c. ChemMasters; Safe-Cure 2000.
d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
e. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
f. Euclid Chemical Company (The); Kurez VOX White Pigmented.
g. Kaufman Products, Inc.; Thinfilm 450.
h. Lambert Corporation; Aqua Kure-White.
i. L&M Construction Chemicals, Inc.; L&M Cure R-2.
j. Meadows, W. R., Inc.; 1200-White.
k. Symons Corporation; Resi-Chem White.
l. Tamms Industries, Inc.; Horncure 200-W.
m. Unitex; Hydro White.
n. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

2.05 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Manufacturers:

a. Bayer Corporation.
b. ChemMasters.
c. Conspec Marketing & Manufacturing Co., Inc.
d. Davis Colors.
e. Elementis Pigments, Inc.
f. Hoover Color Corporation.
g. Lambert Corporation.
h. Scofield, L. M.Company.
i. Solomon Colors.

2. Color: As selected by Architect from manufacturer's full range.

C. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

E. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

F. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm).

1. Products:

a. Burke by Edeco; True Etch Surface Retarder.
b. ChemMasters; Exposee.
c. Conspec Marketing & Manufacturing Co., Inc.; Delay S.
d. Euclid Chemical Company (The); Surface Retarder S.
e. Kaufman Products, Inc.; Expose.
f. Metalcrete Industries; Surftard.
g. Nox-Crete Products Group, Kinsman Corporation; Crete-Nox TA.
h. Scofield, L. M. Company; Lithotex.
i. Sika Corporation, Inc.; Rugasol-S.
j. Vexcon Chemicals, Inc.; Certi-Vex Envioset.

G. Pigmented Mineral Dry-Shake Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.

1. Products:

a. Conspec Marketing & Manufacturing Co., Inc.; Conshake 600 Colortone.
b. Dayton Superior Corporation; Quartz Tuff.
c. Euclid Chemical Company (The); Surflex.
d. Lambert Corporation; Colorhard.
e. L&M Construction Chemicals, Inc.; Quartz Plate FF.
f. MBT Protection and Repair, ChemRex Inc.; Mastercron.
g. Metalcrete Industries; Floor Quartz.
h. Scofield, L. M. Company; Lithochrome Color Hardener.
i. Symons Corporation; Hard Top.

2. Color: As selected by Architect from manufacturer's full range.

2.06 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 3000 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
3. Slump Limit: 4 inches (100 mm) plus or minus 1 inch (25 mm).

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 5-1/2 percent plus or minus 1.5 percent for 1-1/2-inch (38-mm) nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture plasticizing and retarding admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.07 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

2. For concrete mixes larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.05 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.07 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.08 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.09 PAVING TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Expansion joints and deflection fittings.
3. Cleanouts.
4. Backwater valve.
5. Drains.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Stormwater inlets: Include plans, elevations, sections, details, frames, covers, and grates.
3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

D. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:50) and vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

E. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

F. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

B. Handle manholes according to manufacturer's written rigging instructions.

C. Handle stormwater inlets according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Pipe and fittings as indicated on the plans and in accordance with VDOT Road and Bridge Specification Section 232.

2.2 CLEANOUTS

A. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.3 STORMWATER INLETS

A. Use standard inlet type and size as specified on plans.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, non-pressure drainage piping according to VDOT Road and Bridge Specification Sections 302 and 303.

3.3 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.

B. Set cleanout frames and covers in earth in cast-in-place concrete block as indicated on the plans. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.4 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.5 CONNECTIONS

A. Connect non-pressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi .
3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use non-pressure-type flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.

    a. Unshielded flexible couplings for same or minor difference OD pipes.
    b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
    c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.6 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.7 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping according to ASTM F 1417.
    c. Option: Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.8 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water**.**

END OF SECTION 334100

ATTACHMENT C TO ADDENDUM NO. 1 TO
ITB # 24-08-32

078110 – SPRAYED FIRE-RESISTIVE MATERIALS

SECTION 078110 SPRAYED FIRE-RESISTIVE MATERIALS

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 DESCRIPTION OF WORK

A. The work of this section shall include, but is not limited to:

1. Interior sprayed fire-resistive materials applied to surfaces, exposed to view.

1.3 RELATED WORK

A. Examine all of the contract documents for requirements which affect the work of this section. Other specification sections which directly relate to the work of this section include, but are not limited to the following:

1. Division 5 Section “Structural Steel Framing”
2. Division 5 Section “Steel Decking.”
3. Division 5 Section "Cold formed Metal Framing”

1.4 QUALITY ASSURANCE

A. Installer: Contractor shall be approved by manufacturer, and be experienced in installing specified products, and is approved by the manufacturer of the fireproofing products. A manufacturer's willingness to sell products to an installer engaged by contractor, does not in itself confer qualification on the buyer.

B. Single Source: Obtain spray applied fireproofing products from a single source for each product required. Provide secondary materials which are acceptable to the fireproofing manufacturer which are included in the tested and/or listed designs.

C. Fire Resistance: Provide fireproofing materials that have been listed and classified by one or more of the following testing authorities: Underwriters Laboratories or Northbrook, Il and/or Underwriters Laboratories of Scarborough, Ontario; Warnock Hersey or other testing and inspecting agency acceptable to the architect and authorities having jurisdiction.

D. Packaging: All products must be packaged with proper identifications and approval indications acceptable to the testing and/or listing agency.

E. Asbestos: Manufacturer shall provide Certification that products supplied are 100% asbestos free.

F. Painted Steel Surfaces: Steel surfaces requiring fireproofing that are painted and/or primed, shall meet UL requirements for application and adhesion characteristics. Provide certifications from fireproofing manufacturer of compatibility of fireproofing and painted systems. Restrictions published by UL shall apply.

G. Remedial Work: Steel surfaces with incompatible primers or paint shall be either removed, lathed, or otherwise remedied within the requirements of UL, so that adequate and approved bonding can occur, acceptable to authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fireproofing material when ambient or substrate temperatures are 40 deg. F. (4 deg C) or lower, unless temporary heat and protection is provided to maintain temperatures at or above this level for 24 hours before, during and 24 hours after application of fireproofing.

B. Ventilation: Ventilate building spaces during and after application of fireproofing. Ventilation is necessary during enclosure of spray area site, as a result of inclement weather. Said ventilation shall continue until product has set.

C. Surfaces to be Sprayed: Surfaces to be sprayed must be free of any substance that would impair proper adhesion.

D. The contractor shall make available to the fireproofing contractor suitable area(s) for mixing and pumping fireproofing.

1. Provide temporary heat and ventilation to comply with the manufacturer's recommendations.

1.6 SEQUENCING

A. Sequence and coordinate application of sprayed fireproofing with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosure for interior applications to prevent deterioration of applied materials exposed to unfavorable environmental conditions.
2. Avoid exposure of fireproofing to unnecessary damage or abrasion.
3. Do not apply fireproofing to metal roof decking until roofing is complete including installation of all air handling systems. Prohibit all roof traffic until application of fireproofing is completed and dry.
4. Do not apply fireproofing until all hangers clips and other necessary supports

are in place, requiring penetration of fireproofing if installed after the application of fireproofing.

5. Ducts, piping and other items that would interfere with the application of fireproofing shall not be installed, until application is completed.

1.7 APPLICATION PARAMETERS

A. The fireproofing contractor shall be allowed to move freely to apply products as necessary. Materials stored on the floor, shall be protected by the contractor, or relocated if these materials prevent the proper application of fireproofing.

B. Patching, repairing and cleaning of fireproofing, due to damage done by others, shall be performed by the fireproofing applicator.

C. After completion of fireproofing, the fireproofing applicator shall remove all equipment, and broom sweep all floor areas of overspray materials.

D. Application of fireproofing shall not commence until the project is at a stage to allow the applicator to apply product continuously and efficiently, without undue interference and delay by other trades.

E. Conference: Convene a pre-installation conference to establish a procedure to maintain optimum working conditions and to coordinate this work with related and/or adjacent work.

1.8 SUBMITTALS, REFERENCES AND APPLICABLE STANDARDS

A. Product Data: Submit manufacturer's product data, installation instructions, use and limitations for each material used, and applicable fire test designs, as listed by approved fire testing organization.

B. Performance Certification: Submit manufacturer's verification of performance criteria, fire performance and compliance with applicable standards.

C. Applicable Standards and Test Methods: Products Submitted shall be tested in accordance with the following ASTM test methods:

1. E 119 Fire Test of Building Construction and Materials
2. E 84 Test for Surface Burning Characteristics of Building Materials
3. E 136 Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
4. E 605 Thickness and Density of Sprayed Fire Resistive Materials Applied to Structural Members
5. E 736 Cohesion/Adhesion of Sprayed Fire Resistive Materials Applied to Structural Members

6. E 759 Effect of Deflection of Sprayed Fire Resistive Materials Applied to Members
7. E 760 Effect of Impact on Bonding of Sprayed Fire Resistive Materials Applied to Structural Members
8. E 761 Compressive Strength of Sprayed Fire Resistive Materials Applied to Members
9. E 859 Air Erosion of Sprayed Fire Resistive Materials Applied to Structural Members
10. E 937 Corrosion of Steel By Sprayed Fire Resistive Materials Applied to Structural Members
11. AWCI "Inspection Procedure for Field Applied Sprayed Fire Protection Materials", and the current UBC Standard on: "Thickness and Density Determination for Spray Applied Fire Protection"

1.9 WARRANTY

A. General Warranty: Submit a written warranty, executed by the contractor and cosigned by the installer, agreeing to repair or replace sprayed fireproofing materials that fail within the specified warranty period.

1. Failures include, but are not limited to cracking, flaking, eroding in excess of specified requirements, peeling and delaminating of sprayed fireproofing from substrates due to defective materials or installation.
2. Not covered in this warranty are failures due to damage by others, such as occupants and owner maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, excessive flexing of floor systems, and work on said roof systems, and other causes not reasonable foreseeable under conditions of normal use.

B. Warranty Period: 2 years, from date of substantial completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products: All products shall be a wet slurry type. Physical properties shall be in accordance with the following. Products shall be a mixture of gypsum and/or cement based materials, with lightweight aggregates to be mixed with water to form a slurry for conveyance and application. Mineral fiber based products not permitted.

2.2 AVAILABLE MANUFACTURERS

A. Concealed Cementitious Fireproofing: Concealed meeting the below listed minimum physical properties, for use in locations not subject to physical contact or abuse.

1. Southwest Vermiculite Co. Inc. (Type 5)
2. W. R. Grace (Monokote MK-6).
3. CAFCO (300).

B. Physical Properties: Minimum values unless otherwise indicted., or higher values required to attain designated fire resistance ratings, measured per standard ASTM test methods referenced above in Section 1.8, Part C.

1. E 84: Flame Spread 0, and Smoke Developed 0.
2. E 136: Passes, and is determined non - combustible
3. E 605: Density shall be a minimum of 15 pcf.
4. E 736: Cohesion/Adhesion shall be 200 psf; if primed steel is used, comply with minimum requirements of UL for primed steel surfaces.
5. E 759: No cracking, spalling or delamination
6. E 760: Impact: No delamination, cracking or spalling
7. E 761: Compression shall be 5.0 lb/sq. in.
8. E 859: Erosion shall be 0.025 gr/sq.ft. maximum
9. E 937: Corrosion: No evidence of corrosion allowed

C. Structural members not meeting minimum size requirements specified in a design shall receive a thickness of fireproofing consistent with the member's W/D ratio.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide the following materials as standard with each of the fireproofing systems, as recommended by the manufacturer for each condition and substrate.

B. Reinforcements: Provide fiberglass mesh or wire lath for areas where adhesion is not compatible and for application of fireproofing to steel joists.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION EXAMINATION: The applicator and the contractor shall examine surfaces to be fire protected, and determined if the surfaces are satisfactory. Substrate conditions must comply with the following:

A. Substrates must be free of grease, oil, rolling compounds, incompatible primers, loose mill scale, dirt or any other foreign matter which would prevent proper bonding of fireproofing. Structural steel shall be unprimed. Steel roof and floor decking shall be galvanized only.

B. Any objects such as hangers, piping attachments, and other suspended retainer devices

shall be properly secured.

C. Ducts, piping, and other equipment shall not be placed or suspended until the fireprotection materials are in place.

3.2 PREPARATION:

A. Clean any substrate not ready to receive fireproofing. Consult with manufacturer if conditions exist not easily remedied.

B. Apply adhesives as necessary.

C. Cover all work subject to overspray during application. Provide temporary enclosure when necessary to temporarily confine fireproofing and protect the environment.

D. Assure maintenance of ambient temperatures, and/or heat and ventilation when required.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturers written application instructions and procedures for mixing, conveying and applying products, in accordance with the types of recommended equipment, admixtures and specific procedures regarding special conditions.

B. Coat substrates with adhesives if necessary.

C. Extend fireproofing materials in full thickness per approved design, to be protected. Unless otherwise recommended, install fireproofing complete in each area, prior to another.

D. Provide a uniform surface matching UL requirements for designs approved. Apply products at the minimum densities required, or greater.

E. Cure fireproofing to prevent premature drying; protect from freezing as listed in Section 1.5 of this specification.

A. Testing Agency: The Owner shall engage a qualified independent testing agency to perform field quality inspections of applied fireproofing, and prepare reports as required by IBC 2015.

1. Tests shall be done on surface condition, thickness, density, bond strength and adhesion.
2. Variances shall be corrected with the testing agency present, and when the applicator is performing work in the same area, to allow for expedient corrections.
3. A schedule of tests to be performed shall be agreed upon by the applicator, contractor and testing agency. The contractor shall allow the testing agency full access to the site. The contractor shall repair any area damaged by testing.

3.4 CLEANING AND REPAIR:

A. After completion of each days work, the applicator shall broom clean the area fireproofed. Areas not to receive fireproofing but are finished surfaces shall be masked.

B. All patching of damaged fireproofing shall be completed by applicator.

3.5 SCHEDULE:

A. Reference the drawings for applicable fire-resistance hourly ratings of structural components and associated UL design numbers.

END OF 07811 SECTION