

SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Work covered by the Contract Documents.
 2. Work phases.
 3. Work under other contracts.
 4. Work hours.
 5. Use of premises.
 6. Owner's occupancy requirements.
 7. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: DAS Project No. 9390.00 – DOC 1JD DPP Basement Water Infiltration Mitigation.
1. Project Location: 745 Main Street, Dubuque, Iowa 52001.
- B. Owner: Iowa Department of Administrative Services, 109 SE 13th Street, Des Moines, IA 50319
1. Owner's Representative: Jennifer Kleene.
- C. Architect: Edward Matt, AIA, GENESIS Architectural Design, 939 Office Park Road, Suite 101, West Des Moines, IA 50265.
- D. Mechanical-Electrical-Plumbing Engineer: Casey Adams, DURANTEM MEP Consulting, 3737 Woodland Ave., Suite 420, West Des Moines, IA 50266.
- E. The Work consists of the following:
1. Work scope consists of alley pavement removal and patching to install a waterproofing membrane over two basement rooms that are located underground in the alley. Work includes concrete crack repairs, cast in place concrete patching, lightweight concrete infill and waterproofing wall coating. Scope also includes prefinished metal trim, plastic panel protection boards, metal bollards, sealants and painting. There is also some minor interior gypsum board and plaster repairs.
 2. Plumbing and Electrical Work includes relocation and replacement of sprinkler pipes, demolition and relocation of main power lines entering the building with a new power feed to the basement main panel, demolition and relocation of conduits on the back wall

of the building. Work also includes removing and relocating fiber optics cabling into the building. Gas lines will be relocated by the local utility company.

- F. Project will be constructed under a single bid package contract, but coordinated with multiple other bid packages, all under the direction of the Owner's Construction Manager.

1.3 WORK PHASES

- A. The Work shall be conducted in a single phase.
- B. Before commencing work contractor shall submit a construction schedule showing the sequence, commencement, completion dates for all portions of the work.

1.4 WORK UNDER OTHER CONTRACTS

- 1. Owner may engage separate contracts for abatement of Asbestos Containing Materials (ACM). Coordinate with Owner for work interface and cooperate with Owner's other contractors.

1.5 WORK HOURS

- A. Typical work days are between Monday thru Friday. See Division 0 for specific daily work hours.
 - 1. Extended work hours may be arranged upon mutual understanding between Owner and Contractor.
 - 2. Contractor must close and secure all areas of construction at the end of each day's work activities.

1.6 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations, as described herein, and as indicated on Drawings by the Contract limits. Do not disturb portions of building and site beyond areas in which Work is indicated. Contractor's use of premises may be limited by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of premises to work in areas indicated.
- C. Limits: Confine construction operations to limit site disturbance to the property immediately surrounding the porch unless pre-approved by Owner. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways and Entrances: Keep adjacent roads and driveways serving building clear and available to Owner, Owner's employees, and emergency vehicles at all times. Coordinate areas for parking or storage of materials with Construction Manager.

- a. Schedule deliveries to minimize use of driveways and entrances.
- b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site. Deliveries and Contractor access to buildings shall be limited as much as possible while keeping the buildings secure at all times.
- c. Coordinate with Owner for locations available for a job trailer or enclosed material storage container.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner and public will occupy site and existing buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
 1. Maintain access to existing walkways and other adjacent occupied or used facilities. Do not close or obstruct walkways, exits, or other occupied areas or use facilities without written permission from Owner and authorities having jurisdiction.
 2. Street, alley, and sidewalk closures are to be coordinated with the City. Contractor is responsible for any closure permits and fees.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
- B. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations these conventions are as follows:
 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meaning shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjective mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000

SECTION 01 2200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual specification sections or descriptions below for work that requires establishment of unit prices. Methods of measurement and payment for unit prices shall be as specified herein. Document scope with photos and submit with requests for payment.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. The Contractor is required to photograph, document and get Owner approval before proceeding with any additional scope that would require the application of Unit Costs. Owner's representative or the Construction Manager can approval the additional work scope.
- E. List of Unit Prices: A list of unit prices is included in Part 3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

- A. UNIT PRICE No. 1: ADDITIONAL CONCRETE CRACK REPAIR

1. Description: State the lineal foot cost to rout out and apply crack repair compound in cracks on the exterior concrete surfaces of basement room ceiling as directed. Prepare the adjacent concrete and install per specifications. Include mastic top coating after cured.
2. Unit of Measurement: 1 Lineal Foot.

END OF SECTION 01 2200

SECTION 01 7329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. See Division 3 for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.3 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary dust enclosures where needed before beginning any cutting and patching work.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

- A. General: In general, the trade installing the work shall be the responsible party for cut and patch of existing construction as it work relates to their installation. Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces.

- a. If cutting concrete floors that will remain as exposed finished surfaces, do not over cut openings or leave run-on cut marks in finished floor.
 2. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 3. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Walls: Provide an even surface of uniform finish, color, texture, and appearance.
 - a. When patching walls that will remain as exposed finished surfaces, patch concrete provide test area of patched surface for approval before continuing work. See Division 3 Rehabilitation of Cast in Place Concrete for additional requirements.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 7329

SECTION 02 4119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

1.3 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Submit proposed demolition schedule to Owner/Architect for review, discussion, coordination and approval at Pre-Demolition Conference. Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.
- B. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Pre-demolition Conference: To be conducted in conference with the Owner and Construction Manager in a virtual online meeting or at the Project site.

1.5 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. Testing for lead paint and asbestos containing materials was done on the building. A report on the presence of hazardous materials is included for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Asbestos containing materials will be removed by Owner under a separate contract before start of the Work.
 - 2. Lead paint is to be removed by the contractor bidding work on affected areas. Contractor shall be lead-certified and have lead-certified worker perform all work on and around materials that are identified as lead containing or lead based paint.
 - 3. If other materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
- E. Storage or sale of removed items or materials on or off site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations. Contractor shall provide a fire safety plan that addresses down time during work on fire suppression systems.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- B. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

3.2 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

3.3 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
- B. Removed and Salvaged Items:
 - 1. Package or bundle material for storage.
 - 2. Transport items to the Owner's on site storage area.
- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Protect items from damage during storage.
 - 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them unless otherwise noted.

3.5 CLEANING

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

END OF SECTION 02 4119

SECTION 03 0137 - REHABILITATION OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Concrete patching compounds with a one-component shrinkage-compensated, cement-based mortar with extended working time for repairing horizontal concrete surfaces.
2. Crack repair sealant for small cracks using a 100% solid, 2-component elastomeric epoxy.
3. Waterproofing cement-based coating for concrete.

1.2 DESCRIPTION

A. Perform and provide all labor, products, and equipment required for repairing all defects on exterior cast-in-place concrete.

B. Work includes, but is not limited to:

1. Pressure wash cleaning prior to examination of all concrete surfaces.
2. Removal and cut-out of all delaminated, scaled, and spall damaged areas of existing concrete.
3. Preparation, cleaning and priming of all repair surfaces to receive patching compound.
4. Application of rust inhibitor on abrasion cleaned steel reinforcing.
5. Mixing, transportation and application of patching compound.
6. Finishing and curing of patches.
7. Application of cement based waterproofing coating.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Submit substitutions for pre-approval during bidding.

1.4 QUALITY ASSURANCE

- A. Source of Materials: Obtain materials for patching, coating, sealing and crack repair from a single source manufacturer to ensure match quality, color, texture and detailing.

1.5 MOCK UPS

- A. Patching: Prepare a sample area for each type of construction to be patched, rebuilt and/or replaced (e.g. one horizontal surface and one vertical surface). Patching shall demonstrate methods and quality of workmanship expected of repair work. Coordinate with Construction Manager and/or Architect for review.
 - 1. Size: Minimum of 6" x 6" area.
- B. Crack Repair: Prepare a sample area for each type of crack repair required for stone (i.e. cracks and voids larger than 1/8"). Repair shall demonstrate methods and quality of workmanship expected for crack repair. Coordinate with Construction Manager and/or Architect for review.
 - 1. Size: Minimum of 12" length.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

1.7 PROJECT CONDITIONS

- A. Do not apply below 40° F or above 90° or when rain, fog or mist is anticipated within twelve hours after application. Protect from conditions that may cause early water loss: high winds, low humidity, high temperature, and direct sunlight.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide products from a single source manufacturer to ensure product compatibility.

2.2 REPAIR MORTAR: (BASEMENT CONCRETE PATCHING AT PIPE HOLES)

- A. A one-component, shrinkage compensated, rapid setting cement based repair mortar for repairing horizontal concrete surfaces.
- B. Manufacturers: Basis of Design – MasterEmaco T 1061 Rapid Mortar by BASF Corp. (horizontal surfaces only)
 - 1. Acceptable Products:
 - a. Meadow-crete GPS by W. R. Meadows
 - b. SikaTop 122 Plus by Sika Corp.
 - c. Others as pre-approved.
 - 2. Product Properties:

- a. Compressive Strength, ASTM C109. 2500 psi at 1 day, 6000 psi at 7 days, and 7000 psi @ 28 days.
 - b. Bond Strength, ASTM C882 700 psi at 1 day, and 2600 psi at 28 days.
 - c. Modulus of Elasticity, ASTM C469 16.8 GPa (2.44 x 10⁶ psi)
 - d. Drying Shrinkage, ASTM C157 -0.083 % (830 μ strain)
 - e. Flexural Strength, ASTM C348 650 psi at 1 day, 850 psi at 28 days.
 - f. Freeze-Thaw Resistance, ASTM C666 112 % RDM at 300 cycles
- C. BONDING AGENT: Apply bonding agents to enhance bonding between repair mortar to existing concrete where recommended by manufacturer.

2.3 CONCRETE CRACK REPAIR: (BASEMENT CONCRETE CRACKS)

- A. A two-component low viscosity, high strength, multi-purpose liquid epoxy injection resin for pressure injection or gravity feeding applications.
- B. Basis of Design – Sikadur 35 by Sika Corp. (horizontal surfaces only)
 1. Acceptable Products:
 - a. Flex-Seal 510 by Edison Coatings
 - b. Rezi-Weld LV State by W. R. Meadows
 - c. Others as pre-approved.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Protect adjacent Work areas and finish surfaces from damage during mortar system application.
- B. Concrete:
 1. Remove unsound or delaminated concrete.
 2. Saw-cut straight edges along repair area perimeters minimum of 1/4 inch deep (or per manufacturer) to eliminate featheredges. Do not cut reinforcement.
 3. Report cracks that appear in interface area of patch or overlay to Architect, and repair as directed.
 4. Power wash clean to remove area of sand, grit and dust.

3.2 CONCRETE PATCHING (BASEMENT CONCRETE PATCHING AT PIPE HOLES)

- A. Prior to patching, all repair areas to be patched shall be kept continuously wet for at least 20 minutes prior to application of patching compound. Before placing patch, excess water shall be removed from the surface, leaving the surface damp or saturated/surface dry.
- B. If bonding agents are recommended by the manufacturer for the system, apply bonding agent into all cavity surfaces. Apply bonding agent undiluted by brush, roller or garden-type sprayer on to prepared surface or in accordance with manufacturer's instructions if different.

- C. While bonding agent is still wet, mix and place patching compound in accordance with manufacturer's instructions.
- D. Mix the precisely measured quantity of water specified by the manufacturer with full bags of patching compound only. Mix per the manufacturer's instructions. Mix to a uniform consistency, free of lumps or dry material. Do not over mix or whip air into the mix.
- E. Add aggregate per manufacturer's instructions, size up to 3/8".
- F. Hand Placement:
 - 1. Compact mortar into properly prepared substrate prior to bulk placement.
 - 2. Apply mortar up to 3" horizontally dependent on patch size and configuration.
 - 3. Finish surface with a wood or steel trowel, or a sponge float.
 - 4. Do not re-temper or over-work.
- G. Do not open to traffic or expose to weather until adequate strength has been reached, as affected by Working and curing conditions.

3.3 CONCRETE CRACK REPAIR (BASEMENT CONCRETE PATCHING)

- A. All surfaces to be bonded must be free of standing water and completely clean of dirt, rust, curing compounds, grease, oil, paint, waxes, and other materials which would prevent an optimal bond.
- B. Cracks should be v-notched and then mechanical abrading or high pressure water jetting to a sound surface.
- C. Mix per the manufacturer's written instructions. Mix with properly colored sand for cracks over 1/4 inch wide. If mixing with sand, mix in ratios per manufacturer's recommendations.
- D. Pressure Injection of Cracks:
 - 1. Seal ports and cracks with an appropriate paste epoxy.
 - 2. When paste is cured, inject adhesive using standard pressure-injection equipment or by gravity feed.
 - 3. For injection with side-by-side dispenser, hold in upright position and use continuous pressure to avoid an improper mixing ratio.
- E. Gravity Feeding: Pour neat into v-notched crack. Continue placement until completely filled.
- F. For larger patching areas follow manufacturer's instructions.
- G. Clean tools immediately after use with xylene or mineral spirits. Remove cured materials with commercial epoxy or paint stripper solvents.

3.4 CURING:

- A. Cure all concrete repair products accordance with manufacturer's instructions.

3.5 CLEANING

- A. Clean wet mortar material from tools and equipment with water. Remove cured materials mechanically.
- B. Clean up and properly dispose of any debris remaining on Project site related to application.
- C. Do not use storm inlets, floor drains, or facility sinks for cleaning. Coordinate with Owner for appropriate wash out locations.

END OF SECTION 03 0137

SECTION 03 3053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies the following work:
 - 1. Cast-in place concrete, including reinforcement.
 - 2. Lightweight concrete for infills.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Ready-Mix batch tickets.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- D. Pre-installation Conference: Conduct conference at Project site.
- E. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- F. Contact Construction Manager minimum of 3 days prior to pouring concrete to coordinate visually inspection of steel reinforcement.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- B. Form- Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 galvanized reinforcing bars deformed.
- B. Galvanized-Steel Welded Wire Reinforcement: ASTM A185, plain, fabricated from galvanized steel wire into flat sheets. Provide 4" x 4" x 10 gauge mesh at vertical curb.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

- A. Mix Material: Use the following materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I. Contractor may supplement with the following at a rate not to exceed 15%:
 - a. Fly Ash: ASTM C 618, Class C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - 2. Normal-Weight Aggregates: (For Exterior Concrete) ASTM C 33, graded, 3/4-inch nominal maximum coarse-aggregate size.
 - a. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement and coal/chert impurities that cause pop-outs.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - 3. Light-Weight Aggregate: ASTM C 330/C 330M, up to 3/4-inch nominal maximum aggregate size.
 - 4. Water: ASTM C 94/C 94M and potable.
 - 5. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

2.4 CURING MATERIALS

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

2.5 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Proportion Normal Weight Concrete mixture as follows:

1. Minimum Compressive Strength: 3500 ps. at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high range water reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size for exterior concrete.

C. Proportion Light Weight Concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.5.
3. Slump Limit: 6 inches for concrete with verified slump of 4 to 6 inches.

D. Alternative Light Weight Concrete mixture: (CONTRACTOR'S OPTION)

1. Alternative in lieu of providing lightweight concrete is provide Geofill cellular foam concrete.
2. Minimum Compressive Strength: 1000 ps. at 28 days.
3. Flowable and self-leveling.

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

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

PART 3 - EXECUTION

3.1 PROTECTION OF WORK AND ADJACENT AREAS

- A. Protect adjacent slabs during construction. Any broken, cracked or damaged areas of adjacent slabs shall be remove and replace at no cost to the Owner.
- B. Provide suitable barricades to protect sidewalks from traffic. Pedestrian sidewalks shall be closed to traffic for at least 48 hours. All barricades and barricading shall be approved by the Owner.

3.2 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

3.3 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. The maximum deviation of the top surface of any section shall not exceed one-eighth inch 1/8" or the inside face not more than one-fourth inch 1/4" from a straight line.
- D. Hot-Weather Placement: Comply with ACI 301.

3.6 FINISHING FORMED SURFACES

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

3.7 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying. Comply with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 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, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.8 FINAL CLEANING

- A. Concrete trucks are not allowed to deposit "washout" on any of the streets, sidewalks, driveways, or storm sewers of the facility. Coordinate wash out location with Owner.

END OF SECTION 03 3053

SECTION 05 5000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Metal bollards.

1.2 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Prefabricated Steel Bollards: Contractor's option to provide prefabricated galvanized steel bollards in lieu of fabricating. Provide bollards in size, shape and diameter with base plate as shown in the Drawings.

a. Provide products from one of the following manufacturers:

- 1) Global Industrial Inc.
- 2) Others as equal.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

B. Ferrous Metals:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.3 FASTENERS

- A. General: Zinc-plated fasteners with coating complying with ASTM B 633, at exterior walls. Select fasteners for type, grade, and class required.
- B. Wedge Fasteners: Provide galvanized mechanical wedge anchors in sizes as indicated.

2.4 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint for regalvanizing welds in steel.
- B. Nonshrink, Epoxy Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

2.5 FABRICATION

- A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
 - 1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
 - 2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
 - 3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- B. Metal Bollards: Fabricate from Schedule 40 steel pipe.

2.6 FINISHES

- A. Steel and Iron Finishes:
 - 1. Hot-dip galvanize items as indicated to comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.

1. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
2. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
3. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

B. Bollards:

1. Anchor bollards in place by bolting base plates to asphalt paving. Drill holes sized to depth needed for expansion anchors. Position directly under base plate holes.
2. Set anchors embedded in epoxy to fill all gaps.
3. Provide two coats of "Safety Yellow" paint to the bollards. See Division 09 9100.

END OF SECTION 05 5000

SECTION 07 1326 - SELF-ADHERING SHEET WATERPROOFING

1.1 SUMMARY

A. Section Includes:

1. Modified bituminous sheet waterproofing, fabric reinforced.

1.2 PRE-INSTALLATION MEETINGS

- #### A. Pre-installation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- #### A. Product Data: For each type of product.

- #### B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, expansion joints, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1. Include drawings showing layout, sizes, sections, profiles, and joint details.

1.4 INFORMATIONAL SUBMITTALS

- #### A. Sample warranties.

1.5 QUALITY ASSURANCE

- #### A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.6 WARRANTY

- #### A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet, Fabric Reinforced: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of rubberized-asphalt membrane with embedded fabric reinforcement, and with release liner on adhesive side.
1. Basis of Design: Subject to compliance with requirements, manufacturers offering similar products to the following:
 - a. Mel-Rol, by Meadows, W. R., Inc.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF MasterSeal.
 - b. Others as pre-approved.
 3. Physical Properties:
 - a. Pliability: No cracks when bent 180 degrees over a 1-inch mandrel at minus 25 deg F per ASTM D 146/D 146M.
 - b. Puncture Resistance: 40 lbf minimum; ASTM E 154/E 154M.
 - c. Water Vapor Permeance: 0.05 perm (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
 4. Sheet Strips: Self-adhering, reinforced, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.2 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid solvent-borne primer recommended for substrate by sheet-waterproofing material manufacturer.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.
- D. Liquid Membrane: Elastomeric, single-component liquid, cold fluid applied, solvent free, of trowel grade or low viscosity. Use to cover crack repairs in substrate. Product to be compatible with sheet-waterproofing membrane.

1. Basis of Design: Subject to compliance with requirements, manufacturers offering similar products to the following:
 - a. Hydralastic 836, by Meadows, W. R., Inc.
 - b. HLM 5000 by MasterSeal (BASF).
 - c. TremProof by Tremco.
 - d. Others as pre-approved.
- E. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch, predrilled at 3-inch centers. Or termination bars as provided by system manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Coat crack repairs and cover all joints and transitions in materials with liquid membrane waterproofing compound. Provide built up cant between top of concrete and wall intersection. Overlap cracks and transitions min. 2 inches each side.

3.2 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

- A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and per recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 4 inch minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
- D. Horizontal Application: Apply sheets from low to high points of walls to ensure that laps shed water.

- E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
- F. Seal edges of sheet-waterproofing terminations with mastic.
- G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

3.3 PROTECTION, REPAIR, AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 1326

SECTION 07 9200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants for the following applications:
 - 1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. Product Data: Provide product certificates, compatibility and adhesion test reports for each joint-sealant product indicated.
- B. Color Samples: Submit color charts or actual samples for the color of joint sealant required.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- A. Colors of Exposed Joint Sealant: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Single-Component Nonsag Urethane Sealant: Application: Exterior horizontal joints between different materials.
 - 1. Type and Grade: S (single component) and NS (nonsag).
 - 2. Class: 25.
 - 3. Uses Related to Exposure: T (traffic). Uses Related to Joint Substrates: M, and O as applicable to joint substrates indicated.
 - 4. Available Products:
 - a. Bostik Findley Inc.
 - b. Pecora Corporation; Dynatrol I-XL.
 - c. Polymeric Systems Inc.
 - d. MasterSeal Sonneborn: NP-1.
 - e. Tremco; DyMonic.
 - f. Tremco; Vulkem 116.
 - g. Others as pre-approved.
 - 5. Type and Grade: S (single component) and NS (nonsag).
 - 6. Class: 35.
 - 7. Use Related to Exposure: NT (nontraffic).

2.4 SOLVENT-RELEASE-CURING JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealant: ASTM C 1311.
- B. Available Products:
 - a. Bostik, Inc.
 - b. DAP Products, Inc.

- c. Pecora Corporation.
- d. Tremco Incorporated.
- e. Others as pre-approved.

2.5 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
 - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply

primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. For exterior sealants, the temperature must be 40°F (5°C) or above at the time the sealant is applied.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following:
 - 1. Place sealants so they directly contact with joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

- H. For polyurethane sealants, tool clean up and excess sealant smears can be removed with xylene or mineral spirits.

3.3 EXTERIOR JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application EJS-1: Exterior perimeter joints between adjacent materials and frames of doors and windows.
 - 1. Joint Sealant: Single-component non-sag polymer modified urethane sealant.
 - 2. Joint-Sealant Color: Match trim color.
- B. Joint-Sealant Application EJS-2: Exterior vertical joints between different materials.
 - 1. Joint Sealant: Single-component nonsag polymer modified urethane sealant.
 - 2. Joint-Sealant Color: To be selected.
- C. Joint-Sealant Application EJS-3: Exterior sealant around waterproof wall coating.
 - 1. Joint Sealant: Single-component nonsag polymer modified urethane sealant.
 - 2. Joint-Sealant Color: To match substrate; verify with Architect.
- D. Joint-Sealant Application EJS-4: Exterior sealant around basement concrete penetrations.
 - 1. Joint Sealant: Butyl-Rubber-Based Joint Sealant
 - 2. Joint-Sealant Color: Black.

END OF SECTION 07 9200

SECTION 07 9500 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes pre-compressed horizontal expansion joint systems for building exteriors.

1.2 SUBMITTALS

- A. Product Data: For each type of joint product indicated.
- B. Shop Drawings: Provide placement drawings, including line diagrams and details. Submit typical expansion joint cross-section(s) indicating pertinent dimensioning of opening, profile recess and adjacent construction.
- C. Samples: Provide samples for approval on each finish and color.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site in Manufacturer's original, intact, labeled containers. Handle and protect as necessary to prevent damage or deterioration during shipment, handling and storage. Store off the ground, protect from weather and construction activities. Store in accordance with manufacturer's installation instructions.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to furnish materials to repair or replace those that fail within the warranty period.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL JOINT SYSTEMS, GENERAL

- A. General: Provide joint systems of design indicated.
 - 1. Furnish in longest practicable lengths to minimize splicing. Install with hairline mitered corners where joint changes direction.
 - 2. Include factory-fabricated closure materials and transition pieces to provide continuous joint systems.
- B. Design architectural joint systems for the following size and movement characteristics:
 - 1. Nominal Joint Width: As indicated on Drawings.

2.2 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING EXTERIORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the products specified below as basis-of-design products or a comparable product by one of the following:
1. ColorSeal by EMSEAL Joint Systems, Ltd.
 2. WaboHSeal, by Watson Bowman Acme Corp.
 3. WillSeal 250, by TREMCO.
 4. Others as pre-approved.
- B. Joint Systems for Exterior Concrete Slabs. Preformed, Pre-Compressed, Self-Expanding, Sealant System with Silicone Pre-Coated Surface Non-Traffic, High Movement, Primary Seal for Horizontal Joints.
1. Basis-of-Design Product: Horizontal WaboH Seral as manufactured by Watson Bowman Acme Corp.
 2. Type: Expansion Control, Preformed Cellular Foam.
- C. Seal Material: Pre-formed sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system. Expanding foam to be cellular foam impregnated with a water-based, non-drying, 100% acrylic dispersion. Seal shall combine factory-applied, low-m Foam Seals: Install with adhesive recommended by manufacturer.
- a. Modulus silicone and a backing of acrylic-impregnated expanding foam into a unified hybrid sealant system.
 - b. Material shall be capable of movements of +50%, -50% (100% total) of nominal material size.
 - c. Product shall be mildew resistant, non-staining and non-bleeding.
 - d. Size and Model: 25EH, 3/4" wide by 2" deep.
 - e. Color: Manufacturer's standard Gray color.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions.
- B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout.
- C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.
- B. Inspect joint opening for any deficiencies such as spalled edges or protrusions. Repair joint opening deficiencies prior to installation of joint material.

3.3 INSTALLATION

- A. Where indicated and noted on the contract drawings, install seal profiles in a neat workmanlike manner. All surfaces to receive seals shall be free from dirt, water, frost and any loose foreign debris that may be detrimental to effective joint sealing.
- B. Carefully unpackage pre-compressed joint material the shipping forms. Do not cut or puncture the silicone face membrane on top of the joint material. Set material quickly into joint before it expands.
- C. Tape off edges of substrate to prevent epoxy adhesive exposure.
- D. Install with adhesive recommended by manufacturer. Preformed sealant to be installed using manufacturer's standard field-applied 2 component epoxy adhesive on both sides of joint. Mix and apply the epoxy adhesive per manufacturer's recommendations.
- E. Preformed sealant to be installed slightly recessed from the surface such that when the field-applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellows, the system will be flush with the substrate surface.
- F. Provide a 45 deg. miter at "L" shaped corner transitions. Provide a 90 deg. butt joint at "T" shaped transitions.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete.
- B. Protect the installation from damage by work of other Sections.

END OF SECTION 07 9500

SECTION 09 2400 - CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes interior vertical 2-coat cement plaster work.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I.
 - 1. Color for Finish Coats: White.
- B. Masonry Cement: ASTM C 91, Type N.
 - 1. Color for Finish Coats: White.
- C. Plastic Cement: ASTM C 1328.
- D. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- E. Sand Aggregate: ASTM C 897.

2.2 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
- B. Base-Coat Mixes for Use over Unit Masonry and Concrete: Single base (scratch) coat for two-coat plasterwork on high-absorption plaster bases as follows:
 - 1. Portland Cement Mix: For cementitious material, mix 1-part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - 2. Masonry Cement Mix: Use 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 - 3. Portland and Masonry Cement Mix: For cementitious material, mix 1-part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - 4. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.

- C. Ready-Mixed Base-Coat Plaster: Mill-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Plaster Wall Patch Dry Mix, by DAP.
 - b. Two-Way Hardwall Plaster, by Gold Bond.
 - c. Lahabra FastWall, by Parex.
 - d. Quikrete Stucco Finish, by Sakrete.
 - e. Others as pre-approved.
- D. Ready-Mixed Finish-Coat Plaster: Mill-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Stucco Patch, by DAP.
 - b. Quick Set Gauging Plaster, by Gold Bond.
 - c. Lahabra PermaFinish, by Parex.
 - d. Quikrete Stucco Patch, by Sakrete.
 - e. Others as pre-approved.
 - 2. Color: Match existing wall finish.

2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Bonding Compound: ASTM C 932.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Prepare smooth, solid substrates for plaster according to ASTM C 926.

3.2 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
- B. Bonding Compound: Apply on unit masonry and concrete substrates for direct application of plaster.
- C. Walls; Base-Coat Mix: For base (scratch) coat, for two-coat plasterwork and having 1/2-inch thickness on masonry walls.

1. Allow to cure per manufacturer's instructions before applying finish coat.
- D. Plaster Finish Coats: Apply 1/8-inch thick to provide a float finish to match existing wall finish.
 1. Allow to cure per manufacturer's instructions before painting.

3.3 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

END OF SECTION 09 2400

SECTION 09 2900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Gypsum board accessories.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum Co.
 - b. G-P Gypsum.
 - c. Lafarge North America Inc.
 - d. National Gypsum Company.
 - e. USG Corporation.
 - f. Others as pre-approved.

B. Regular Type:

1. Thickness: 1/2 - 5/8 inch - as required to match existing.
2. Long Edges: Tapered.

2.2 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet
 - 2. Shapes:
 - a. Corner bead.
 - b. L-Bead: L-shaped; exposed long flange receives joint compound.

2.3 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats. Provide wallboard tape finishes utilizing a Level 4 Finish as follows:
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

2.5 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
 - 1. Textures and Finishes:
 - a. Walls - Smooth finish.

PART 3 - EXECUTION

3.1 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Regular Type: As indicated on Drawings.

3.2 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. U-Bead: Use at exposed panel edges.

3.3 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Provide wallboard tape finishes utilizing a Level 4 Finish as follows:
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: Apply setting-type taping compound for embedding tape and first coat on joints, fasteners, and trim flanges,. Fully embed tape in joint compound, and then wipe with a joint knife, leaving a thin coat of compound over tape. Lightly sand smooth before recoating.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound. Lightly sand smooth before recoating.

4. Finish Coat: For third coat, use setting-type, sandable topping compound. Provide final sanding to leave a smooth surface without pockets, dimples, bumps or ridges. Final sanding should leave a surface that is ready to receive paint primer.

3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

END OF SECTION 09 2900

SECTION 09 9100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior and exterior substrates:
 - 1. Steel or galvanized metal.
 - 2. Gypsum board.
 - 3. Plaster.

1.2 SUBMITTALS

- A. Product Data: For each type of paint product indicated.
- B. Samples: Provide paint draw-down samples for approval on each finish and color.

1.3 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Acceptable mock ups can remain as a part of the completed work.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

2.2 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products by the following:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
 - a. Behr Paint Company.

- b. Benjamin Moore & Co.
- c. Diamond Vogel.
- d. PPG Paints.
- e. Pratt & Lambert.
- f. Rust-Oleum Corp.
- g. Sherwin-Williams Company.
- h. Others as pre-approved.

B. Material Compatibility:

- 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
- 2. For each coat in a paint system, provide products recommended in writing by manufacturers of top coat for use in paint system and on substrate indicated.

C. Colors: As selected or pre-selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Wood: 15 percent.
 - 2. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- C. New surfaces should be fully primed, and previously painted surfaces may be primed or spot primed as necessary.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections.
- E. Painting Mechanical and Electrical Work: Unless noted otherwise, paint items exposed in occupied public spaces including, but not limited to, the following:
 1. Mechanical Work:
 - a. Pipe hangers and supports
 2. Electrical Work:
 - a. Electrical equipment that is indicated to have a factory-primed finish for field painting.
 - b. Exposed surface mounted conduits and junction boxes.
- F. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- G. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 INTERIOR PAINTING SCHEDULE

- A. Gypsum Board Substrates:
 1. Latex System: MPI INT 9.2A.
 - a. Prime Coat: Interior latex primer/sealer. MPI #39.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (eggshell). MPI #52.
- B. Plaster Substrates:
 1. Latex System: MPI INT 9.2A.
 - a. Prime Coat: Interior latex matching topcoat.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (eggshell).
- C. Other Substrates: Provide primer and topcoats in accordance with manufacturer's recommendations.

3.4 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Alkyd Enamel System:

- a. Prime Coat: Alkyd anticorrosive metal primer. MPI #79.
- b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
- c. Topcoat: Exterior alkyd enamel (satin gloss). MPI #94.

B. Galvanized-Metal Substrates:

1. Alkyd Enamel System:

- a. Prime Coat: Cementitious galvanized-metal primer.
- b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
- c. Topcoat: Exterior alkyd enamel (semi-gloss). MPI #94.

C. Other Substrates: Provide primer and topcoats in accordance with manufacturer's recommendations.

END OF SECTION 09 9100

**SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Above ground piping.
- B. Mechanical couplings.
- C. Pipe hangers and supports.

1.02 REFERENCE STANDARDS

- A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
- B. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
- C. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.
- D. AWWA C606 - Grooved and Shouldered Joints; 2022.
- E. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Sprinkler-based System:
 - 1. Comply with NFPA 13.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A795 Schedule 40, black.
 - 1. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.03 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.
- C. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.
- D. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
- E. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.04 MECHANICAL COUPLINGS

- A. Manufacturers:
 - 1. Anvil International: www.anvilintl.com.
 - 2. Shurjoint Piping Products, Inc: www.shurjoint.com.
 - 3. Tyco Fire Protection Products: www.tyco-fire.com.
 - 4. Victaulic Company: www.victaulic.com.
 - 5. Substitutions: See Section 01 2500 - Substitution Procedures.

- B. Rigid Mechanical Couplings for Grooved Joints:
 - 1. Dimensions and Testing: Comply with AWWA C606.
 - 2. Minimum Working Pressure: 300 psig (2065 kPa).
 - 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
 - 4. Housing Coating: Factory applied orange enamel.
 - 5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
 - 6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
 - 1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- I. Structural Considerations:
 - 1. Do not penetrate building structural members unless indicated.
- J. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- K. Escutcheons:
 - 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
 - 2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 - 3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

- L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

**SECTION 221005
PLUMBING PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Natural gas piping, above grade.
- B. Pipe flanges, unions, and couplings.
- C. Pipe hangers and supports.
- D. Ball valves.

1.02 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- B. ASME B31.1 - Power Piping; 2022.
- C. ASME B31.9 - Building Services Piping; 2020.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- E. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- G. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- H. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- J. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- K. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.
- L. NSF 372 - Drinking Water System Components - Lead Content; 2022.
- M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 QUALITY ASSURANCE

- A. Work is to be completed by Black Hills Energy.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.

2.03 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
 - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.04 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
- B. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 - 1. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
 - 2. Masonry Screw Type Anchors: Comply with ICC-ES AC106.
 - 3. Other Types: As required.

2.05 BALL VALVES

- A. Manufacturers:
 - 1. Anvil International: www.anvilintl.com.
 - 2. Apollo Valves: www.apollovalves.com.
 - 3. Nibco, Inc: www.nibco.com.
 - 4. Substitutions: See Section 01 2500 - Substitution Procedures.
- B. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 4. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

3.02 APPLICATION

- A. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.03 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Gas Distribution Systems:
 - 1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
 - 2. General Systems:
 - a. Inject a minimum of 10 psi (68.9 kPa) of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
 - b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound (0.45 kg).
- C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.04 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2) Hanger Rod Diameter: 3/8 inches (9 mm).

END OF SECTION

**SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

PART 3 EXECUTION

2.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation.
- D. Report discrepancies to Architect before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

2.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 2 weeks before partially or completely disabling system.
- E. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Owner at least 2 weeks before partially or completely disabling system.
- F. Existing Fiber Optic Communication System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 2 weeks before partially or completely disabling system.

2.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.

- G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

2.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION

**SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Heat shrink tubing.
- E. Oxide inhibiting compound.
- F. Wire pulling lubricant.

1.02 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.04 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductor Material:
 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 3. Tinned Copper Conductors: Comply with ASTM B33.
- I. Minimum Conductor Size:
 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape

3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com.
 - b. Southwire Company: www.southwire.com.
 - c. Substitutions: See Section 01 2500 - Substitution Procedures.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.

2.04 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Wiring Connectors for Splices and Taps:
 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 2. Copper Conductors Size 6 AWG and Larger: Use compression connectors.
- C. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- D. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- F. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.05 ACCESSORIES

- A. Electrical Tape:
 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 3. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
 - C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
 - D. Wire Pulling Lubricant:
 1. Listed and labeled as complying with UL 267.
 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 3. Suitable for use at installation temperature.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 1. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Installation in Raceway:
 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 2. Pull all conductors and cables together into raceway at same time.
 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- G. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- J. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use electrical tape.
 - a. For taped connections, first apply adequate amount of electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Wet Locations: Use heat shrink tubing.
- L. Insulate ends of spare conductors using vinyl insulating electrical tape.
- M. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- N. Install firestopping to preserve fire resistance rating of partitions and other elements.
- O. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

**SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
 - 2. Coordinate work to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
 - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
 - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has cured.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - b. Requirements of authorities having jurisdiction.
 - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
 - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.

6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- D. Metal Channel/Strut Framing Systems:
 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 2. Comply with MFMA-4.
- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch (6 mm) diameter.
 - b. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch (10 mm) diameter.
 - c. Trapeze Support for Multiple Conduits: 3/8-inch (10 mm) diameter.
- F. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
 2. Concrete: Use expansion anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors.
 4. Plastic and lead anchors are not permitted.
 5. Powder-actuated fasteners are not permitted.
 6. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
 - b. Comply with MFMA-4.
 - c. Channel Material: Use galvanized steel.
 7. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
 - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
 - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- J. Secure fasteners in accordance with manufacturer's recommended torque settings.
- K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

**SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Galvanized steel electrical metallic tubing (EMT).

1.02 RELATED REQUIREMENTS

- A. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- H. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- I. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- J. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
 - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
 - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

- A. See Section 01 3300 - Administrative Requirements for submittals procedures.
- B. Project Record Documents: Record actual routing for conduits 2-inch (53 mm) trade size and larger.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Concealed Above Accessible Ceilings: Use galvanized steel electrical metallic tubing (EMT).
- D. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel electrical metallic tubing (EMT).
- E. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC).
 - 1. Exterior locations subject to severe physical damage include, but are not limited to:
 - a. Where exposed to vehicular traffic below 20 feet (6.1 m).

2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.
- C. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4-inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
 - 2. Material: Use steel.
 - a. Do not use die cast zinc fittings.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.05 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- C. Sealing Systems for Concrete Penetrations:
 1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
 2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.
- D. Conduit Routing:
 1. Arrange conduit to maintain adequate headroom, clearances, and access.
 2. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
 3. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 4. Route conduits above water and drain piping where possible.
 5. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 6. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 7. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Hot water piping.
- E. Conduit Support:
 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use of spring steel conduit clips for support of conduits is not permitted.
 9. Use of wire for support of conduits is not permitted.
- F. Connections and Terminations:
1. Use approved conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
 6. Secure joints and connections to provide mechanical strength and electrical continuity.
- G. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
 7. Install firestopping to preserve fire resistance rating of partitions and other elements.
- H. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where conduits are subject to earth movement by settlement or frost.
- I. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.
 - c. Where conduits enter building from underground.
 - d. Where conduits may transport moisture to contact live parts.
 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
 - a. Where conduits pass from outdoors into conditioned interior spaces.
 - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 271000 STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Communications system design requirements.
- B. Communications pathways.
- C. Fiber optic cable and interconnecting devices.
- D. Communications identification.

1.02 REFERENCE STANDARDS

- A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.
- B. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).
- E. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.
- F. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2023.
- G. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.
- H. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).
- I. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).
- J. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.
- K. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).
- L. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- M. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
 - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
 - 1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
 - 2. Comply with Communications Service Provider requirements.
 - 3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
 - 4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
 - 5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. System Description:
 - 1. Backbones - Within Building: Fiber optic, 12 -fiber.
- C. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

2.02 PATHWAYS

- A. Conduit: See section 230533.13.

2.03 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

- A. Fiber Optic Backbone Cable:
 - 1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
 - 2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
 - 3. Cable Capacity: Quantity of fibers as indicated on drawings.
 - 4. Cable Applications:
 - a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
- B. Fiber Optic Interconnecting Devices:
 - 1. Connector Type: Type LC.
 - 2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
 - 3. Maximum Attenuation/Insertion Loss: 0.3 dB.

2.04 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.02 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
 - 1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
 - 2. 12 inches (300 mm) from power conduits and cables and panelboards.

3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 2. Do not over-cinch or crush cables.
 3. Do not exceed manufacturer's recommended cable pull tension.
 4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
 1. At Distribution Frames: 120 inches (3000 mm).
 2. At Outlets - Optical Fiber: 39 inches (1000 mm).
- C. Fiber Optic Cabling:
 1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
 2. Support vertical cable at intervals as recommended by manufacturer.
- D. Identification:
 1. Use wire and cable markers to identify cables at each end.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
 1. Inspect cable jackets for certification markings.
 2. Inspect cable terminations for color coded labels of proper type.
 3. Inspect outlet plates and patch panels for complete labels.
- D. Testing - Fiber Optic Cabling:
 1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
- E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 31 2000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

D. Fill: Soil materials used to raise existing grades.

E. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

F. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner and then only after arranging to provide temporary utility services according to requirements indicated.

B. Contractor is responsible to locate all utilities within their work area prior to commencing work. Coordinate locations of site utilities with the City and the building Owner.

1.4 FIELD CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups that are free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Satisfactory soils are to be maintained within 2 percent of optimum moisture content at time of compaction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain erosion and sedimentation controls during earthwork operations.

3.2 EXCAVATION

- A. Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - 2. Excavation for Underground Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm).

3.3 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.4 SOIL FILL

- A. Place and compact fill material in layers to required elevations as follows:
 - 1. Under walks and pavements, use satisfactory soil material.

3.5 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 4 inches in loose depth for material compacted by mechanical vibratory compaction tampers.

- B. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. Under pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at compact each layer of initial and final backfill soil material at 95 percent.

3.6 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose off Owner's property.

END OF SECTION 31 2000

SECTION 32 1216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.

B. Related Requirements:

1. Section 31 2000 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the IOWA DOT.
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of IOWA SUDAS for asphalt paving work.
1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- B. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: ASTM D 6373 or AASHTO M 320 with binder designation.
- B. Tack Coat: ASTM D 977 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 MIXES

- A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Asphalt Mix Design Methods"; and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proof-roll subgrade below pavements to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

3.2 SURFACE PREPARATION

- A. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 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.

3.3 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in 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. Spread mix at a minimum temperature of 250 deg F.
 - 2. 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.
- 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.

3.4 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.

3.5 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. 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: 92 percent of reference maximum theoretical density according to ASTM D 2041/D 2041M, but not less than 90 percent or greater than 96 percent.
- C. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- D. 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.
- E. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

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

3.6 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 or minus 1/4 inch.
- 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.

3.7 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.8 FIELD QUALITY CONTROL

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

3.9 WASTE HANDLING

- A. General: Handle asphalt-paving waste according to approved waste management requirements as found in Division 01.

END OF SECTION 32 1216