Flying Creek Nature Preserve – Park Project

City of Fairhope

Project Number: 2023-PWI 001PP

Technical Specifications

February 23, 2024

Nick Combs, P.E.
Thompson Engineering, Inc.

thompson
ENGINEERING

Table of Contents

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under Owner's separate contracts.
5. Owner-furnished/Contractor-installed (OFCI) products.
6. Contractor's use of site and premises.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and Drawing conventions.

1.2 PROJECT INFORMATION

A. Project Identification: 2023-PWI 001PP Flying Creek Nature Preserve – Park Project

1. Project Location: Fairhope, Alabama

B. Owner: City of Fairhope

1. Owner's Representative: Richard Johnson

C. Architect: Thompson Engineering: (251) 666-2443

1. Architect's Representative: Nick Combs: (251) 284-1088

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Architectural: Watershed

a. Rebecca Bryant: (251) 406-2143

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Construction of asphalt drives, gravel parking, pedestrian trail network, miscellaneous structures, and other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime lump sum contract.

1.4 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1.5 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1.6 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify **Architect** not less than **two** days in advance of proposed utility interruptions.
2. Obtain **Architect's** written permission before proceeding with disruptive operations.

C. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.

1. Notify **Architect** not less than **two** days in advance of proposed disruptive operations.
2. Obtain **Architect's** written permission before proceeding with disruptive operations.

D. Smoking and Controlled Substance Restrictions: Use of tobacco products, **alcoholic beverages,** and other controlled substances **on Owner's property** is not permitted.

E. Employee Identification: **Provide** identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

F. Employee Screening: Comply with Owner's requirements for **drug and background** screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

A. 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. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

END OF SECTION 011000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner's portion of the Work.
6. Coordination of Owner-installed products.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.
10. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of limits on use of Project site.
2. Section 024119 "Selective Demolition" for demolition and removal of existing asphalt pavement and concrete sidewalk.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is

not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction 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.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching 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 provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate

and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to **Owner** that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.

B. Engage a **land surveyor** experienced in laying out the Work, using the following accepted surveying practices:

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of **two** permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

D. Final Property Survey: Engage a **land surveyor** to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by **land surveyor**, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of **96 inches** in occupied spaces and **90 inches** in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.6 CUTTING AND PATCHING

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

C. Temporary Support: Provide temporary support of Work to be cut.

D. 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.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. 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.

G. 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. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. **Concrete**: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Site Access: Provide access to Project site for Owner's construction personnel **and Owner's separate contractors**.

1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.
2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed products

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel **and Owner's separate contractors**.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

3.8 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials

specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected site elements

1.2 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 INFORMATIONAL SUBMITTALS

A. Schedule of selective demolition activities with starting and ending dates for each activity.

1.4 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Storage or sale of removed items or materials on-site is not permitted.

D. 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.

E. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.5 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Arrange to shut off utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

3.2 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

B. Remove temporary barricades and protections where hazards no longer exist.

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:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Dispose of demolished items and materials promptly.

B. 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.

3.4 CLEANING

A. Remove demolition waste materials from Project site **and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.**

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

END OF SECTION 024119

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SCOPE

A. Description of Work

1. Provide all labor, material and equipment to furnish and install all concrete formwork, concrete reinforcement and cast-in-place concrete as shown on the Drawings and specified herein.

2. The work also includes the removal of forms at completion of the concrete work.

1.2 APPLICABLE SPECIFICATIONS

A. The Contractor shall follow the practices and standards of the following American Concrete Institute Specifications which are made part of this specification:

1. ACI-201, "Guide to Durable Concrete"

2. ACI-211, "Recommended Practice for Selecting Proportions for Concrete"

3. ACI-214, "Recommended Practice for Evaluation of Compression Test Results of Field Concrete"

4. ACI-304, "Recommended Practice for Measuring, Mixing and Placing Concrete"

5. ACI-305, "Recommended Practice for Hot Weather Concreting"

6. ACI-306, "Recommended Practice for Cold Weather Concreting"

7. ACI-315, "Manual of Standard Practice for Detailing Concrete Structures"

8. ACI-318, "Building Code Requirements for Reinforced Concrete"

9. ACI-347, "Recommended Practice for Concrete Formwork"

10. ACI-350, "Concrete Sanitary Engineering Structures"

11. ACI-522, “Specification for Pervious Concrete”

B. The Contractor shall follow the practices and standards of the following Concrete Reinforcing Steel Institute which are made a part of this specification:

1. "The Manual of Standard Practice for Reinforced Concrete Construction"

2. "Placing Reinforcing Bars"

3. "Splicing Reinforcing Bars"

C. The Contractor shall follow the practices and standards of the following American Society for Testing and Materials which are made a part of this Specification:

1. ASTM A82, "Specification for Cold-Drawn Steel Wire for Concrete Reinforcement"

2. ASTM A185, Specification for Welded Steel Wire Fabric for Concrete Reinforcement"

3. ASTM A615, "Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement"

4. ASTM C33, "Specification for Concrete Aggregates"

5. ASTM C150, "Specification for Portland Cement"

6. ASTM E8, "Tension Testing of Metallic Materials"

D. The International Conference of Building Officials' "Uniform Building Code," Volume I, Section 2607.

1.3 SUBMITTALS

A. Submittals shall include, but also not be limited to, the following:

1. Type and brand of cement used

2. Design mix

3. Delivery tickets

4. Details of concrete reinforcement shall be in accordance with the "Manual of Standard Practice for Reinforced Concrete Construction" as published by the Concrete Reinforcing Steel Institute.

PART 2 - PRODUCTS

2.1 FORMWORK

A. Form Materials

1. Boards

   a. Boards shall be 6 or 8 inches shiplapped or T. & G. "Standard" grade Douglas fir.

2. Plywood

   a. Plywood shall conform to U.S. Product Standard PS 1-66 and shall be a minimum of 5/8 inches thick.

3. Framing, Studding and Bracing

   a. Framing, studding and bracing shall be "Standard" or "Construction" grade Douglas fir.

B. Formwork Accessories

1. Form Ties and Spreaders

   a. Standard metal form clamp assembly, of type acting as spreaders and leaving no metal within 1-1/2 inches of the concrete face. Inner tie rods shall be left in concrete when forms are removed.

2. Form Anchors and Hangers

   a. Anchors and hangers used for exposed concrete shall not leave exposed metal at surface.

3. Material and Finish

   a. All metal ties, anchors, etc., which remain embedded in the concrete shall be galvanized.

C. Form Coating

1. Form coating shall be a non-grain raising and non-staining type that will not leave residual matter on surface of the concrete or adversely affect proper bonding of subsequent application of other materials applied to the concrete surface. Coatings containing mineral oil or other non-drying ingredients will not be permitted.

2.2 REINFORCEMENT

A. Material

1. All reinforcing bars shall conform to ASTM A615, Grade 60.

2. Reinforcing bar supports shall conform to the "Bar Support Specifications and Standard Nomenclature" as contained in "The Manual of Standard Practice for Reinforced Concrete Construction" as published by the Concrete Reinforcing Steel Institute. Wherever the legs of any support device rest directly upon forms which, after stripping, will expose the concrete surfaces to permanent view, the devices shall either be galvanized or provided with plastic button tips at the ends to prevent rust staining of the concrete.

B. Fabrication

1. All reinforcement shall be of clean new stock, free from defects, mill or rust scales, or coatings that will reduce bond. Reinforcement shall be cold bent to the shapes shown on the Drawings. The heating of reinforcement for bending will not be permitted. Reinforcing bars shall not be bent or straightened in a manner that will injure the material.

2. All hooks shall be bent using the pin diameters and dimensions as defined as "ACI Standard Hooks" in "The Manual of Standard Practice for Reinforced Concrete Construction" as published by the Concrete Reinforcing Steel Institute unless otherwise shown on the Drawings.

3. Reinforcing bars shall conform accurately to the dimensions shown on the Drawings and within the fabricating tolerances as shown in the "Manual of Standard Practice for Reinforced Concrete Construction" as published by the Concrete Reinforcing Steel Institute.

2.3 CONCRETE

A. Materials

1. Cement shall be an acceptable brand of Portland Cement, ASTM C150, Type I. In the event field conditions require, and the Engineer finds it acceptable, a high-early strength Portland Cement, Type III may be used. Only one brand of cement shall be used in this work.

2. Water shall be clean, free from organic or vegetable matter, acid, alkali, or other injurious elements.

3. Fine Aggregate shall be clean hard natural sand or manufactured sand, or a combination of both and shall conform to ASTM C33.

4. Coarse Aggregate shall be hard, durable, uncoated crushed stone, gravel or air cooled blast-furnace slag conforming to ASTM C33. Maximum size of coarse aggregate shall not be larger than one-fifth of the narrowest dimension between sides of forms, one-third

of the depth of slabs, nor three-fourths of the minimum clear distance between reinforcing bars, whichever is least. In no case shall the maximum size exceed 1-1/2 inches.

B. Proportioning

1. Concrete mix shall have a consistency enabling it to be readily worked into all corners of the form and around all reinforcing by usual methods of placing and consolidating without permitting segregation or excessive free water.

2. All concrete on project shall be air-entrained to the recommended air content set forth in table 1.4.3, ACI 201, but under no condition shall the air content be less than 5%.

3. Concrete mix shall be proportioned by an acceptable testing and/or inspection laboratory. The design shall provide a 4000 psi minimum 28 day compressive strength.

4. Regardless of the strengths shown by testing, all concrete shall have a maximum water cement ratio of 5 gallons per sack of cement, and a minimum cement factor of 6 sacks per cubic yard of concrete.

5. The slump of the concrete mix shall be 4 inches.

6. Concrete design mix shall be submitted to the Engineer for review before work commences. No concrete shall be placed until the Engineer has reviewed and accepted the design mix.

C. Grout

1. Grout shall be SikaGrout 328 for grout pads up to 6” thick. Use SikaGrout 350 for grout pads 6”-12” thick.

PART 3 - INSTALLATION

3.1 FORMWORK

A. Formwork General

1. Boards may be used for concrete which will not be exposed in the finished work, and which are not otherwise scheduled or specified.

2. The Contractor, at his option, may use plywood for forms in lieu of boards.

3. Steel forms may be used in lieu of plywood forms.

B. Wood and Steel Forms

1. General

a. Wood and/or steel forms shall be constructed of sound material, shall be of the correct shape and dimensions, mortar tight, of sufficient strength, and so braced

and tied together that the movement of men, equipment, materials, or placing and vibrating the concrete will not throw them out of line or position. For circular structures, circular forms or chords having a maximum length of flat service of 18 inches shall be used.

2. Forms for Exposed Concrete

   a. Forming panels shall be clean, smooth, uniform in size, and free from damaged edges and holes. All edges of plywood shall be backed to prevent separation.

3. Framing and Bracing

   a. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.

4. Tolerances

   a. Variation from plumb in lines and surfaces of columns, walls, and arises shall not exceed 1/8 inch in 10 feet with maximum "in" and "out" variation occurring in not less than 20 feet.

5. Chamfered Corners

   a. For all exposed corners provide moldings in forms for all chamfering.

6. Form Ties

   a. Form ties shall be of sufficient strength and used in sufficient quantities to prevent spreading of the forms.

7. Cleanouts and Access Panels

   a. All forms and surfaces to receive concrete shall be cleaned of all chips, sawdust, and other debris and shall be thoroughly blown out with compressed air just before concrete is placed.

8. Construction Joints

    a. Construction joints shall be formed where shown on the Drawings or permitted by the Engineer. Provide a surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.

    b. In general, formed construction joints or keys shall be in width one-third (1/3) of the width of the concrete and in depth one-sixth (1/6) of the width of the concrete. All keys shall be continuous and none smaller than 2 inches in width and 2 inches in depth shall be used.

    c. Wall footings shall have continuous keys for keying foundation walls.

    d. Before concreting is resumed, the surfaces of previously placed concrete shall be cleaned and coated with an acceptable epoxy bonding compound. New concrete shall be placed after the bonding compound becomes tacky.

9. Embedded Items

    a. Provisions shall be made for pipes, sleeves, anchors, inserts, reglets, anchor bolts, nailers, waterstops and other features. No wood shall be embedded in concrete.

10. Openings for Items Passing Through Concrete

    a. Frame openings in concrete where shown on the Drawings. The Contractor shall establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections. The Contractor shall be held responsible for proper coordination of all work of this nature.

11. Shores and False Work

    a. The Contractor shall be fully responsible for the proper strength, safety, and adequacy of all falsework, supports, posts, footings, etc., used on and in connection with the work.

12. Reuse and Coating of Forms

    a. Thoroughly clean forms and recoat with specified form coating before each reuse. Do not reuse any form for exposed work which cannot be reconditioned to "like new" condition.

13. Inspection

    a. Prior to placing of any concrete, and after placement of reinforcing steel in the forms, the Contractor shall notify the Engineer so that proper inspection may be made.

14. Rejection of Defective Work Due to Improper Forms

a. Reconstruction of forms and new concrete shall be furnished at no additional cost to the Owner in the event of rejection or defective work.

C. Removal of Forms and Shores

1. The supporting forms and shoring shall not be removed until the members have acquired sufficient strength to support their weight and the loads superimposed thereon safely.

2. During the period that forms are in place on the concrete work, said forms shall be kept wet at all times.

3. In removing plywood forms, no metal pinch bars shall be used and special care shall be taken in stripping.

4. Nothing herein shall be construed as relieving the Contractor of any responsibility for the safety of the structure.

5. After stripping, the Contractor shall properly protect all concrete to be exposed in the finish work from damage, with boards and non-staining building paper to prevent staining, spalled edges, chips, etc.

3.2 REINFORCEMENT

A. Placing

1. The placement of the bars shall conform to "Placing Reinforcing Bars" as published by the Concrete Reinforcing Steel Institute.

2. Bars shall be securely tied to prevent displacement during the pouring operation and all dowels must be wired in place before depositing concrete.

3. All splicing of bars, concrete cover, and bar spacings shall conform to "Building Code Requirements for Reinforced Concrete" (ACI-318) as published by the American Concrete Institute and to recommended practices in "Splicing Reinforcing Bars" by the Concrete Reinforcing Steel Institute unless shown otherwise on the Drawings.

4. The Contractor shall exercise extreme care in placing the reinforcement in areas where the earth is used as a form. If any soil or foreign material is displaced into the excavation, the reinforcement shall be removed, the excavation cleaned, and the reinforcement replaced.

B. Splicing

1. Lapped ends of bars shall be placed in contact and securely wired or may be separated sufficiently to permit the embedment of the entire surface of each bar in concrete. Lapped splices shall not be used for bars larger than Size No. 11 and at locations shown on the Drawings. Splices in adjacent bars shall be staggered. Splice adjacent sheets of mesh reinforcement by lapping not less than 6 inches, the lapped ends being securely wired or clipped together with standard clips.

C. Protection of Exposed Reinforcement

1. Exposed reinforcement intended for bonding to future work, shall be thoroughly protected from corrosion. Such reinforcement shall be given a heavy wrapping of burlap saturated and sealed with a bituminous compound.

3.3 CONCRETE

A. Delivery of Concrete

1. A delivery ticket shall be submitted with each batch at the time of delivery. Failure to render such ticket to the Contractor's Job Superintendent shall automatically be cause for rejection of the concrete. The delivery ticket shall show the following:

   a. Amount of aggregate water

   b. Amount of batch water

   c. Quantities of sand, stone and cement

   d. Design strength

   e. Time that truck left batch plant

2. The Contractor's Job Superintendent shall write on the back of the delivery ticket:

   a. The time of arrival of the truck mixer on the site

   b. The time of deposit of the concrete from the truck

   c. The place of deposit of the concrete

3. The completed delivery ticket shall be delivered to the Engineer. Failure to deliver such completed ticket to the Engineer will be cause for the Engineer to reject the deposited concrete at any time and cause it to be removed and replaced at the Contractor's expense.

4. No concrete shall be deposited on the job when it has contained its mix water longer than 60 minutes.

B. Placing Concrete

1. Before placing concrete, all construction debris, water and ice shall be removed from the places to be occupied by the concrete.

2. Rock surfaces upon which concrete is to be placed shall be level, free from oil, water, mud, loose semi-detached or unsound rock fragments and rough enough to assure bond with concrete.

3. Where reinforcing bars are required, said bars shall be securely tied to prevent displacement during the pouring operation.

4. Concrete shall be deposited in approximately horizontal layers not to exceed 18 inches in thickness to avoid flowing.

5. Falling concrete shall be closely confined in a drop chute of the proper size to within two or three feet of the place of deposit in the forms and the final drop must be vertical to avoid segregation of aggregates. In no case shall concrete be deposited from a height that will cause separation of the aggregates.

6. Concrete shall be mixed in such quantities as required for immediate use and shall be placed while fresh before loss of slump occurs. Retempering by adding water to restore slump lost during excessive mixing or due to too long a lapse of time since initial mixing will not be permitted.

7. All slabs shall be placed for full thickness in one operation without any change in proportions.

C. Temperature of Concrete

1. Concrete, when deposited, shall have a temperature ranging between a minimum of 50 deg. F. and a maximum of 90 deg. F.

2. When the temperature of the surrounding air is below 40 deg. F. or above 90 deg. F., concreting shall be done in accordance with the recommendations noted in ACI-306 and ACI-305 respectively.

D. Grout

1. Non-Shrink Grout shall be placed in accordance with the manufacturer's recommendations. This grout shall be used for setting precast beams on bents and other areas where a non-shrink grout is required.

E. Protection of New Work

1. All freshly placed concrete shall be adequately protected from mechanical injury or by action of the elements until such time as the concrete is thoroughly set.

F. Curing

1. Curing shall be started immediately upon completion of the finishing operation. Curing shall continue uninterrupted for a minimum period of 14 days unless a longer period is hereinafter specified. Rapid drying upon completion of the curing period shall be prevented. At no time during the curing period shall the temperature of the concrete be permitted to drop below 40 deg. F.

G. Defective Concrete

1. Defective concrete is defined as concrete in place which does not conform to strength, shapes, alignments and/or elevations as shown on the Drawings.

2. All defective concrete shall be removed and replaced in a manner meeting with the Engineer's satisfaction.

PART 4 - SAMPLING AND TESTING

4.1 TESTING LABORATORY

A. A laboratory selected by the Owner, but paid by the Contractor, shall establish the mix proportions and test the concrete. One test shall be performed for concrete used on this project. The laboratory shall maintain records showing brand of cement, brand and quantity of admixtures, time and location of the batch from which the test was made, air content, slump, and compressive strength. The laboratory shall supply the test cylinders, slump cones, field technicians, and all equipment necessary for performance of field and laboratory testing specified herein.

B. One strength test shall consist of six field specimens, two (2) specimens for testing at seven (7) days, two (2) specimens for testing at fourteen (14) days, and two (2) specimens for testing at twenty-eight (28) days. The samples for strength tests shall be taken in accordance with "Method of Sampling Fresh Concrete" (ASTM C-172). Cylinders for acceptance tests shall be molded and laboratory-cured in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C-39). Each strength test result shall be the average of two cylinders from the same sample tested at seven (7), fourteen (14) and twenty eight (28) calendar days.

END OF SECTION 033000

SECTION 071900
WATER REPELLENTS AND ANTI-GRAFFITI

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water repellents and anti-graffiti coating applied to exterior and interior, concrete surfaces.

1.2 REFERENCE STANDARDS

A. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2018).

C. ASTM D5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2022).

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. ASTM D2369 - Standard Test Method for Volitile Content of Coatings

F. ASTM D6532 - Standared Test Method for Evaluation of the Effect of Clear Water Repellent Treatments on Water Absorbtion of Hydraulic Cement Mortar Specimens.

G. ASTM D7089 - Standard Practice for Determination of the Effectiveness of Anti-Graffiti Coating for Use on Concrete, Masonry and Natural Stone Surfaces by Pressure Washing.

H. ASTM E96 - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.

1.4 SUBMITTALS

A. See Article 7.16 - Submittals for submittal procedures.

B. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.
   2. Extra Water Repellent Material: Two gallons of type installed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least five (5) years of documented experience

C. Owner reserves the right to provide continuous independent inspection of surface preparation and application of water repellent.

1.6 MOCK-UPS

A. Prepare representative surface 36 by 36 inches in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. For proposed substitutions, prepare side-by-side mock-ups of specified and substitute products.

C. Mock-up may remain as part of work.

1.7 FIELD CONDITIONS

A. Protect liquid materials from freezing.

B. Do not apply water repellent when ambient temperature is lower than 40 degrees Fahrenheit, and rising during application and for eight hours following. Surface and air temperatures should not exceed 90 degrees Fahrenheit.

C. Surfaces should be dry.

D. All caulking (sealants) should be applied a miniumum of 24 hours prior to applications, or as required by sealant manufacturer, whichever is greater, before application of water and graffiti-resistant treatment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
   1. Basis of Design: PROSOCO, Inc - Sure Klean Weather Seal Blok-Guard & Graffiti Control WB 6: www.prosoco.com.
   2. NanoSlic - NS 240 Ceramic Anti-Graffiti Coating: www.nanoslic.com
   3. RainGuard, VandlGuard - Non-Sacrificial Anti-Graffiti Coating: www.rainguardpro.com

2.2 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Vertical surfaces.
   2. Number of Coats: Two.
   3. VOC Content: Less than 100 g/L, when tested in accordance with ASTM D3960 or ASTM D5095.
   4. Silane, siloxane, silane-siloxane blend, or siliconate that reacts chemically with concrete and masonry.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.2 PREPARATION

A. Protection of Adjacent Work:
   1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
   2. Protect adjacent surfaces not intended to receive water repellent.

B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

D. Remove loose particles and foreign matter.

E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.

F. Scrub and rinse surfaces with water and let dry.

G. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.3 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.

B. Apply two coats, minimum.

C. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION 071900

SECTION 074113
METAL ROOF PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal roof panel system of preformed steel panels.

1.2 RELATED REQUIREMENTS

A. Section 051200 - Structural Steel Framing: Roof framing and purlins.

B. Section 061000 - Rough Carpentry: Roof sheathing.

C. Section 079200 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

D. Section 099113 - Exterior Painting: Field priming and painting roofing panels.

1.3 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022.

F. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2017).

G. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2018, with Editorial Revision (2019).

H. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments; 2023.

I. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.4 SUBMITTALS

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

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Summary of test results, indicating compliance with specified requirements.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.
   2. Include structural analysis signed and sealed by qualified structural engineer, indicating compliance of roofing system to specified loading conditions.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
   1. Include typical fastening detail.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Test Reports: Indicate compliance of metal roofing system to specified requirements.

I. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section and with at least three years of documented experience.
   1. Accredited by IAS in accordance with IAS AC472.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Provide strippable plastic protection on prefinished roofing panels for removal after installation.

C. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.7 FIELD CONDITIONS

A. Do not install metal roof panels, eave protection membrane, underlayment, or _____ when surface, ambient air, or wind chill temperatures are below 45 degrees F.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Architectural Metal Roof Panel Manufacturers:
   1. ATAS International, Inc; Dutch Seam: www.atas.com/#sle.
   2. MBCI; Craftsman SB Batten Panel: www.mbci.com/#sle.
   3. Metl-Span, a Nucor Company; ____: www.metlspan.com/#sle.
   4. Petersen Aluminum Corporation; Snap-Clad Panel: www.pac-clad.com/#sle.
   5. Sheffield Metals International; SMI 1.75” SnapLock Standing Seam: www.sheffieldmetals.com/#sle.

2.2 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
   1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
      a. Live Loads: As required by ASCE 7.
   2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
   3. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures.
   4. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

2.3 METAL ROOF PANELS

A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.
   1. Steel Panels:
      a. Steel Thickness: Minimum 24 gauge, 0.024 inch.
   2. Profile: Standing seam, with minimum 1-inch seam height; concealed fastener system for snap-on application of matching standing seam batten.
   3. Texture: Smooth.
   4. Length: Full length of roof slope, without lapped horizontal joints.
   5. Width: Maximum panel coverage of 18 inches.

2.4 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.5 FABRICATION

A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

2.6 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer’s standard line.

B. Solar Reflectance Index (SRI): 39, Initial, greater than 2:12 steep-sloped roof.

2.7 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, trim, closure strips, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

D. Underlayment: Self-adhering sheet membrane
   1. Material: Cold applied, self adhering membrane composed of hight strength polyethelene film coated on one side with a layer of rubberized asphalt adhesive and interwound with a disposable release sheet. An embossed, slip resistant surface is provided on the polyethelene
   2. Color: Gray-black
   3. Membrane Thickness: 40 mil ASTM D3767 procedure A (Section 9.1)
   4. Tensile Strength, Membrane: 250 psi ASTM D412 (Die C modified)
   5. Elongation, Membrane: 250% ASTM D412 (Die C modified)
   6. Low Temperature Flexibility: Unaffected @ -20 F ASTM D1970
   7. Adhesion to wood deck: 3.0 lbs/in. width ASTM D903
   8. Permeance (Max): 0.05 Perms ASTM E96
   9. Material Weight Installed (Max): 0.3 lb/ft2 STM D461
   10. Flexible Flashing and Eave protection Membrane: Self-adhering polymer modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil thickness with a strippable treated release paper and polyethylene sheet top surface.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.

B. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.

C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.

D. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.

B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, trim, closure strips, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Install roofing felt and building paper slip sheet on roof sheathing before installing preformed metal roof panels; secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners; apply from eaves to ridge in shingle fashion, overlapping horizontal joints at least 2 inches and side and end laps at least 3 inches; offset seams in building paper and seams in roofing felt.

D. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by panel manufacturer.

3.4 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.5 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION 074113

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, exterior penetrations, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

1.2 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

F. CDA A4050 - Copper in Architecture - Handbook; current edition.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's standard colors.

2.2 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.3 EXTERIOR PENETRATION FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.4 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I, No. 15.

C. Primer: Zinc chromate type.

D. Concealed Sealants: Non-curing butyl sealant.

E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

3.3 INSTALLATION

A. Comply with drawing details.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.5 SCHEDULE

A. Flashings Associated with Shingle Roofing, including Valley, Hip, Ridge, Eave, Gutter Edge, Gable Edge, Chimney:

END OF SECTION 076200

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hurricane-resistant hollow metal doors and frames.

B. Refer to Door Schedule and details in drawings.

1.2 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 099113 - Exterior Painting: Field painting.

1.3 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. HMMA: Hollow Metal Manufacturers Association.

C. NAAMM: National Association of Architectural Metal Manufacturers.

D. SDI: Steel Door Institute.

E. UL: Underwriters Laboratories.

1.4 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2019.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

J. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2022.

L. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

M. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

N. FBC TAS 201 - Impact Test Procedures; Testing Application Standard; 1994.

O. FBC TAS 202 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure; Testing Application Standard; 1994.

P. FBC TAS 203 - Criteria for Testing Products Subject To Cyclic Wind Pressure Loading; Testing Application Standard; 1994.

Q. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.

R. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

S. Miami (APD) - Approved Products Directory; Miami-Dade County; Current Edition.

T. NAAMM HMMA 805 - Recommended Selection and Usage Guide for Hollow Metal Doors and Frames; 2012.

U. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

V. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

W. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

X. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; 2018.

Y. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

Z. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2019.

1.5 SUBMITTALS

A. See Article 7.16 - Submittals for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: https://steeldoor.org/sdi-certified/#sle.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hurricane-Resistant Hollow Metal Doors and Frames:
1. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
2. Ceco Door, an Assa Abloy Group company{CH#47874}: www.assaabloydss.com/#sle.
3. Curries, an Assa Abloy Group company{CH#47874}: www.assaabloydss.com/#sle.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.

6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Hurricane-Resistant Doors:
1. Comply with Florida Building Code (FBC) test protocols for High Velocity Hurricane Zone (HVHZ) FBC TAS 201, FBC TAS 202 and FBC TAS 203.
2. Design and size door and frame components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M.
   a. Design Wind Loads: Comply with requirements of authorities having jurisdiction.
   b. Wind-Borne Debris Resistance: Door and frame components shall have FLA (PAD) approval or Miami (APD) approval for Large and Small Missile impact and pressure cycling at design wind loads.
3. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
4. Door Thickness: 1-3/4 inches, nominal.
5. Door Face Sheets: Flush.
6. Door Finish: Factory primed and field finished.

2.4 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Hurricane-Resistant Door Frames: With same hurricane resistance as door; face welded or full profile/continuously welded construction, ground smooth, fully prepared and reinforced for hardware installation.

D. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

E. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

2.5 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.6 ACCESSORIES

A. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Section 087100.

3.4 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.6 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION 081113

SECTION 086200
UNIT SKYLIGHTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Skylights with integral frame.

1.2 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood framing for rough opening.

B. Section 076200 - Sheet Metal Flashing and Trim: Skylight counterflashing.

1.3 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

C. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2023.

1.4 SUBMITTALS

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

B. Product Data: Include structural, thermal, and daylighting performance values.

C. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.

D. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

E. Manufacturer's Installation Instructions: Indicate special procedures.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.6 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide five-year manufacturer warranty including coverage for leakage due to defective skylight materials or construction. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Unit Skylights:
   1. Basis of Design: Velux America, Inc; VELUX Fixed Curb Mounted Skylights: www.veluxusa.com/#sle.
   2. FAKRO America LLC; Curb Mounted Fixed Skylight FXC: www.fakrousa.com/#sle.
   3. Kingspan Light + Air, LLC; Polycarbonate Unit Skylight: www.kingspanlightand air.us/#sle.
   4. Wasco Skylights - Part of the VELUX Group; Wasco EcoSky Unit Skylight: www.wascoskylights.com/#sle.

2.2 SKYLIGHTS

A. Skylights: Factory-assembled glazing in aluminum frame, free of visual distortion, and weathertight.
   1. Shape: Square dome.
   2. Glazing: Double.
   3. Operation: None; fixed.
   4. Roof Slope: As indicated on drawings.
   5. Nominal Size: 24 by 24 inch.

2.3 PERFORMANCE REQUIREMENTS

A. Provide unit skylights that comply with the following:
   1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific skylight type:
      a. Performance Grade (PG): Equivalent to or greater than specified design pressure.
   2. Allow for expansion and contraction within system components caused by a cycling surface temperature range of 170 degrees F without causing detrimental effects to system or components.

2.4 COMPONENTS

A. Double Glazing: Acrylic plastic; factory sealed.

2.5 ACCESSORIES

A. Anchorage Devices: Type recommended by manufacturer, concealed.

B. Counterflashings: Same metal type and finish as skylight frame.

C. Protective Back Coating: Zinc molybdate alkyd.

D. Sealant: Elastomeric, silicone or polyurethane, compatible with material being sealed .

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that openings and substrate conditions are ready to receive work of this section.

C. Verify that curbs installed under other sections are complete.

3.2 PREPARATION

A. Apply protective back coating on aluminum surfaces of skylight units that will be in contact with cementitious materials or dissimilar metals.

3.3 INSTALLATION

A. Install unit skylights in accordance with manufacturer's instructions and ASTM E2112.

B. Install skylight units and mount securely to curb assembly; install counterflashing as required.

C. Apply sealant to achieve watertight assembly.

3.4 CLEANING

A. Upon completion of installation, thoroughly clean skylight aluminum surfaces in accordance with AAMA 609 & 610.

B. Remove protective material from prefinished aluminum surfaces.

C. Wash down exposed surfaces; wipe surfaces clean.

D. Remove excess sealant.

END OF SECTION 086200

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for wood and hollow metal doors.

B. Thresholds.

1.2 RELATED REQUIREMENTS

A. Section 080671 - Door Hardware Schedule: Schedule of door hardware sets.

B. Section 081113 - Hollow Metal Doors and Frames.

1.3 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. BHMA (CPD) - Certified Products Directory; Current Edition.

C. BHMA A156.1 - Standard for Butts and Hinges; 2021.

D. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2017.

E. BHMA A156.3 - Exit Devices; 2020.

F. BHMA A156.4 - Door Controls - Closers; 2019.

G. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

H. BHMA A156.13 - Mortise Locks & Latches Series 1000; 2017.

I. BHMA A156.16 - Auxiliary Hardware; 2018.

J. BHMA A156.20 - Standard for Strap and Tee Hinges, and Hasps; 2021.

K. BHMA A156.21 - Thresholds; 2019.

L. BHMA A156.25 - Electrified Locking Devices; 2018.

M. BHMA A156.30 - High Security Cylinders; 2020.

N. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

O. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

P. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

Q. DHI (KSN) - Keying Systems and Nomenclature; 2019.

R. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

S. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

T. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

U. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

V. UL 437 - Standard for Key Locks; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Schedule meeting at project site prior to Contractor occupancy.
   2. Attendance Required:
      a. Contractor.
      b. Owner.
      c. Architect.
   3. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
   4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
   6. Deliver established keying requirements to manufacturers.

1.5 SUBMITTALS

A. See Article 7.16 - Submittals for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
      a. Submit in vertical format; see Section 08 0671.
   3. List groups and suffixes in proper sequence.
   4. Provide complete description for each door listed.
   5. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
   6. Include account of abbreviations and symbols used in schedule.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
   1. Submit manufacturer's parts lists and templates.
   2. Bitting List: List of combinations as furnished.

F. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Supplier's qualification statement.

J. Specimen warranty.

K. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

L. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Lock Cylinders: One for each master keyed group.

3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Ten years, minimum.
   2. Exit Devices: Five years, minimum.
   3. Locksets and Cylinders: Five years, minimum.
   4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Listed and certified compliant with specified standards by BHMA (CPD).
   4. Auxiliary Hardware: BHMA A156.16.
   5. Straps and Tee Hinges: BHMA A156.20.
   6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
   7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.

D. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Door Hardware Schedule.

E. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a. Aluminum fasteners are not permitted.
      b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
   2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
      a. Self-drilling (Tek) type screws are not permitted.
   3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
   4. Provide wall grip inserts for hollow wall construction.
   5. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.
   6. Fire-Rated Applications: Comply with NFPA 80.
      a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.

b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

7. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated.

2.2 HINGES

A. Manufacturers:
1. McKinney; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Bommer Industries, Inc; _____: www.bommer.com/#sle.
3. D&D Technologies USA, Inc; SureClose ConcealFit: www.ddtech.com/#sle.
4. Hager Companies; _____: www.hagerco.com/#sle.
5. Pamex, Inc; Hinges: www.pamexinc.com/#sle.
6. Stanley, dormakaba Group; _____: www.stanleyhardwarefordoors.com/#sle.
7. Studco Building Systems; EZConcept RocYork Concealed Hinges : www.studcosystems.com/#sle.
8. Waterson Corp; Self-Closing Hinge, Model _____: www.watersonusa.com/#sle.
9. Substitutions: See Section 016000 - Product Requirements.

B. Hinges: Comply with BHMA A156.1, Grade 1.
1. Provide hinges on every swinging door.
2. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
3. Provide ball-bearing hinges at each door with closer.
4. Provide non-removable pins on exterior outswinging doors.
5. Provide non-removable pins on interior outswinging doors at _____.
6. Provide following quantity of butt hinges for each door:
a. Doors From 60 inches High up to 90 inches High: Three hinges.

2.3 LOCK CYLINDERS

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide high security mechanical type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.30 or UL 437 at locations indicated.
2. Provide cylinders from same manufacturer as locking device.
3. Provide cams and/or tailpieces as required for locking devices.
4. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.

2.4 CYLINDRICAL LOCKS

A. Manufacturers:
1. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company; ____: www.assaabloydss.com/#sle.
2. Best, dormakaba Group; ____: www.bestaccess.com/#sle.
3. DORMA USA, Inc; C300 Series, C500 Series, C800 Series, CL700 Series, and CK700 Series: www.dorma.com/#sle.
4. Hager Companies; _____: www.hagerco.com/#sle.
5. Pamex, Inc; Cylindrical Locks: www.pamexinc.com/#sle.
6. Schlage, an Allegion brand; ____: www.allegion.com/us/#sle.
7. Stanley, dormakaba Group; _____: www.stanleyhardwarefordoors.com/#sle.
8. Substitutions: See Section 016000 - Product Requirements.

B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
1. Bored Hole: 2-1/8 inch diameter.
2. Latchbolt Throw: 1/2 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
a. Finish: To match lock or latch.

5. Provide a lock for each door, unless otherwise indicated that lock is not required.
6. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

2.5 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
1. Rockwood; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Forms+Surfaces; _____: www.forms-surfaces.com/#sle.
3. Hager Companies; _____: www.hagerco.com/#sle.
4. Hiawatha, Inc, division of Activar Construction Products Group, Inc; _____: www.activarcpg.com/hiawatha/#sle.
5. Pamex, Inc; Door Pulls and Push Plates: www.pamexinc.com/#sle.
6. Trimco; _____: www.trimcohardware.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
1. Pull Type: Straight, unless otherwise indicated.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
a. Edges: Beveled, unless otherwise indicated.
3. Material: Stainless steel, unless otherwise indicated.
4. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.

2.6 CLOSERS

A. Manufacturers; Surface Mounted:
1. Corbin Russwin, Norton, Rixson, Sargent, or Yale; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. DORMA USA, Inc; 7400 Series, 8600 Series, 8900 Series, and TS93: www.dorma.com/#sle.
3. Hager Companies; _____: www.hagerco.com/#sle.
4. LCN, an Allegion brand; _____: www.allegion.com/us/#sle.
5. Pamex, Inc; Closers: www.pamexinc.com/#sle.
6. Stanley, dormakaba Group; _____: www.stanleyhardwarefordoors.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

B. Closers: Comply with BHMA A156.4, Grade 1.
1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.

2.7 PROTECTION PLATES

A. Manufacturers:
1. Rockwood; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Hager Companies; _____: www.hagerco.com/#sle.
3. Hiawatha, Inc, an Activar Construction Products Group company; _____: www.activarcpg.com/hiawatha/#sle.
4. Ives, an Allegion brand; _____: www.allegion.com/us/#sle.
5. Trimco; _____: www.trimcohardware.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Protection Plates: Comply with BHMA A156.6.

C. Metal Properties: Stainless steel material.
1. Metal, Standard Duty: Thickness 0.050 inch, minimum.
2. Metal, Heavy Duty: Thickness 0.062 inch, minimum.
3. Metal, Extra Heavy Duty - Diamond Plate: Thickness 1/8 inch, minimum, with raised diamond plate surface.
4. Metal, Extra Heavy Duty - Flat Plate: Thickness 1/8 inch, minimum, with smooth plate surface.

D. Edges: Beveled, on four sides unless otherwise indicated.

E. Fasteners: Countersunk screw fasteners.

2.8 KICK PLATES

A. Manufacturers:
1. Hiawatha, Inc, an Activar Construction Products Group company; _____: www.activarcpg.com/hiawatha/#sle.
2. Ives, an Allegion brand; _____: www.allegion.com/us/#sle.
3. Standard Metal Hardware Manufacturing Ltd; Door Plates: www.smhardware.com/#sle.
4. Trimco; _____: www.trimcohardware.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.9 MOP PLATES

A. Mop Plates: Provide along bottom edge of push side of doors to provide protection from cleaning liquids and equipment damage to door surface.
1. Size: 6 inch high by 1-1/2 inch less door width (LDW) on pull side and 2 inch LDW on push side of door.

2.10 DOOR EDGE PLATES

A. Manufacturers:
1. Rockwood; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Hiawatha, Inc, an Activar Construction Products Group company; _____: www.activarcpg.com/hiawatha/#sle.
3. Ives, an Allegion brand; _____: www.allegion.com/us/#sle.
4. Trimco; _____: www.trimcohardware.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

B. Door Edge Plates: Comply with BHMA A156.6.
1. Provide along latching edge of door to protect from damage as objects are moved through door opening.
2. Material: Aluminum, at least 0.050 inch thick.
3. Type: Square edge, mortised into edge of door.

2.11 WALL STOPS

A. Manufacturers:
1. Rockwood; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Hiawatha, Inc, division of Activar Construction Products Group, Inc; _____: www.activarcpg.com/hiawatha/#sle.
3. Pamex, Inc; Wall Stops: www.pamexinc.com/#sle.
4. Standard Metal Hardware Manufacturing Ltd; Wall Stops: www.smhardware.com/#sle.
5. Trimco; _____: www.trimcohardware.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
1. Type: Bumper, concave, wall stop.
2. Material: Aluminum housing with rubber insert.

2.12 THRESHOLDS

A. Manufacturers:
1. Pemko; an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
2. Hager Companies; _____: www.hagerco.com/#sle.
3. National Guard Products, Inc; _____: www.ngpinc.com/#sle.
4. Reese Enterprises, Inc; _____: www.reeseusa.com/#sle.
5. Zero International, Inc; _____: www.zerointernational.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Thresholds: Comply with BHMA A156.21.
   1. Provide threshold at interior doors for transition between two different floor types, and over building expansion joints, unless otherwise indicated.
   2. Provide threshold at each exterior door, unless otherwise indicated.
   3. Type: Flat surface.
   4. Material: Stainless steel.
   5. Threshold Surface: Fluted horizontal grooves across full width.
   6. Field cut threshold to profile of frame and width of door sill for tight fit.
   7. Provide non-corroding fasteners at exterior locations.

2.13 FINISHES

A. Finishes: Marine Grade Stainless Steel

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch.
      b. Push Plates/Pull Bars: 42 inch.
      c. Deadlocks (Deadbolts): 48 inch.
      d. Exit Devices: 40-5/16 inch.
      e. Door Viewer: 43 inch; standard height 60 inch.

D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.5 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.6 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION 087100

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exposed surfaces of the following locations (coordinate with application of anti-graffiti coating
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Steel lintels and ledge angles.
   3. Interior and exterior surfaces of hollow metal ddoors and frames.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
   6. Floors, unless specifically indicated.
   7. Glass.
   8. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

Section 071900 - Water Repellents and Anti-Graffiti

1.3 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2019.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

F. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

G. SSPC V1 (PM1) - Good Painting Practice: Painting Manual Volume 1; 2016.

H. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

I. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

J. SSPC-SP 13 - Surface Preparation of Concrete; 2018.

1.5 SUBMITTALS

A. See Article 7.16 - Submittals for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.
5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals and shingle roofing, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. Paints:

1. Base Manufacturer: SHERWIN WILLIAMS.
2. Behr Process Corporation; _____: www.behr.com/#sle.
3. PPG Paints; _____: www.ppgpaints.com/#sle.
4. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
b. SCAQMD 1113 Rule.
c. CARB (SCM).
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.
1. Two top coats and one coat primer.
2. Top Coat(s): Exterior Light Industrial Coating, Water Based; For Hollow Metal Doors and Frames.
a. Products:
1) Behr Premium Interior/Exterior Direct-To-Metal Paint Semi-Gloss [No. 3200]. (MPI #163)
2) PPG Paints Advantage 900 Interior/Exterior Latex, 919-10 Series, Semi-Gloss.
3) PPG Paints Pitt-Tech Plus DTM Industrial Enamel, 90-1110 Series, Satin. (MPI #161)
4) Sherwin-Williams Pro Industrial DTM Acrylic, Semi-Gloss. (MPI #163)

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Rust-Inhibitive Water Based Primer.
a. Products:
1) Behr Premium Plus Interior/Exterior Multi-Surface Primer and Sealer [No. 436]. (MPI #107)
2) Behr Interior/Exterior Metal Primer [No. 435]. (MPI #107)
3) PPG Paints Pitt-Tech Plus DTM Industrial Primer, 4020 PF Series.

4) Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer. (MPI #107)

2. Stain Blocking Primer.
   a. Products:
      1) PPG Paints Seal Grip Interior/Exterior Alkyd Universal Primer/Sealer, 17-941NF. (MPI #136)
      2) Sherwin-Williams Extreme Block Stain Blocking Primer. (MPI #136)
      3) Vista Paint Corporation; 4200 Terminator II: www.vistapaint.com/#sle.
3. Bonding Primer, Water Based.
   a. Products:
      1) Behr Interior/Exterior Bonding Primer [No. 432]. (MPI #17)
      2) Behr Premium Plus Interior/Exterior Multi-Surface Primer and Sealer [No. 436]. (MPI #17)
      3) Kilz Adhesion Bonding Primer [No. L2111].
      4) PPG Paints Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI Series. (MPI #17)

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   2. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
   3. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
   2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

G. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

H. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

I. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

H. Sand wood and metal surfaces lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 099113

SECTION 099300
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of stains and transparent finishes.

C. Scope: All exposed wood surfaces unless otherwise noted on drawings.
   1. Underside of roof deck
   2. Exposed surfaces of wood structural members
   3. Exposed surfaces of fascia

1.2 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting: Stains and transparent finishes.

1.3 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2019.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

F. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

1.5 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category.
   2. Manufacturer's installation instructions.
   3. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, 6"x12" inch in size.

D. Certification: By manufacturer that stains and transparent finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Stain and Transparent Finish Materials: 1 gallon of each color and type; from the same product run, store where directed.
   3. Label each container with color and type in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide finishes from the same manufacturer to the greatest extent possible.
   1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. Transparent Finishes:
   1. Behr Process Corporation: www.behr.com/#sle.
   2. PPG Paints; _____: www.ppgpaints.com/#sle.
   3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Stains:
   1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.2 STAINS AND TRANSPARENT FINISHES - GENERAL

A. Finishes:
   1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   3. Supply each finish material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide stains and transparent finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 EXTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

END OF SECTION 099300

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Refer to Toilet Accessories Schedule in Drawings.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

G. ASTM D4802 - Standard Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet; 2016.

H. ASTM D5047 - Standard Specification for Polyethylene Terephthalate Film and Sheeting; 2017.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021a.

J. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.5 SUBMITTALS

A. See Article 7.16 - Submittals for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories: re Toilet Acessories Schedule Sheet A401:
   1. Basis of Design: Bradley Corporation; _____: www.bradleycorp.com/#sle.
   2. A&J Washroom Accessories, Inc
   3. Bobrick Washroom Equipment,Inc
   4. GAMCO Specialty Accessories,: A Division of Bobrick Washroom Acessories, Inc

B. Provide products of each category type by single manufacturer.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide _____ keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Acrylic Plastic Sheet: ASTM D4802.

F. PETG Plastic Sheet: ASTM D5047.

G. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

H. Adhesive: Two component epoxy type, waterproof.

I. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

J. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated in drawings.

3.4 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 102800

SECTION 129000 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes:
1. Pavers
2. Bike Racks
3. Benches
4. Trash Receptacles
5. Recycling Bins
6. Water Fountain
7. Seatwall Caps
8. Gabion Walls
9. Picnic Tables
10. Bollards
11. Bike Repair Station
12. Natural Timber Seating

1.2 SUBMITTALS

A. Submittal Compliance Form: If Basis-of-Design products are provided, a Submittal Compliance Form may be submitted in lieu of required.

B. Samples: For each exposed product and for each color and texture specified.

C. Product Schedule: For site furnishings. Use same designations indicated on Plans.

D. Maintenance Data: For site furnishings to include in maintenance manuals.

1.3 MATERIALS

A. Pavers
1. Description: Custom recycled glass concrete pavers installed at the trailhead as shown on the plans. Pavers to be made from 70% recycled crushed glass concrete sourced from the City of Fairhope.
2. Manufacturer: Osprey Initiative, LLC, 2350 Halls Mill Road, Mobile, Alabama, 36606, Contact: Don Bates, (o.) 251-525-9727, (c) 601-842-7305, website: www.osprey.world, email: don.bates@osprey.world.
3. Model: Custom according to plans.
4. Quantity: As shown on plans.
5. Finishes: Custom according to plans.
6. Installation: Per layout and section shown on plans.

B. Bike Racks
1. Description: Pre-manufactured bike rack installed per manufacturer's specifications located at the trailhead as shown on the plans.
2. Manufacturer: Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan, 49048, Contact: Mallary Morvant, (c) 985-869-0341, website: www.landscapeforms.com, email: MallaryM@landscapeforms.com.

3. Model: LF FLO Bike Rack
4. Quantity: 1
5. Finishes: Aluminum casting with powder coat finish.
6. Color: LF Terra
7. Installation: Surface mount per manufacturer's specifications.

C. Benches
1. Description: Pre-manufactured bench installed per manufacturer's specifications located throughout the project as shown on the plans.
2. Manufacturer: Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan, 49048, Contact: Mallary Morvant, (c) 985-869-0341, website: www.landscapeforms.com, email: MallaryM@landscapeforms.com.
3. Model: LF Lakeside Bench
4. Quantity: 23
5. Finishes: Lakeside Backed Bench, Grass Pattern
6. Color: LF Terra
7. Installation: Surface mount per manufacturer's specifications.

D. Trash Receptacles
1. Description: Pre-manufactured trash receptacle installed per manufacturer's specifications located throughout the project as shown on the plans.
2. Manufacturer: Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan, 49048, Contact: Mallary Morvant, (c) 985-869-0341, website: www.landscapeforms.com, email: MallaryM@landscapeforms.com.
3. Model: LF Lakeside Litter Recptacle
4. Quantity: 6
5. Finishes: Lakeside Side Opening Litter Receptacle, Grass Side Panel
6. Color: LF Terra
7. Installation: Surface mount per manufacturer's specifications.

E. Recycling Bins
1. Description: Pre-manufactured recycling bin installed per manufacturer's specifications located throughout the project as shown on the plans.
2. Manufacturer: Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan, 49048, Contact: Mallary Morvant, (c) 985-869-0341, website: www.landscapeforms.com, email: MallaryM@landscapeforms.com.
3. Model: LF Lakeside Litter Recptacle
4. Quantity: 6
5. Finishes: Lakeside Side Opening Litter Receptacle, Grass Side Panel
6. Color: LF Loll Leaf Green
7. Installation: Surface mount per manufacturer's specifications.

F. Water Fountain
1. Description: Pre-manufactured water fountain installed per manufacturer's specifications located throughout the project as shown on the plans.
2. Manufacturer: Elkay, Inc., 1333 Butterfield Road, Suite 200, Downers Grove, Illinois, 60515, Contact: Elkay Customer Care, (o) 630-574-8484, website: www.elkay.com, email: CustCare@Elkay.com.
3. Model: Elkay Outdoor exH2O Bottle Filling Station Bi-Level (Model No. LK4420BF1UDB)
4. Quantity: 1
5. Finishes: Marine-grade 316 stainless steel
6. Color: Black
7. Installation: Floor mount per manufacturer's specifications.

G. Seatwall Caps
1. Description: Custom recycled glass seatwall caps poured-in-place on top of the gabion seat wall located at the outdoor pavilion as shown on the plans. Seatwall cap to be made from 70% recycled crushed glass concrete sourced from the City of Fairhope.
2. Manufacturer: Osprey Initiative, LLC, 2350 Halls Mill Road, Mobile, Alabama, 36606, Contact: Don Bates, (o.) 251-525-9727, (c) 601-842-7305, website: www.osprey.world, email: don.bates@osprey.world.
3. Model: Custom according to plans.
4. Quantity: As shown on plans.
5. Finishes: Custom according to plans.
6. Color: Concrete gray
7. Installation: Per layout and section shown on plans.

H. Gabion Walls
1. Description: Pre-manufactured gabion seat wall installed in place at the outdoor pavilion as shown on the plans.
2. Manufacturer: Tensar Internation Corp, 2500 Northwinds Parkway, Suite 500, Alpharetta, Georgia, 30009, Contact: David Fuqua, (c) 913-972-1414, website: www.tensarcorp.com, email: dfuqua@tensarcorp.com.
3. Model: Sierra Scape Retaining Wall System
4. Quantity: As shown on plans.
5. Finishes: Stone face, galvanized wire form
6. Installation: Per layout and section shown on plans and installed per the manufacturer's specifications.

I. Picnic Tables
1. Description: Custom locally sourced and harvested hardwood picnic table and bench set milled on-site and installed at the outdoor pavilion as shown on the plans.
2. Manufacturer: Grass Roots Wood Co., Fairhope, Alabama, Contact: Adam Scardamalia, (c) 251-586-4086, website: www.thewoodgrain.com, email: woodgrainonline@gmail.com.
3. Model: Custom according to plans.
4. Quantity: 4-6
5. Finishes: Natural hardwood, harvested and milled from project site.
6. Color: Natural stained wood.
7. Installation: Per manufacturer's specifications.

J. Bollards
1. Description: Pre-manufactured bollard installed per manufacturer's specifications located throughout the project as shown on the plans.
2. Manufacturer: Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan, 49048, Contact: Mallary Morvant, (c) 985-869-0341, website: www.landscapeforms.com, email: MallaryM@landscapeforms.com.
3. Model: LF Guide Bollard – 35 Series
4. Quantity: 11
5. Finishes: Cast aluminum and powder coated.
6. Color: LF Terra
7. Installation: Surface mount per manufacturer's specifications.

K. Bike Repair Station
1. Description: Pre-manufactured bike repair station installed per manufacturer's specifications located at the trailhead as shown on the plans.
2. Manufacturer: Dero, 5522 Lakeland Ave. N., Minneapolis, Minnesota, 55429, (o) 888-337-6729 website: www.dero.com, email: customerservice@dero.com.

3. Model: Fixit Plus with Air Kit Prime
4. Quantity: 1
5. Finishes: Cast aluminum and powder coated.
6. Color: Black
7. Installation: Surface mount per manufacturer's specifications.

L. Natural Timber Seating
1. Description: Custom locally harvested and sourced hardwood natural timber seating furnishings milled on-site and installed at the outdoor classroom as shown on the plans.
2. Manufacturer: Grass Roots Wood Co., Fairhope, Alabama, Contact: Adam Scardamalia, (c) 251-586-4086, website: www.thewoodgrain.com, email: woodgrainonline@gmail.com.
3. Model: Custom according to plans.
4. Quantity: 20 (size varies according to plans)
5. Finishes: Natural hardwood, harvested and milled from project site, applied with Japanese Yakisugi burning technique (refer to drawing notes).
6. Color: Natural wood.
7. Installation: Per plans and specifications.

1.4 WARRANTY

A. Warranty all work for a period of one (1) year after date of final acceptance of the work in total, against defects in materials, equipment, workmanship, and any repairs required or other defects of workmanship, material or equipment.

B. Repair unsatisfactory conditions promptly at no cost to the Owner.

C. Emergency repairs may be made by the Owner without relieving the General Contractor of his warranty obligations.

D. Respond to Owner's request for repair work within ten (10) days. If not, Owner may proceed with such necessary repairs at the Contractor's expense.

PART 2 - CONSTRUCTION

2.1 Construction

A. Examination:
1. Examine areas and conditions, with installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Installation:
1. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
2. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
3. Install site furnishings level, plumb, true and securely anchored at locations indicated on plans.

END OF SECTION 129000

SECTION 139000 – TRAILS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Extent of trail development work is shown on drawings and in schedules.

B. Provide and furnish all labor, materials, and equipment required or inferred from drawings and specifications to complete the work of this section.

C. Work includes: Construction layout and staking, clearing and grubbing, and construction and maintenance for the following trial types:
1. Primitive Trail
2. Intermediate Trail
3. Feeder Trail
4. Corridor Trail
5. Carriage Trail
6. Multi-Use Trail

D. Trail Descriptions:
1. Primitive Trail
   a. The primitive trail will allow for pedestrian only use and provide a unique passive walking experience along historic Fly Creek. This trail will offer views and access to the natural sandy bottom creek showcasing diverse riparian habitat and clean flowing water that leads to Mobile Bay. The primitive trail will be a 2'wide natural mulch surface to limit impacts and erosion to the creek bank and will lead to outdoor classrooms and overlooks.
      1) Length: approx. 0.25 miles
      2) Width: 2' wide
      3) Surface: Natural mulch surface
2. Intermediate Trail
   a. The intermediate trail will provide the most diversity of experiences and terrain throughout the nature preserve. This trail network will transition from riparian habitat along the creek to upland forested habitat and through the longleaf forest. The trail will remain narrow at only 3' wide with a natural mulch surface as to manage congestion and impacts within the landscape.
      1) Length: approx. 1.25 miles
      2) Width: 3' wide
      3) Surface: Natural mulch surface
3. Feeder Trail
   a. The feeder trail will provide a direct route from the parking lot area to the pedestrian tunnel which will be constructed under Veterans Drive adjoining the two separate parcels. This trail will be 6' wide with a compacted gravel surface to help mitigate any conflicts between pedestrians and bicyclist traveling between the two parcels.
      1) Length: approx. 0.25 miles
      2) Width: 6' wide
      3) Surface: Compacted gravel surface
4. Corridor Trail
   a. The corridor trail is an existing logging road that allowed for access to the central portion of the property for harvesting timber. This trail will serve as the central connector trail that provides access to the outdoor pavilion, and displays a unique habitat transition in the

landscape from the upland hardwood forest to a native longleaf habitat. The existing trail will be improved with an 8' wide compacted mulch surface to provide easy access to these unique site features.
1) Length: approx. 0.25 miles
2) Width: 8' wide
3) Surface: Compacted mulch surface

5. Carriage Trail
   a. The carriage trail pays tribute to the historic road that was located within the property boundaries prior to the construction of Highway 98 in the early 1960's. The carriage trail will be (2) 3' wide lanes of a compacted gravel surface that mimics a rural carriage trail and will provide direct access from the parking area to the restroom pavilion and pollinator garden.
      1) Length: approx. 0.25 miles
      2) Width: 2 lanes at 3' wide each
      3) Surface: Compacted gravel surface
6. Multi-Use Trail
   a. The multi-use trail provides connectivity to all inclusive trails within the nature preserve. This trail will provide for a variety of experiences from the trailhead and Eastern Shore Trail to several outdoor classrooms and pavilion. The trail will be 5' wide and constructed of a compacted mulch surface to minimize impacts while still providing enough space for a range of users.
      1) Length: approx. 0.75 miles
      2) Width: 5' wide
      3) Surface: Compacted mulch surface

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. Approval and Selection of Materials and Work: The selection of all materials and the execution of all operations required under the specifications and drawings are subject to the approval of the Landscape Architect and the Owner. They have the right to reject any and all materials and any and all work, which in their opinion, does not meet the requirements of the Contract Documents at any stage of the operations. The Contractor shall remove rejected work and/or materials from job site and replace promptly.

1.3 WARRANTY

A. Warranty all work for a period of one (1) year after date of final acceptance of the work in total, against defects in materials, equipment, workmanship, and any repairs required resulting from defects of workmanship, material or equipment.

B. Repair unsatisfactory conditions promptly at no cost to the Owner.

C. Emergency repairs may be made by the Owner without relieving the Landscape Contractor of his warranty obligations.

D. Respond to Owner's request for repair work within ten (10) days. If not, Owner may proceed with such necessary repairs at the Contractor's expense.

PART 2 - CONSTRUCTION

2.1 LAYOUT

A. Contractor shall best fit trail alignment to follow any existing pathways, minimize clearing/grubbing, preserve healthy native vegetation, and stability of trail bedding materials.

B. Contractor will be provided a .DWG and/or .LN3 file by the engineer for use with contractor's required survey grade GPS equipment for proper location of trail alignments.

C. Trail alignment to follow the centerline of existing previously cleared areas to minimize any impacts to existing native vegetation.

D. Contractor shall stake and flag trail alignments prior to performing any clearing and grubbing. Contractor to notify the Landscape Architect within 72 hours for approval of anticipated clearing and grubbing to verify alignment of trails.

E. Remove all construction stakes, tags, flagging and plastic ribbon from the project area within 7 days after the final inspection of all other work on the project. Dispose of all stakes, tags, flagging, and plastic ribbon off of the property.

2.2 CLEARING AND GRUBBING

A. This work consists of clearing, grubbing, trimming, removing, and treating trees, logs, limbs, branches, brush, plants, and other vegetation within the clearing limits. Work includes the felling and treatment of designated trees outside the clearing limits. Also, included are the protection from injury or defacement of trees and other objects not designated for removal and treatment of damaged trees.

B. Clear to the dimensions shown on the plans or 12 inches beyond the fill and backslope catch points, whichever is greater.

C. Reuse, remove and/or dispose of trees, logs, limbs, branches, brush, herbaceous plants, and other vegetation within the clearing limits, except for the following:
   1. Live, sound, and firmly rooted trees greater than 6" in diameter (avoid where possible).
   2. Live brush, herbaceous plants, and trees within the trailway and the clearing limits that are less than 12 inches in height and less than ½ inch in diameter at ground line.

D. Except as provided above, cut all limbs and branches more than ½ inch in diameter at a height less than 8' that extend into the clearing limits. Cut limbs flush with the tree trunks or stems or cut at the ground surface.

E. When felling, cutting, or trimming, do not cause bark damage to standing timber. If damage does occur to standing trees, treat the injured trees according to industry arboriculture standards. Remove and dispose of trees with major roots exposed by construction that are rendered unstable.

F. Remove all stumbs within the trailbed. Remove stumbs located between the edge of trailbed and the edge of the trailway that cannot be cut flush with the finished slope or that are not tightly rooted.

G. The primitive trail must be hand cleared to avoid any impacts to the Fly Creek watershed and habitat.

H. Conserve and use all suitable material for specified work. Remove all debris from within the trailway limits and uniformly spread outside the clearing limits, not more than 4 inches in depth. Do not obstruct drainage or create piles, berms, or windrows of debris.

I. Construct embankments with suitable compacted material. Compact all disturbed soil within the trailbed area prior to placing mulch or gravel.

J. Minor deviations of +/- 12 inches in vertical alignment from existing grade and 36 inches in horizontal alignment with smooth transitions of at least 10 feet on each side of the deviation are acceptable unless otherwise shown on the plans. These deviations are to minimize impacts to existing native vegetation or drainage ways.

K. Make necessary adjustments of horizontal or vertical alignment, within the tolerances specified in this subsection, to produce the designed trailway section and balance earthwork. Such adjustments shall not be considered as changes.

2.3 TRAILBED FINISH

A. Fill holes with suitable material, compact, and cut high points to provide a uniform trailbed finish.

2.4 DITCHES

A. Construct ditches and swales to be free of loose rocks, roots, sticks, and other obstructions.

2.5 GEOSYNTHETICS

A. Where shown on the plans, place geosynthetics flat and parallel to the centerline of the trail before placing embankment. Overlap geosynthetics a minimum of 24 inches. Install anchors or fasteners as recommended by geosynthetic manufacturer.

PART 3 - TRAIL SURFACING

3.1 MULCH

Mulch shall consist of shredded bark mulch as specified on the Drawings. Material shall be uniform in size, color, quality and overall appearance. Mulch shall be free of material injurious to plant growth. Sources of mulch should be free of weeds and invasive plant parts or seeds. Sawdust, dirt, garbage, or other debris mixed in the mulch is not acceptable. Contractor shall submit two pounds of proposed mulch for inspection by Landscape Architect.

1. Shredded Bark Mulch: Shredded bark mulch shall be used in all mulch areas of flowerbeds and tree pits. Shredded bark mulch shall consist of shredded bark and wood. Maximum length of any individual component shall be two inches (2”) and a minimum of seventy-five percent (75%) of the mulch shall pass through a one inch (1”) screen. Mulch shall be free of germination-inhibiting ingredients. The bark mulch shall have the characteristics of retaining moisture, forming a mat not susceptible to spreading by wind or rain, and providing a good growth medium for plants. Shredded bark much may contain up to fifty percent (50%) shredded wood material. Wood chips are not acceptable. Bark mulch containing shredded wood shall be aged a minimum of one year prior to installation. Bark mulch shall be free of soil, rocks, and weeds. The shredded bark mulch shall be free of any dyes or artificial coloring.
2. Pine Straw: Pine straw mulch shall be used in trenches and all disturbed natural areas. Pine straw mulch shall be a standard horticultural product – clean and free from all foreign matter, including weed seeds and chemical contamination, and free of any dyes or artificial coloring.

3.2 AGGREGATE SURFACING AND BASE COURSE

A. Aggregate surfacing for trailbed applies to the Carriage Trail and Feeder Trail as shown on the plans.

1. Carriage Trail
   a. 6” depth Aggregate Base Course (ALDOT #57 Stone)
   b. 3” depth Aggregate Surfacing (ALDOT #8910 Stone)
2. Feeder Trail
   a. 6” depth Aggregate Surfacing (ALDOT #57 Stone)

B. Prepare and finish trailbed as required on the plans. Obtain written approval from the Landscape Architect before placing aggregate.

C. Submit samples and test results to the Landscape Architect verifying that aggregate gradation and color meets contract requirements.

D. Use aggregate that is uniformly mixed at optimum moisture content and spread and compact in layers to the final thickness as shown on the plans. Obtain compaction by one of the following methods:
   1. by hand, using non-mechanized compaction tools over the full area of each layer until visual displacement ceases;
   2. by mechanical vibratory compactors over the full area of each layer until visual displacement ceases, but not fewer than three complete passes;
   3. by using a roller or mechanical hand tamper until the density is at least 90 percent of the maximum density, as determined by AASHTO T 99, Method C or D.

E. Immediately following final spreading, smoothing, and compacting, correct any irregularities or depressions that develop by adding or removing material until the surface is smooth, uniform, and compacted.

F. Do not vary the total compacted thickness of the aggregate by more or less than ¾ inch from the specified thickness or place it consistently below or above the specified depth.

G. Do not vary the aggregate width by more than ± 3 inches from the specified width or place it consistently narrower or wider than the specified width.

END OF SECTION 139000

SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water and fire service mains.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

B. DI: Ductile Iron

1.4 SUBMITTALS

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

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water for both water and fire service mains. Include tapping of water mains and backflow prevention.

2. Contractor shall obtain a copy of the local utility company standard specifications for installation and maintain onsite.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.

2. Protect valves against damage to threaded ends and flange faces.

3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.

2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

2. Gaskets: AWWA C111, rubber.

2.2 PVC PIPE AND FITTINGS

A. PVC, Schedule 40 Pipe: ASTM D 1785.

1. PVC, Schedule 40 Socket Fittings: ASTM D 2466.

B. PVC, Schedule 80 Pipe: ASTM D 1785.

1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.

2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.

C. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.

1. Comply with UL 1285 for fire-service mains if indicated.

2. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

    a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.3 CORROSION-PROTECTION PIPING ENCASEMENT

A. Encasement for Underground Metal Piping:

1. Standards: ASTM A 674 or AWWA C105.

2. Form: Sheet or tube.

3. Material: High-density, cross-laminated PE film of 0.004-inch minimum thickness.

4. Color: Black.

2.4 GATE VALVES

A. AWWA, Ductile-Iron Gate Valves:

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 Cast Iron Pipe Co.

    b. McWane, Inc.

    c. U.S. Pipe and Foundry Company.

2. Nonrising-Stem, Resilient-Seated Gate Valves:

    a. Description: ductile-iron body and bonnet; with ductile-iron gate, resilient seats, bronze stem, and stem nut.

        1) Standard: AWWA C509.

        2) Minimum Pressure Rating: 250 psig.

        3) End Connections: Mechanical joint.

        4) Interior Coating: Complying with AWWA C550.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Description: Sleeve and valve compatible with drilling machine.

a. Standard: MSS SP-60.

b. Tapping Sleeve: ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.

c. Valve: AWWA, ductile-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inchesin diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 WATER METERS

A. Water meters will be furnished and installed by utility company.

2.7 BACKFLOW PREVENTERS

A. Reduced-Pressure Backflow Preventers:

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. Ames Fire & Waterworks; a division of Watts Regulator Co.

b. Conbraco Industries, Inc.

c. Watts Water Technologies, Inc.

d. Wilkins; a Zurn company.

2. Standard: AWWA C511.

3. Operation: Continuous-pressure applications.

4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.

5. Size: NPS

6. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.

7. End Connections: flanged NPS 2-1/2 and larger.

8. Configuration: Designed for vertical inlet, horizontal center section, and vertical outlet flow.

9. Accessories:

a. Valves: OS&Y gate type with flanged ends on inlet and outlet.

b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

2.8 WATER METER BOXES

A. Water meter vault to be furnished by the utility company.

2.9 CONCRETE VAULTS

A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858. Vault shall have a aluminum access hatch sized such to fully expose the entire content of vault area.

2.10 PROTECTIVE ENCLOSURES

A. Freeze-Protection Enclosures:

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. Aqua Shield.

b. G&C Enclosures.

c. Hot Box, Inc.

d. Hubbell Power Systems

e. Watts Water Technologies, Inc.

2. Description: Hubbell Power Systems, Windbreaker B110-S or Approved Equal, Insulated enclosure designed to protect aboveground water piping, equipment, or specialties from freezing and damage, with heat source to maintain minimum internal temperature of 40 deg F when external temperatures reach as low as minus 34 deg F.

a. Standard: ASSE 1060.

b. Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.

1) Housing: Reinforced-fiberglass construction.

a) Size: Of dimensions indicated, but not less than those required for access and service of protected unit.

b) Drain opening for units with drain connection.

c) Access doors with locking devices.

d) Insulation inside housing.

e) Anchoring devices for attaching housing to concrete base.

2) Electric heating cable or heater with self-limiting temperature control.

B. Enclosure Bases:

1. Description: 4-inch-minimum thickness concrete, of dimensions required by manufacturer. Include openings for piping.

2.11 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:

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 Cast Iron Pipe Co.

b. McWane, Inc.

c. U.S. Pipe and Foundry Company.

2. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.

a. Standard: AWWA C502.

b. Pressure Rating: 250 psig

c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.

d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.

e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.

f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

2.12 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections:

1. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch-high brass sleeve; and round escutcheon plate.

a. Standard: UL 405.

b. Connections: Two NPS 2-1/2inlets and one NPS 6 outlet.

c. Inlet Alignment: Inline, horizontal.

d. Finish Including Sleeve: Polished chrome-plated.

e. Escutcheon Plate Marking: "AUTO SPKR."

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping shall be the following:

1. Ductile-iron, push-on-joint pipe; mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

F. Aboveground and vault water-service piping shall be the following:

1. Ductile-iron, flange-end pipe; ductile-iron, flange-end fittings.

G. Underground Fire-Service-Main Piping shall be the following:

1. Ductile-iron, push-on-joint pipe; mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

H. Aboveground and Vault Fire-Service-Main Piping shall be ductile-iron, flange-end pipe; ductile-iron pipe fittings; and flange-end joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

A. See Division 22 Section "Common Work Results for Plumbing" for piping-system common requirements.

3.5 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Comply with NFPA 24 for fire-service-main piping materials and installation.

1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.

C. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.

D. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

E. Bury piping with depth of cover over top at least 30 inches, with top at least below finished and or existing ground elevations.

F. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

G. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

H. Sleeves are specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

I. Mechanical sleeve seals are specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

J. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

K. See Division 22 Section "Domestic Water Piping" for potable-water piping inside the building.

3.6 JOINT CONSTRUCTION

A. See Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

B. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.

2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

3.7 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
2. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.

E. MSS Valves: Install as component of connected piping system.

F. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

3.9 REDUCED PRESSURE BACKFLOW PREVENTOR INSTALLATION

A. Install in aboveground freeze proof protective enclosure.

B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.

C. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.

3.10 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.11 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 4 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

E. Provide electrical connections for heating elements as required by the construction drawings.

3.12 WATER METER BOX INSTALLATION

A. Water meter boxes to be installed by the local water department. Contractor shall coordinate the installation..

3.13 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C 891.

3.14 PROTECTIVE ENCLOSURE INSTALLATION

A. Install concrete base level and with top approximately 2 inchesabove grade.

B. Install protective enclosure over valves and equipment.

C. Anchor protective enclosure to concrete base.

3.15 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. Dry-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.

C. AWWA Fire Hydrants: Comply with AWWA M17.

D. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.16 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install ball drip valves at each check valve for fire department connection to mains.

3.17 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. See Division 22 Section "Common Work Results for Plumbing" for piping connections to valves and equipment.

C. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

D. Connect water-distribution piping to interior domestic water and fire-suppression piping.

3.18 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for six hours.

1. Increase pressure in 50-psigincrements and inspect each joint between increments. Hold at test pressure for 6 hours; decrease to 0 psig. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.19 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

3.20 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.

b. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

c. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 221113

SECTION 221313 - FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Baldwin County Sewer Service Standard Specifications for Sanitary Sewer Systems and Pumping Station Construction

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Cleanouts.
3. Manholes.

1.3 SUBMITTALS

A. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

B. Product Certificates: For each type of pipe and fitting, from manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

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

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

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

A. Pipe: ASTM A 746, Class 52, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.

D. Gaskets: AWWA C111, rubber.

E. Polyethylene Sheath: AWWA C105

2.2 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.

2. Fittings: ASTM D 3034, PVC with bell ends.

3. Gaskets: ASTM F 477, elastomeric seals.

2.3 CLEANOUTS

A. PVC Cleanouts:

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

2.4 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Diameter: 48 inches minimum unless otherwise indicated.

3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.

4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.

5. Riser Sections: 4-inchminimum thickness, of length to provide depth indicated.

6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.

7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.

9. Steps: Individual FRP steps; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals.

10. Adjusting Rings: Interlocking cast iron rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser, with 4-inch-minimum-width flange and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."

2. Material: ASTM A 48, Class 30 gray iron unless otherwise indicated.

C. Manhole-Cover Inserts:

1. Description; Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent stormwater inflow. Include handle for removal and gasket for gastight sealing.

2. Type: Solid

2.5 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water: Potable.

B. Portland Cement Design Mix: 4000 psiminimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.

2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psiminimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 1 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 4 percent.

PART 3 - EXECUTION

3.1 EARTHWORK

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

3.2 PIPING INSTALLATION

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

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings

according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

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

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

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping with 36-inch minimum cover or as indicated on the construction drawings.

2. Install ductile-iron, gravity sewer piping according to ASTM A 746.

3. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

1. Ductile-iron pipe and fittings.

H. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.

2. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

3.4 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Install FRP manholes according to manufacturer's written instructions.

D. Form continuous concrete channels and benches between inlets and outlet.

E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 6inchesabove finished surface elsewhere unless otherwise indicated.

F. Install manhole-cover inserts in frame and immediately below cover.

3.5 CONCRETE PLACEMENT

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

3.6 CLEANOUT INSTALLATION

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

1. Use Heavy-Duty, top-loading classification cleanouts in all areas.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 6 inches deep. Set with tops 1 inch above surrounding grade.

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

3.7 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 22 Section "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inchesof concrete with 28-day compressive strength of 3000 psi.

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

3.8 IDENTIFICATION

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

1. Use detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.9 FIELD QUALITY CONTROL

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

1. Submit separate report for each system inspection.

2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

c. Damage: Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.

e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

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

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

4. Submit separate report for each test.

5. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

a. Test gravity sewer piping according to ASTM F 1417.

6. Manholes: Perform Negative Air Pressure (Vacuum) test according to ASTM C 1244.

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

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

3.10 CLEANING

A. Clean dirt and superfluous material from interior of piping.

END OF SECTION 221313

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, removing site utilities, and abandoning site utilities in place.
7. Temporary erosion- and sedimentation-control measures.

B. Related Sections:

1. Division 01 Section "Execution" for field engineering and surveying.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service providers or One Call (811) for area where Project is located before site clearing.

C. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

D. Do not direct vehicle or equipment exhaust towards protection zones.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS - NONE

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Install orange construction fencing around each tree trunk as indicated by the details provided in the construction drawings.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of the Alabama Department of Environmental Management.

B. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. All temporary erosion and sedimentation control measures shall be installed and maintained in accordance with the Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas, latest edition.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than **two** days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Grind down stumps and remove roots, obstructions, and debris to a depth of 24inchesbelow exposed subgrade.

3. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.

2. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311000

SECTION 312000 **-** EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for walks, pavements, turf and grasses, and plants.

2. Excavating and backfilling for structures.

3. Subbase course for concrete walks.

4. Subbase course and base course for asphalt paving.

5. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:

1. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

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

E. Unclassified Excavation: Removal of all material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

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

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

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

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

1.4 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches

C. Qualification Data: For qualified testing agency.

D. Material Test Reports: For each borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.

2. Laboratory compaction curve according to ASTM D 698.

E. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify **"811 - One Call"** for area where Project is located before beginning earth moving operations.

C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures are in place as indicated in the construction drawings.

D. Do not commence earth moving operations until plant-protection measures specified in the construction drawings are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.

2. Parking vehicles or equipment.

3. Erection of sheds or structures.

4. Impoundment of water.

5. Excavation or other digging unless otherwise indicated.

6. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. A geotechnical report has been prepared for the subject site by Thompson Engineering, "Geotechnical Design Report, Triangle Park Master Plan Development Project, TE Project No. 22-1101-0229", and dated November 15, 2023. The contractor shall obtain and review for all recommendations for soil materials.

2.2 GEOTEXTILES

A. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.

2. Grab Tensile Strength: 247 lbf; ASTM D 4632.

3. Sewn Seam Strength: 222 lbf; ASTM D 4632.

4. Tear Strength: 90 lbf; ASTM D 4533.

5. Puncture Strength: 90 lbf; ASTM D 4833.

6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.

7. Permittivity: 0.02 per second, minimum; ASTM D 4491.

8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.

2. Yellow: Gas, oil, steam, and dangerous materials.

3. Orange: Telephone and other communications.

4. Blue: Water systems.

5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Undercut: In accordance with the Geotechnical Report, the proposed new construction area shall be undercut to a depth of 2 feet and extend 3 feet beyond the proposed perimeter of the building. Replacement fill soils should be compacted to a minimum in-place soil density of 95% Standard Proctor maximum dry density (ASTM D-698). For backfilling of the undercut areas, an initial lift of 12-18 inches of "Select Sand" may be utilized where saturated conditions exist.

B. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

2. Rock encounter during excavation shall be removed to a minimum depth of 12" below finish subgrade elevation in all areas.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 incheshigher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.7 SUBGRADE INSPECTION

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.8 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.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.

2. Surveying locations of underground utilities for Record Documents.

3. Testing and inspecting underground utilities if allowed by the utility with jurisdiction.

4. Removing concrete formwork.

5. Removing trash and debris.

6. Removing temporary shoring and bracing, and sheeting.

7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inchesof bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."

D. Trenches under Roadways: Contractor shall backfill trenches within existing roadway crossings with ALDOT #57 stone compacted to 98%. Trenches located within proposed pavement and landscape areas shall be backfilled with approved fill material and compacted in accordance with the Geotechnical Report recommendations but not less then 98% Standard Proctor.

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Install detectable warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs. The contractor shall review the requirements of the utility providers prior to installation of detectable warning tape to verify any changes that may have occurred following the preparation of the project specifications.

3.11 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place fill material in loose layers not greater than 6" and compact to a minimum of 98% Standard Proctor density until required elevations have been achieved.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 3 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.

2. Under walkways, scarify and recompact top 12inchesbelow subgrade and compact each layer of backfill or fill soil material at 95 percent.

3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.

4. For utility trenches, compact each layer of initial and final backfill soil material at 98 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within 0.10 foot of required elevations.

3.15 BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place base course under pavements as follows:

1. Place base course material over subbase course under hot-mix asphalt pavement.

2. Shape base course to required crown elevations and cross-slope grades.

3. Place base course 6 inches or less in compacted thickness in a single layer.

4. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

5. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 1557.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.

2. Determine that fill material and maximum lift thickness comply with requirements.

3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2,500 sq. ft.or less of paved area or building slab, but in no case fewer than three tests.

2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

3. The contractor shall refer to the geotechnical report for all testing requirements for the project and shall comply with the more stringent of requirements.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, 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.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 320190 – LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. The Landscape Maintenance Agreement is to include the complete care and guarantee of all planted trees, plants, groundcovers, and sod areas within the limits of work shown on the Landscape Planting Plans for a period of one year following substantial completion.

B. Related Work:
   1. Documents affecting the work of this Section include, but are not necessarily limited to, General Conditions and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. The Maintenance Contractor is hereby made aware that both the Owner and the Landscape Architect anticipate that the Landscape Maintenance at this site shall be of the very highest quality possible.

B. All work to be performed such as pruning, mowing, fertilizing, watering, weeding, edging, spraying, policing, plant installation, over-seeding, aerating, and mulching shall be strictly managed and executed and performed by experienced personnel.

C. The Owner shall be insured of a complete maintenance program and plant guarantee for all trees, plants, and mulched areas such that the quality of planting does not deteriorate, but obtains vitality and healthy new growth for the duration of the Agreement.

D. The Landscape Maintenance Contractor must take every precaution to prevent saturation of the plant material during the life of the Agreement (i.e., diversion swales, installation of underdrains if needed, removal of mulch and tree saucers when necessary, and/or raising distressed plant material when necessary).

E. Guarantee of Plant Material
   1. The Landscape Maintenance Contractor guarantees and will replace, at no additional cost to the Owner, 100% of the plants which, in the opinion of the Landscape Architect, fail to maintain a healthy, vigorous condition (excluding theft or vandalism) regardless of the Contractor responsible for the initial installation. Replacement plant material shall meet all specifications as listed in the Landscape Specifications and Plant List in regard to species, variety, color, and quality. Size of replacement plant material shall equal to that of the plant which is being replaced and/or the size of existing adjacent like specimens.
   2. The Contractor is responsible for "treating" problem plant material and shall outline immediate steps to correct problems or improve performance of the plant.
   3. In the event that the performance of the Landscape Maintenance Contractor should fail to satisfy the expectations and standards set forth in this Section of Specifications as interpreted by the Owner and the Landscape Architect, the Owner reserves the right to obtain others to perform such duties and deduct all costs from the Maintenance Contractor's payments.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 029000.

B. Schedule:

1. Prior to beginning work on this contract the Landscape Maintenance Contractor is to provide the Owner with a detailed schedule of how the work is to be accomplished. The schedule is to include target dates for all work performed under this contract, time estimates for task completion, and anticipated labor forces.

PART 2 - PRODUCTS

2.1 SOIL ADJUSTMENTS

A. Soil is to be maintained at the pH levels noted under Section 029000 of these specifications.

B. Soil pH adjustments (from Princeton Nurseries "How to Adjust Soil pH").

1. To raise soil pH one point: Spread ground limestone.

SOIL TYPE	LIMESTONE (Per 1000 SF)	LIMESTONE (Per acre)
Sandy Loam	80 lbs.	1-1/2 tons
Loam	110 lbs.	2 tons
Clay Loam	120 lbs.	2-1/2 tons

2. To lower soil pH one point: Spread powdered sulfur and aluminum sulfate.

SOIL TYPE	POWDERED SULFUR (Per 1000 SF)	POWDERED SULFUR (Per acre)
Sandy Loam	7 lbs.	300 lbs.
Loam	10 lbs.	430 lbs.
Clay Loam	14 lbs.	600 lbs.

SOIL TYPE	ALUMINUM SULFATE (Per 1000 SF)	ALUMINUM SULFATE (Per acre)
Sandy Loam	50 lbs.	2000 lbs.
Loam	70 lbs.	3000 lbs.
Clay Loam	90 lbs.	3500 lbs.

3. Use one-half (1/2) the above applications to lower the pH one point on established plantings (preferably in the dormant season). Cultivate thoroughly, by hand, into the one (1) to two (2) inches of soil above the plant roots, avoiding damage to the root systems.

2.2 APPLICATIONS OF INSECTICIDES AND PESTICIDES

A. Recommended treatment application. See following chart:

INSECTICIDES AND PESTICIDES
APPLY AS PER MANUFACTURER'S INSTRUCTIONS
INSECT CONTROL CHART

NAME OF PEST/ COMMENTS	INSECTICIDE	HYDRAULIC SPRAYER FORMULA (Per 100 Gal. Water)	MIST BLOWER (Per 100 Gal. Water)
Aphids (Apply when noticed)	Malathion	1 qt.	4-1/2 gal.
Lace Bugs (2 applications, 2-3 wks. apart)	Malathion 50% emulsion	1 qt.	4-1/2 gal.
Leaf Hoppers (repeat if necessary)	Methoxychlor	3 lbs	
Scale Insects – Crawling Stage (First application in early June. Repeat 3 weeks thereafter)	Methoxychlor 25% E.C.	2 qts.	3 gal.
Scale Insects – Dormant (Apply only when temperature is above 45° F.	Superior Type Dormant Oil	3 gals.	5 gal.
Spider Mites (Two applications 3 wks. apart)	Malathion	1 qt.	4-1/2 gal.
Other special miticides	Manuf. directions	Manuf. directions	
Canker Worms (Inch Worms)(While foliage is young)	Methoxychlor 50% Wettable Powder	3 lbs.	
All other leaf-eating caterpillars (when noticed)	Same as for Canker Worms		
Bag Worms (early to middle June)	Malathion	1 qt.	
Bag Worms (when adults emerge)	Malathion	1 qt.	4-1/2 gal.
Japanese Beetle (when adults emerge)	Sevin 50% Wettable Powder	2 lbs.	
Other leaf-eating beetles (when noticed)			
Birch Leaf Miner (when new growth has 4 or 5 leaves showing or when miners are 2/3 in. in diameter)	Malathion 50% emulsion	1 qt.	4-1.2 gal.
	Meta-systox-R 25% SC	1-1/2 pts.	
Locust Pod Gall (April when buds show green)	Lindane 20% EC	1 pt.	
Mimosa Web Worms (when noticed)	Sevin	2 lbs.	

	50% Wettable Powder		

B. All insecticides and pesticides are to be applied by a person who maintains a valid Alabama insecticide and pesticides applicator and operations license.

C. All chemicals are to be applied per manufacture recommendation and in strict accordance with federal, state, county, and city directives on environmental control. Chemicals must have an EPA approval number.

2.3 APPLICATION OF FERTILIZER

Recommended application times and rates:

FERTILIZING SUMMARY

PLANT TYPE	TIME OF APPLICATION	FERTILIZER	RATE OF APPLICATION
Shade trees	February	8-12-12	1 cup/caliper inch of tree
Ornamental trees	March	8-8-8	1 cup/caliper inch of tree
Medium evergreen trees	March June	13-13-13 10-10-10	1 cup/caliper inch of tree
Shrubs and massed evergreens	March May July	13-13-13* 10-10-10* 10-10-10*	½ cup/ft. ht.of shrub
Groundcover	April	13-13-13	10 lbs./1000 sf, thoroughly water after application
Seeded areas	March (early) June (early) September (early)	10-10-10	50 lbs./2500 sf or 800 lbs./acre
** Granulated fertilizer*			

PART 3 - EXECUTION

A. Planted Trees

1. Watering without Irrigation: When a drought (no rain for 2 or 3 weeks during summer months) occurs, it will be necessary to soak the tree(s). Check all trees and plants weekly, for dryness, by removing the straw from their bases and sampling the soil approximately twelve to fifteen inches (12" –15") deep. If no moisture is present, water each tree until the ground is saturated to the base of the tree rootball or a minimum of thirty-inch (30") depth. Watering Agent: Apply watering agent when the soil has become hardened beyond normal absorption rates, apply per manufacturer's recommendations.

2. Mulch: Maintain a layer of good heavy mulch which is three (3) inches in depth around all trees and shrubs in order to preserve moisture as specified.
3. Fertilizing: All planted trees shall be deep-root fed herein. Feed by boring a one and one-half inch (1-1/2") diameter hole to a depth of twelve to fifteen inches (12' – 15") and at the rate of eight to ten (8" – 10") holes per tree. Use two (2) pounds of material a year per inch in caliper of tree measured six (6) inches off the ground. Backfill all holes and repair any damage resulting from fertilizing operations.
4. Abnormal Conditions: Each tree is to be inspected each week for abnormal conditions such as insects, borers, web worms, red spiders, Japanese beetles, etc. Any abnormal conditions are to be treated immediately following recognized horticultural procedures.
5. Sucker Growth: Remove all sucker growth three (3) times a year. Sucker growth is defined as the shoots that sprout out around the base of a tree trunk.
6. Dead Wood: Remove and/or prune all dead branches a minimum of two (2) times per year. Treat all wounds and cuts with an asphaltic tree wound paint.
7. Insect Control: Apply insecticides as necessary in order to effectively control borers, aphids, mealy bugs, mites, tent worms, etc. Follow manufacturer's recommendations. NOTE: All chemicals are to be used in strict accordance with the federal, state, and county directives on environmental control. Chemicals must have an EPA approval number.
8. Leaning Trees: Straighten any leaning trees by pulling them to an upright position and installing a new guy wire and/or stake. If the tree cannot be successfully straightened by pulling over, then the Contractor shall dig around the rootball and straighten. To insure the tree is not damaged in the straightening process, a rubber hose should be used to protect the tree from being cut.
9. Pruning: Prune and/or thin trees and tree forms as directed by Owner or designated representative a minimum of two (2) times a year (once before spring and once during mid-summer) to adequately maintain an attractive shape and fullness with respect to the intended character of the planting.
10. Tree Wrapping: Tree wrapping is to be maintained for a period of one (1) year on newly planted material. At the end of this one (1) year period, tree wrap material is to be removed. If insects and borers are found, all trees on the site, which are subject to infestation are to be sprayed with an appropriate pesticide.
11. Tree Saucers: Tree Saucers are to be maintained per details noted in Construction Documents.
12. Water Removal from Tree Wells: The Landscape Maintenance Contractor is responsible for checking trees for standing water by inspecting the PVC pipe that extends vertically into the tree pit. If standing water is present, pump until all standing water has been removed.

B. Shrubs and Groundcover
1. Pruning: Prune and/or thin as directed by the Owner or his designated representative a minimum of two (2) times per year to adequately maintain an attractive shape and fullness with respect to the intended character of the plants. Consider specific plant characteristics (e.g., setting of flower buds) to determine specific pruning times.
2. Mulching: All shrub, tree beds and groundcover areas are to be continuously maintained with a clean, freshly mulched appearance using the mulch originally specified. Areas to receive "mulch only" are defined on the Landscape Development Plan. These areas and all other shrub beds are to be kept free of weeds at all times.
3. Fertilizer: Fertilize all shrubs two times a year with a 21-4-20 I sobutyliden diurea (IBDU) 75% WIN fertilizer or an approved substitute by spreading fertilizer around the base of the plant and working it into the soil by hand. (Use 1/2 cup per foot spread of shrub). See Fertilization Schedule and Details.
4. Insecticides: Inspect shrubs for insects, grubs, mites, etc. a minimum of every two (2) weeks. Apply insecticides and pesticides as per manufacturer's recommendations to effectively control insect infestation.
5. Edging: Edge and trim shrub, groundcover, and tree bed areas such that a clean and manicured appearance is exhibited at all times.

6. Watering: During summer months, if rain does not occur sufficiently to keep all shrubs moist, water thoroughly by soaking each plant. This is particularly important during the first year after planting. During unseasonably dry conditions plants are to be thoroughly watered a minimum of once a week.
7. Policing: Remove all debris such as paper, broken limbs, bottles, cans, etc., during the routine maintenance of the site.

C. Miscellaneous: Building foreground areas, parking lots, sidewalks, all roadways and grounds visible from roadways shall be maintained as follows.
1. The entire site: During each maintenance visit remove unsightly litter, broken limbs, debris, etc.
2. All debris and litter collected during the normal operation shall be removed from the site by the Landscape Maintenance Contractor.
3. All storm drains, ditches, culverts, etc., within the limits of work must be kept free of litter which could obstruct proper water flow.

D. Safety and chemical use:
1. All materials and performance of work must meet all Federal Health and safety laws currently in effect. All chemicals to be used in performance of this Contract must carry an EPA approval number.
2. Contractor must provide and require the wearing of protective clothing, mask, eye protection, etc., during any operation as required or directed by applicable laws, regulations or ordinances, and/or directions of manufacturers of material or equipment.
3. All equipment must be properly maintained and is subject to inspection by the Owner. Remove from premises any equipment deemed inoperable or unsafe. All equipment must meet American Standard Safety Specification and OSHA requirements.
4. The Contractor shall adequately protect workers, adjacent property, and the public, and take all necessary precautions for the safety of his employees on the job and of the persons employed at the facility being maintained.

3.2 INSPECTIONS

A. The Owner, along with the designated representative, will make periodic reviews of the entire site related to visual aspects and the Contractor's performance. The Contractor will, on the sole judgment of the designated representative, make repairs and adjustments as directed by the representative during the site visit.

3.3 CLEAN-UP AND PROTECTION

A. During Landscape Maintenance work, keep pavements clean and work area in an orderly condition.

B. Protect all plant material and other items (paving, walkways, buildings, etc.) from damage due to maintenance operations. Treat, repair, or replace items damaged by Landscape Maintenance Contractor as directed.

END OF SECTION 320190

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

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

B. Related Sections:

1. Division 02 Section "Selective Demolition" for demolition and removal of existing asphalt pavements.
2. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 and Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, 2022 Edition, for definitions of terms.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: For each job mix proposed for the Work as required by ALDOT Standard Specifications for Highway Construction, 2022 Edition and ALDOT Construction Manual, Latest Edition

B. Material Certificates: For each paving material, from manufacturer.

C. Material Test Reports: For each paving material.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by ALDOT.

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

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of ALDOT Standard Specifications for Highway Construction, 2022 Edition for asphalt paving work.

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

1.7 PROJECT CONDITIONS

A. Environmental Limitations: The contractor shall install asphalt paving materials only when environmental conditions are in accordance with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Sections 410 and 424.

B. Pavement-Marking Paint: The contractor shall install pavement-marking paint only when environmental conditions are in accordance with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 701.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: All aggregate materials used for asphalt paving shall be in accordance with ALDOT Standard Specifications for Highway Construction, 2022 Edition. The contractor shall provide material certifications form the manufacturer and/or provider for all materials used for this project. All course and fine aggregates furnished shall come from an approved producer who is participating in and meeting the requirements of ALDOT-249, Procedure for Acceptance of Course and Fine Aggregates.

B. Coarse and Fine Aggregate: All aggregates used in producing asphalt paving shall be in compliance with Section 424 of the ALDOT Standard Specifications for Highway Construction, 2022 Edition.

C. Mineral Filler: Mineral Filler shall consist of finely divided mineral matter such as rock dust, slag dust, hydrated lime, hydraulic cement, or fly ash meeting the requirements of ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 805.

D. Base Course: Shall be a Type B, plant mixed aggregate material and shall comply with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 825.

2.2 ASPHALT MATERIALS

A. Asphalt Cement: All asphalt cement material shall comply with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 410.

B. Prime Coat: Asphalt emulsion prime coat complying with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 401.

C. Tack Coat: Shall comply with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 405.

D. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Sand: AASHTO M 29, Grade Nos. 2 or 3.

B. Pavement-Marking Paint: All marking paint shall comply with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 701 for Class 1, Type B.

1. Color: Yellow - Centerline Stripe

2. Color: Blue - Handicap Striping and Symbols

2.4 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes in accordance with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 424 and complying with the following requirements:

1. Binder Course: Superpave Bituminous Concrete Upper Binder Layer, 3/4" Maximum Aggregate Size Mix, ESAL Range C/D.

2. Surface Course: Superpave Bituminous Concrete Wearing Surface Layer, 1/2" Maximum Aggregate Size Mix, ESAL Range C/D.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.

3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

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

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

3.2 PATCHING

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

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.

2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.07 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.

D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.3 SURFACE PREPARATION

A. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.

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

2. Protect primed substrate from damage until ready to receive paving.

B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.10 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 BASE COURSE PLACEMENT

A. The subgrade material shall be free of standing water and debris. The contractor shall verify that proper grades have been established prior to installation of the base course. The contractor shall re-establish any required grade elevations that are not within the required tolerances.

B. Following the proof-rolling of the subgrade material, the contractor shall install the base course material. A maximum 6" lift of material shall be allowed. If the material thickness is greater than 6", the material shall be install in equal lifts and compacted.

C. Compaction of the base course material shall be conducted in accordance with ALDOT Standard Specifications for Highway Construction, 2022 Edition. A minimum compaction of 98% Modified Proctor in accordance with ASTM D 1557 is required.

3.5 HOT-MIX ASPHALT PLACING

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

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.

2. Place hot-mix asphalt surface course in single lift.

3. Spread mix at minimum temperature of 250 deg F.

4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.

5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

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

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

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

3.6 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.

2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.

3. Offset transverse joints, in successive courses, a minimum of 24 inches.

4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints as specified by the ALDOT standard specifications.

5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

6. Compact asphalt at joints to a density within 2 percent of required density.

3.7 COMPACTION

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

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

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

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

has been uniformly compacted as required by ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 424.

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

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

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

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

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

3.8 INSTALLATION TOLERANCES

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

1. Base Course: Plus or minus 1/2 inch.

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

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

1. Base Course: 1/4 inch.

2. Surface Course: 1/8 inch.

3.9 PAVEMENT MARKING

A. Allow paving to age for minimum of 14 days or per paint manufacturers recommendations (whichever is longer) before starting pavement marking.

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

C. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness as required by ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 701.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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

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

D. In-Place Density: Testing agency will take samples of compacted pavement according to ALDOT Standard Specifications for Highway Construction, 2022 Edition.

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

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd.or less of installed pavement, with no fewer than 3 cores taken.

    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

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

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

3.11 DISPOSAL

A. Remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

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

END OF SECTION 321216

SECTION 321613 - CONCRETE SIDEWALKS AND CURBS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Curbs and gutters.
2. Walks.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

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

B. Other Action Submittals:

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

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

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

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

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

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

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

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

1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 FORMS

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

1. Use flexible or uniformly curved forms for curves with a radius of 100 feetor less. Do not use notched and bent forms.

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

2.2 STEEL REINFORCEMENT

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

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

C. Plain-Steel Wire: ASTM A 82/A 82M.

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

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

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

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

H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports

according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or pre-cast concrete of greater compressive strength than concrete specified, and as follows:

2.3 CONCRETE MATERIALS AND MIX

A. Concrete shall meet the requirements of a Class A, Type 2 mix as provide in Section 501 of ALDOT Standard Specifications for Highway Construction, 2022 Edition.

B. All concrete shall have a minimum compressive strength of 3,500 psi at 28 days.

2.4 CURING MATERIALS

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

B. Water: Potable.

2.5 RELATED MATERIALS

A. Joint Fillers: Shall be in accordance with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 618 and 623.

2.6 DETECTABLE WARNING MATERIALS

A. Detectable Warning Mat: Pre-fabricated composite tactile warning surface with truncated domes spacing not to exceed 2.35".

1. Size of Mat: One piece, 24 by 36 inches.

2.7 CONCRETE MIXING

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

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 EXAMINATION

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

3.2 PREPARATION

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

B. Remove any construction debris and standing water from the work area. If standing water is removed, verify the subgrade integrity prior to installation.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

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

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

3.4 STEEL REINFORCEMENT

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

3.5 JOINTS

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

1. When joining existing sidewalk, installed 18" dowels into existing concrete and anchor with an appropriate epoxy adhesive. 8" minimum embedment is required.

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

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.

2. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Expansion Joints: Form expansion joints of preformed joint-filler strips abutting concrete curbs, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 80 feet unless otherwise indicated.

2. Extend joint fillers full width and depth of joint.

3. Terminate joint filler not less than 1/2 inchor more than 1 inch below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.

5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

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

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

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

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

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

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

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

G. Screed sidewalk surface with a straightedge and strike off.

H. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

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

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg Fand not more than 80 deg F at point of placement.

2. Do not use frozen materials or materials containing ice or snow.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

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

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3.7 FLOAT FINISHING

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

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

1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.8 DETECTABLE WARNINGS

A. Detectable Warning Mats: Install detectable warning mats as part of a continuous concrete paving placement and according to mat manufacturer's written instructions.

3.9 CONCRETE PROTECTION AND CURING

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

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

C. Apply plastic sheeting to concrete surfaces if hot, dry, or windy conditions could cause excessive moisture loss to occur.

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

3.10 PAVING TOLERANCES

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

1. Elevation: 3/4 inch

2. Thickness: Plus 3/8 inch, minus 1/4 inch.

3. Surface: Gap below 10-foot-long, unleveled straightedge not to exceed 1/2 inch.

4. Lateral Alignment and Spacing of Dowels: 1 inch.

5. Vertical Alignment of Dowels: 1/4 inch.

6. Joint Spacing: 3 inches.

7. Contraction Joint Depth: Plus 1/4 inch, no minus.

8. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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

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

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

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

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

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

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

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

F. Concrete paving will be considered defective if it does not pass tests and inspections.

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

H. Prepare test and inspection reports.

3.12 REPAIRS AND PROTECTION

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

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

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

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

END OF SECTION 321313

SECTION 328400 – PLANTING IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work includes: Provide an irrigation system as specified herein, and install, complete in place, tested and approved, including but not necessarily limited to:
   1. Planting area sprinkler system (locations as specified in drawings)
   2. Automatic controller and remote control valves

B. Related Work:
   1. Documents affecting work of this section include, but are not necessarily limited to: General Conditions, Supplementary Conditions, and Sections in Drawing Document Set LI200, LI201, LI500.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section. Landscape irrigation layout must be designed by a Licensed Irrigation Contractor and sent to the Landscape Architect for review prior to installation.

1.3 SUBMITTALS

A. Product data as specified on the shop drawings.

B. Shop Drawings: Drawings showing the layout of heads and pipes will be required for the proposed irrigation system prior to installation. Provide head to head coverage and separate shrub, trees, lawn and flower beds into their own zones. Any differences between the proposed system and actual installed conditions are to be recorded by the Irrigation Contractor in the form of an "As-Built" drawing submitted at the end of the job. Provide the Owner and the Landscape Architect with a copy of the irrigation drawings before work under this Contract will be considered for acceptance. All isolation valve locations shall be shown with actual measurements to reference points so they may be located easily in the field.

1.4 WARRANTY

A. Warranty all work for a period of one (1) year after date of final acceptance of the work in total, against defects in materials, equipment, workmanship, and any repairs required resulting from leaks or other defects of workmanship, material or equipment.

B. Repair unsatisfactory conditions promptly at no cost to the Owner.

C. Emergency repairs may be made by the Owner without relieving the Irrigation Contractor of his warranty obligations.

D. Repair settling of backfilled trenches occurring during the warranty period, including restoration of damaged plantings, paving or improvements resulting from settling of trenches or repair operations.

E. Respond to Owner's request for repair work within ten (10) days. If not, Owner may proceed with such necessary repairs at the Contractor's expense.

PART 2 - PRODUCTS

2.1 PIPE

A. Plastic pipe:
1. Use one inch (1") sizes and up, Class 200 polyvinyl chloride PURPLE, bearing the seal of the National Sanitation Foundation, unless otherwise specified by local codes.
2. Fittings: Use Schedule 40 polyvinyl chloride, type I-II, bearing the seal of the National Sanitation Foundation, and complying with ASTM D2466.
3. For joining, use a solvent complying with ASTM D2466 and recommended by the manufacturer of the approved pipe.
4. Plastic pipe identification: Continuously and permanently mark with manufacturer's name, pipe size, schedule number, type of material, and code number.

2.2 SWING JOINTS

A. Lawn heads: Polyethylene cut-off type or swing joints.

B. Shrub head: Polyethylene cut-off type or swing joints.

2.3 VALVES

A. Gate valve:
1. Provide one hundred and twenty-five (125) pound rated screwed valve of size required for the line.
2. Acceptable manufacturers:
a. Nibco
b. Crane; or approved equal

2.4 MANUAL AND AUTOMATIC VALVE SLEEVES

A. For manual control valve:
1. Plastic valve box, 10" minimum.
2. Acceptable manufacturers:
a. Carson
b. NEC

B. For gate valves:
1. Plastic valve box, 10" minimum.
2. Acceptable manufacturers:
a. Carson
b. NEC

2.5 SPRINKLER HEADS

A. Provide the sprinkler heads shown in the irrigation detail drawings shown on sheet LI500.

2.6 WATER CONNECTION

A. Contractor shall provide wells and pumps necessary to run the required system and the system will be controlled by approved controller.

2.7 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation as selected by the Contractor subject to the approval of the Landscape Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until satisfactory conditions are corrected.

3.2 FIELD MEASUREMENTS

A. Make necessary measurements in the field to ensure precise fit of items in accordance with the approved design.

3.3 TRENCHING AND BACKFILLING

1. Trench, backfill, and compact in accordance with the detail on the drawings.

3.4 INSTALLATION OF PIPING

A. General:
1. Lay out the piping system in accordance with arrangement shown on the Irrigation Sleeving and Limits Drawings.
2. Unless otherwise indicated, comply with requirements of Uniform Plumbing Code.

B. Piping depth: Install piping with at least the following minimum depth:
1. Main lines – 18”
2. Laterals – 12”

C. Plastic pipe:
1. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings:
   a. Store under cover until ready to install.
   b. Transport only in a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.
2. Repair dented and damaged pipe by cutting out and discarding the dented or damaged section, and rejoining with a coupling.
3. In jointing, use only the specified solvent and make joints in accordance with the manufacturer’s recommendations as approved by the Landscape Architect.
4. Center load plastic pipe with a small amount of backfill to prevent arching and whopping under pressure.
5. For plastic-to-steel connections:
   a. Work the steel connection first.
   b. Use Teflon tape on threaded plastic-to-steel connections.
   c. Use only light wrench pressure.

3.5 INSTALLATION OF EQUIPMENT

A. Install manual and automatic control valves where indicated on approved Irrigation Drawings and in accordance with the manufacturer’s recommendations as approved by the Landscape Architect.

B. Shrub spray heads:

1. All shrub areas are to be irrigated by zones.
2. Install where indicated on approved Irrigation Drawings and in accordance with the manufacturer's recommendations as approved by the Landscape Architect.
3. Set tops of heads to height prescribed by the Landscape Architect.
4. Set heads 4" minimum from edge of hardscaped areas.

3.6 TESTING AND INSPECTING

A. Testing: The following items should be completed after installation but before the irrigation system is covered.
   1. Notify Landscape Architect twenty-four hours prior to pressure test. Unless otherwise instructed, Landscape Architect shall be present at pressure test.
   2. Make necessary provision for thoroughly bleeding the line of air and debris.
   3. After valves have been installed, test water lines for leaks at a pressure of one hundred (100) psi for a period of two (2) hours, with a five (5) pressure loss.
   4. Observe lateral lines for leaks during operation.
   5. Provide required testing equipment and personnel.
   6. Repair leaks, and retest until acceptance by the Landscape Architect.

B. Final inspection:
   1. Clean, adjust, and balance all systems. Verify that:
      a. Remote control valves are properly balanced.
      b. Heads are properly adjusted for radius and arc of coverage as well as proper height.
      c. The installed system is workable, clean, and efficient.

3.7 INSTRUCTIONS

A. Attach legible, laminated legend inside each controller door, stating the areas covered by each remote control valve.

B. After the system has been completed, inspected, and approved, instruct the Owner's maintenance personnel in the operation and maintenance of the system.

END OF SECTION 328400

SECTION 329300 – PLANT MATERIAL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of landscape development work is shown on drawings and in schedules.

B. Provide and furnish all labor, materials, and equipment required or inferred from drawings and specifications to complete the work of this section.

C. Subgrade Elevations: Refer to civil plans provided by General Contractor required to establish elevations as included in this contract.

1.2 QUALITY ASSURANCE

A. Reference Standards:
1. Standardized Plant Names, latest edition, by the American Joint Committee on Horticultural Nomenclature.
2. American Standard for Nursery Stock, latest edition, by the American Association of Nurserymen.

B. Source Quality Control:
1. General: Only plants grown in a recognized nursery in accordance with good horticultural practice will be accepted.
2. Provide healthy, vigorous stock free of purple nut sedge, disease, insects, eggs, larvae, and defects, such as knots, sunscald, injuries, abrasions, or disfigurement.
3. Inspection of plant material prior to digging: Contractor must locate all plant material to be supplied for the job and inform Landscape Architect in writing of location at least ten (10) days prior to digging. In the event plant material is found to be unacceptable, the Contractor will pursue other sources until acceptable plant material is found, at no additional cost to the Owner.
4. Ship landscape materials with certificates of inspection required by governing authorities. Inspection by Federal and/or State Governments at Grower does not preclude rejection of plants at the site by the Landscape Architect. Comply with regulations applicable to landscape materials. Prepare plants for shipment to prevent damage to the plants.

C. Do not make substitutions: If specified landscape material is not obtainable, submit to Landscape Architect proof of non-availability and proposal for use of equivalent material. For proof of non-availability, submit a written statement from a minimum of twelve (12) reliable Nursery Sources (American Nurserymen's Association Members) that the plant material in question is not obtainable in the Eastern United States.

D. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

E. Topsoil: Contractor shall engage a reputable laboratory to include testing and analysis of stockpiled topsoil on site. In the report, list fertilization and soil amendment recommendations to insure vigorous growth for all plants specified.

F. Approval and Selection of Materials and Work: The selection of all materials and the execution of all operations required under the specifications and drawings are subject to the approval of the Landscape Architect and the Owner. They have the right to reject any and all materials and any and all work, which

in their opinion, does not meet the requirements of the Contract Documents at any stage of the operations. The Contractor shall remove rejected work and/or materials from job site and replace promptly.

1.3 SUBMITTALS

A. Certification: Prior to acceptance of plant material, submit certificates of inspection as required by governmental authorities, and manufacturers or vendors certified analysis for soil amendments and fertilizer materials. Submit Nursery location and photographs prior to inspection by Landscape Architect to substantiate that materials comply with specified requirements. Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.

B. Planting Schedule: Submit planting schedule showing scheduled dates for each type of planting in each area of site, prior to beginning of the work.

C. Maintenance Instructions: Upon completion of the installation, submit typewritten recommendations for maintenance of any portion of the landscape, which in the opinion of the Contractor, requires special attention.

D. Soil Report: Submit results of laboratory soil tests and sample of recommended soil mix one week prior to beginning of the work.

E. Approval: Obtain approval from Landscape Architect for all submittals prior to beginning of work, unless otherwise noted.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site. (Plants shall not be transported in temperatures below twenty degrees (20°) Fahrenheit).

B. Trees, Shrubs, and Groundcover: Provide freshly dug trees and shrubs. Do not prune prior to delivery. Do not bend or bind-tie trees or shrubs in such a manner as to damage bark, break branches, or destroy natural shape or trees will be rejected. Provide protective covering during shipment.

C. Deliver trees, shrubs, and groundcover after preparations for planting have been completed and plant immediately. Do not store plant material on site more than 30 days. If planting is delayed more than six (6) hours after delivery, set trees, shrubs, and ground cover in shade, protect from weather and mechanical damage, and keep roots moist.

D. Do not remove container-grown stock from containers until planting time.

E. Label at least one (1) tree and one (1) shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

F. Do not remove labels attached to plant material by the Landscape Architect until directed to do so.

1.5 JOB CONDITIONS

A. Insurance on plant material and other materials stored or installed is the responsibility of the Landscape Contractor. Such insurance shall cover fire, theft, and vandalism. Should the Contractor elect not to provide for such insurance, he will in no way hold the Owner responsible for any losses incurred by the aforementioned acts. The Landscape Contractor is responsible for all costs incurred in replacing damaged or stolen materials prior to provisional acceptance of the work.

B. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

C. Existing Utilities: Determine location of underground utilities before performing any subsurface work. Perform work in a manner, which will avoid possible damage. Excavate as required. Maintain grade stakes set by others, unless both concerned parties mutually agree upon removal. All damage to utilities resulting from work covered in these specifications will be repaired at the Landscape Contractor's expense.

D. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect in writing before planting.

E. Planting Time: Plant or install materials during suitable weather conditions.

F. Planting Schedule: Prepare a proposed planting schedule. Schedule dates for each type of landscape work during contract period. Coordinate schedule with General Contractor and Irrigation Contractor.

1.6 WARRANTY

A. Warranty all trees, shrubs, and groundcover for a period of one (1) year from the date of substantial completion, against defects including death and unsatisfactory growth, in the opinion of the Landscape Architect and/or the Owner, except for defects resulting from neglect by Owner abuse or damage by others, or unusual phenomena or incidents, which are beyond Landscape Contractor's control. Should questions arise concerning responsibility of replacement the Landscape Architect will be available for consultation provided the Owner and Landscape Contractor mutually desire.

B. Replacement of damaged plant material due to acts of God such as tornadoes, hurricanes, killing freeze or other factors beyond the Landscape Contractor's control should be negotiated by the Owner and the Landscape Contractor. The Landscape Architect will be available for consultation provided the Owner and Landscape Contractor mutually desire.

C. Remove and replace all trees, shrubs, and groundcovers, or other plants found to be dead or in unhealthy condition during warranty period as determined by Landscape Architect or Owner. Make replacements as soon as weather conditions permit.

D. Replacements: Match adjacent specimens of same species. Replacements are subject to all requirements stated in this specification and subject to inspection by the Landscape Architect prior to digging.

E. Repair grades, paving, and any other damage resulting from replacement planting operations, at no additional cost to the Owner.

F. Inspect job site monthly during warranty period to determine what changes, if any, should be made in the maintenance program. Submit all recommended changes in writing to the Landscape Architect and the Owner.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Contractor shall backfill all planting and sod areas to 4” depth of topsoil, as required. ASTM D 5268, pH range of 5.5 to 7, a minimum of four percent (4%) organic material content; free of stones one (1) inch or larger in any dimension and other extraneous materials harmful to plant growth.

B. Topsoil Source: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil.

2.2 SOIL AMENDMENTS

A. Lime: Natural limestone containing not less than eighty-five percent (85%) of total carbonates shall be ground to such fineness that fifty percent (50%) will pass through a one hundred (100) mesh sieve and no less than ninety percent (90%) passes a ten (10) mesh sieve.

B. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Sulfur: Granular, biodegradable, containing a minimum of ninety percent (90%) sulfur, with a minimum ninety-nine percent (99%) passing through a No. 6 sieve and a maximum ten percent (10%) passing through a No. 40 sieve.

D. Iron Sulfate: Granulated ferrous sulfate containing a minimum of twenty percent (20%) iron and ten percent (10%) sulfur.

E. Aluminum Sulfate: Commercial grade, unadulterated.

F. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8.

G. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.

2.3 FERTILIZERS

A. Bonemeal: Commercial, raw, finely ground; four percent (4%) nitrogen and twenty percent (20%) phosphoric acid.

B. Superphosphate: Soluble mixture of treated minerals; twenty percent (20%) available phosphoric acid.

C. Commercial Fertilizer: Conform to all applicable State fertilizer laws. Fertilizer which becomes caked or otherwise damaged and unsuitable for use will not be accepted.
Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients: For trees and shrubs, provide fertilizer with not less than ten percent (10%) available phosphoric acid and from three percent (3%) to five percent (5%) total nitrogen and from three percent (3%) to five percent (5%) soluble potash.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of fifty percent (50%) water-insoluble nitrogen, phosphorus, and potassium in the following composition: 20 percent (20%) nitrogen, ten percent (10%) phosphorus, and ten percent (10%) potassium, by weight.

E. Pre-emergent Herbicide: Use appropriate herbicide for specific planting and season with approval of Landscape Architect. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer's instructions.

2.4 PLANTING SOIL

A. Provide planting soil mix amended as per laboratory recommendations. Basic planting soil mix consists of:
1. (7) parts topsoil

2. (2) parts humus (forest or peat)
3. (1) part mushroom compost, flowers only
4. (1) part sand
5. Fertilizer as recommended
6. Cotton seed meal as recommended
7. Lime as recommended

2.5 PLANT MATERIALS

A. General:
1. Provide plants true to species and variety, complying with recommendations of ANSI Z60.1 “Standard for Nursery Stock”.
2. Specific requirements concerning plant material and the manner in which it is to be supplied are shown on the drawings and plant list.
3. Acclimatization: Plants must have grown under climatic conditions (temperature extremes similar to those of the locality of the project site for a minimum of two (2) years immediately prior to being planted on the job).

B. Quality and Size:
1. Furnish nursery grown plants, freshly dug, normally shaped and well branched, fully foliaged when in leaf and with healthy well-developed root systems. Plants to be free of insect infestations or their eggs and purple nut sedge.
2. Furnish plants to match as closely as possible whenever symmetry is called for.
3. Provide trees and shrubs of sizes shown or specified. Trees and shrubs of larger size may be used if acceptable to the Landscape Architect, and if sizes of roots or rootballs are increased proportionately. The increased size will not result in additional cost to the Owner.
4. Stock specified in a size range: Within each size range not less than fifty percent (50%) of the plants must be of the maximum size specified.
5. Balled and Burlapped Plants: Plants designated "B&B" are to have firm, natural balls of soil corresponding to sizes specified in ANSI Z60.1 "Standard for Nursery Stock". Balls to be firmly wrapped in burlap and securely tied with heavy twine, rope or wire baskets. Plants with loose, broken or manufactured rootballs will be rejected. Rootballs shall be lifted from the bottom only, not by stems or trunks.
6. Container grown plants in cans or plastic containers will be acceptable in lieu of balled and burlapped plants provided that they meet size and caliper specified. The container must be removed prior to planting, care being exercised as to not injure the plant.

C. TREES
1. Provide trees of height and caliper listed or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.
2. Provide self-supporting trees with straight trunks and leaders intact.
3. Determining dimensions for trees are caliper, height and spread. Caliper is measured six inches (6") above ground for trees up to and including four-inch (4") caliper. Trees over four-inch (4") caliper measure twelve inches (12") above ground. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to tip. Take measurements with branches in normal position.
4. Tree Forms: Do not limb up tree forms more than two feet (2’) before planting. Prune to desired shape as directed by Landscape Architect.

D. SHRUBS
1. Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed.

E. GROUNDCOVER
1. Provide plants established and well-rooted in removable containers or integral peat pots and with not less than minimum number and length of runners by ANSI Z60.1 for the pot size shown or listed.

F. ANNUALS
1. Provide healthy, disease-free plants of species and variety shown or listed. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

G. PERENNIALS
1. Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed.

H. GRASS SOD
1. N/A

I. SEED
1. In lieu of sod, a native seed mix shall be applied to specialty planting areas and disturbed areas for soil stabilization as follows:
    a. Round Stone Native Seed Company – Seed Mix 182 – Coastal Plain Woodland Edge/Part Shade Mix
    b. Round Stone Native Seed Company – Seed Mix 179 – Waterway Runoff Erosion Control Mix
2. Follow manufacturer's specifications for application methods and rates.

2.6 MULCH

Mulch shall consist of shredded bark mulch as specified on the Drawings. Material shall be uniform in size, color, quality and overall appearance. Mulch shall be free of material injurious to plant growth. Sources of mulch should be free of weeds and invasive plant parts or seeds. Sawdust, dirt, garbage, or other debris mixed in the mulch is not acceptable. Contractor shall submit two pounds of proposed mulch for inspection by Landscape Architect.

1. Shredded Bark Mulch: Shredded bark mulch shall be used in all mulch areas of flowerbeds and tree pits. Shredded bark mulch shall consist of shredded bark and wood. Maximum length of any individual component shall be two inches (2") and a minimum of seventy-five percent (75%) of the mulch shall pass through a one inch (1") screen. Mulch shall be free of germination-inhibiting ingredients. The bark mulch shall have the characteristics of retaining moisture, forming a mat not susceptible to spreading by wind or rain, and providing a good growth medium for plants. Shredded bark much may contain up to fifty percent (50%) shredded wood material. Wood chips are not acceptable. Bark mulch containing shredded wood shall be aged a minimum of one year prior to installation. Bark mulch shall be free of soil, rocks, and weeds. The shredded bark mulch shall be free of any dyes or artificial coloring.
2. Pine Straw: Pine straw mulch shall be used in trenches and all disturbed natural areas. Pine straw mulch shall be a standard horticultural product – clean and free from all foreign matter, including weed seeds and chemical contamination, and free of any dyes or artificial coloring.

2.7 MISCELLANEOUS LANDSCAPE MATERIALS

A. Burlap for wrapping earthball to be jute mesh not less than seven (7) pounds and two (2) ounces per square yard.

B. Stakes and deadmen: No. 2 or better uniform grade pressure treated pine LP-22, or sound new hardwood or redwood free of knot holes and other defects.

C. Anchors: No. 3 or No. 4 rebars or comparable size steel stakes.

D. Guys and Wire Ties: Two-strand, twisted, pliable galvanized steel wire not lighter than No. 10 gauge.

E. Hose: One-half inch (1/2") diameter black reinforced rubber or plastic garden hose, cut to required lengths to protect tree trunks from damage by wires. Used hose is acceptable.

F. Wrapping: Tree wrap tape not less than four inches (4") wide, designed to prevent borer damage and winter freezing.

G. Soil Separator: Rot resistant polypropylene filter fabric, water permeable, and unaffected by freeze-thaw.

H. Drainage Gravel: Clean No. 57 crushed stone.

I. Anti-Erosion Mulch: Clean, threshed straw of wheat, rye, oats or barley.

J. Anti-Desiccant: Emulsion type, film-forming agent designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer's instructions.

K. Recognized Tree Paint: Color gray.

L. Weed-Control Barriers:
1. Nonwoven Fabric: Polypropylene or polyester fabric, 3 oz. / square yard.
2. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz. / square yard.

M. Water: Temporary water shall be furnished by the Contractor, at his expense, to meet the needs of this contract. Hoses and other equipment required for watering shall be furnished by this section. Water shall be suitable for irrigation and free of substances harmful to plant life. Temporary above ground irrigation is an acceptable form of watering through the establishment period, but must be removed (if required by the owner) by the contractor upon acceptance of the plant material following the warranty period. Temporary above ground irrigation lines should be brown in color and covered by pine straw mulch wherever possible. Planting areas for permanent irrigation are specified within the drawings and within the Irrigation System Specification Section 031000.

PART 3 - EXECUTION

3.1 PREPARATION

A. General:
1. Contractor must examine conditions under which planting is to be installed. Review applicable architectural and engineering drawings, and be familiar with alignment of underground utilities before digging.
2. Planting time: Planting operations are to be performed at such times of the year as the job may require, with the stipulation that the Contractor guarantees the plant material as specified herein. Plant only during periods when weather conditions are suitable.
3. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure Landscape Architect's acceptance before start of excavation for planting work. Make adjustments as may be requested.
4. Notify Landscape Architect of adverse sub-surface drainage or soil conditions. State conditions and submit a proposal for correction including costs. Obtain approval for method of correction

prior to continuing work in the affected area. In the event that alternate locations are selected, the contractor will prepare such areas at no additional expense to the Owner.

3.2 EXCAVATION

A. Excavation for Trees and Shrubs:
1. Excavate pits, beds and trenches with vertical sides, as specified and as shown on the drawings.
2. Loosen hardpan and moisture barrier to a depth of two feet (2') minimum below the bottom of the tree pit or until hardpan has been broken and moisture is allowed to drain freely. For shrub beds, loosen hardpan six-inch (6") minimum below bottom excavation.
3. For balled and burlapped (B&B) trees and shrubs, make excavations at least half again as wide as the ball diameter and equal to the ball depth, plus an allowance for setting of ball on a layer of compacted backfill. Allow for six-inch (6") minimum setting layer of planting soil mixture.
4. For container grown stock, excavate as specified for balled and burlapped (B&B) stock, adjusted to size of container width and depth.

B. Test Drainage:
1. Tree pits: Fill each tree pit with water. If percolation is less than fifty percent (50%) within a period of twelve (12) hours, drill a twelve-inch (12") auger to a depth of four feet (4') below the bottom of the pit. Fill augured pit with No. 57 stone and cover with soil separator. Retest percolation in pit.
2. Shrub and groundcover beds: Spot test shrub and groundcover beds.
3. Dispose of subsoil removed from landscape excavations. Do not mix with planting soil, use as backfill or use to construct saucers around plant pits.

3.3 PREPARATION OF PLANTING SOIL

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.

B. Mix specified soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.

C. For pit and trench type backfill, mix planting soil prior to backfilling.

D. For planting beds, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
1. Mix lime, if required, with dry soil prior to mixing of fertilizer.
2. Prevent lime from contacting roots of acid-loving plants.
3. Apply phosphoric acid fertilizer (other than that constituting a portion of complete fertilizers) directly to subgrade before applying planting soil and tilling.

3.4 PLANTING TREES AND SHRUBS

A. Set balled and burlapped (B&B) stock on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball two inches (2”) to three inches (3”) above the finish grade and also two inches (2”) to three inches (3”) above the grade they bore to natural grade before transplanting. Remove all wire and ropes from rootball. Use planting soil mixture to backfill plant pits. When plants are set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately two-thirds (2/3) full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

B. Set container grown stock as specified for balled and burlapped stock, except cut cans on two sides with an approved can cutter and remove bottoms of wooden boxes after partial backfilling so as not to damage rootballs.

C. Disk top of backfill to allow for mulching.

D. Form shallow saucers to the finished grade outside the tree pit approximately four-inch (4”) height, capable of holding water about each plant by placing a mound of topsoil around the edge of each filled-in pit.

E. Apply anti-desiccant using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage. If deciduous trees or shrubs are moved in full leaf, spray with anti-desiccant at nursery before moving and again after planting as per manufacturer's recommendations.

F. Mulch: Immediately after planting work has been completed, mulch flowerbeds, trenches and planting beds. Provide not less than three-inch (3") thickness of mulch on flowerbeds and tree pits with shredded bark mulch, and trenches and natural areas with pine straw. Finish edges according to detail.

G. Water: Soak all plants immediately after planting; continue watering thereafter as necessary until acceptance of the work in total.

H. Smooth planting areas to conform to specified grades after full settlement has occurred and mulch has been applied.

3.5 STAKING, GUYING AND PRUNING

A. Stake and guy trees immediately after planting. Plants shall be plumb after staking or guying. Maintain stakes, wires and guys until acceptance of the work in total. Staking of trees in parking lot islands is an exception to this section.

B. Pruning: Unless otherwise directed by the Landscape Architect do not cut tree leaders, and remove only injured or dead branches from trees, if any. Prune shrubs at the direction of the Landscape Architect.

C. Remove and replace promptly any plants pruned or malformed resulting from improper pruning.

D. Paint wounds and cuts over three-quarter inches (3/4") in diameter with approved tree paint designed for this purpose. Cover all exposed living tissue.

E. Wrap tree trunks of two-inch (2") caliper and larger. Start at ground and cover trunk to height of first branches and securely attach. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures before wrapping.

3.6 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain trees, shrubs and other plants.

C. Maintenance period shall extend for one year after substantial completion.

D. Maintain trees, shrubs & other plants by watering, pruning, cultivating, weeding, and re-mulching as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required. Restore or replace damaged wrappings. Spray as required to keep trees and shrubs free of insects and disease.

3.7 CLEAN-UP AND PROTECTION

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

B. Upon completion of work, clear grounds of debris, superfluous materials and all equipment. Remove from site to satisfaction of Landscape Architect and Owner.

C. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed, at no additional cost to the Owner.

D. Theft: Landscape Contractor is responsible for theft of plant material at the job site before, during and after planting, until the date of provisional acceptance of the work in total.

3.8 INSPECTION, ACCEPTANCE, RETAINAGE AND PAYMENT

A. Progress Payments may be applied for pertaining to installed work only.

B. Upon completion of work, notify Landscape Architect and Owner at least ten (10) days prior to requested date of inspection for provisional acceptance. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

C. Upon satisfactory completion of repairs and/or replacements, the Landscape Architect certifies, in writing, the provisional acceptance of the work in total.

D. Final Acceptance: One year after provisional acceptance of the work in total the Landscape Architect and the Owner inspect the work for final acceptance. Upon satisfactory completion of repairs and/or replacements the Landscape Architect certifies, in writing, the final acceptance of the work.

E. All planting and plant material required in these specifications must be in satisfactory condition and accepted by the Landscape Architect when the Contractor applies for final payment.

F. Approval of Final Acceptance is evidence of completion and acceptance of the work required in these specifications. Payment made by the Owner to the Contractor pursuant to the issuance of Final Acceptance Certificate shall be deemed to be accepted by all parties hereto as the final payment for the work specified herein.

END OF SECTION 329300

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Mobile Area Water and Sewer System Standard Specifications

1.2 SUMMARY

A. This Section includes the following:

1. Piping joining materials.
2. Transition fittings.
3. Sleeves.
4. Identification devices.
5. Grout.
6. Flowable fill.
7. Piped utility demolition.
8. Piping system common requirements.
9. Equipment installation common requirements.
10. Painting.
11. Concrete bases.
12. Metal supports and anchorages.

1.3 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. DI: Ductile Iron.

D. PVC: Polyvinyl chloride plastic.

1.4 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solvent Cements for Joining Plastic Piping:

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.2 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. AWWA Transition Couplings NPS 2and Larger:

1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

C. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:

1. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Division 22 Section "Common Work Results for Plumbing."

B. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.4 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

2.5 FLOWABLE FILL

A. Description: Low-strength-concrete, flowable-slurry mix.

1. Cement: ASTM C 150, Type I, portland.

2. Density: 115- to 145-lb/cu. ft..

3. Aggregates: ASTM C 33, natural sand, fine.

4. Admixture: ASTM C 618, fly-ash mineral.

5. Water: Comply with ASTM C 94/C 94M.

6. Strength: 100 to 200 psi at 28 days.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.

3. Equipment to Be Removed: Disconnect and cap services and remove equipment.

4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.

5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING INSTALLATION

A. Install piping according to the following requirements and Division 33 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

E. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

F. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.

3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

5. PVC Nonpressure Piping: Join according to ASTM D 2855.

6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

G. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

H. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

I. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.

2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

J. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.5 PAINTING

A. Painting of piped utility systems, equipment, and components is specified in Division 09 painting Sections.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 330500

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Manholes.
3. Catch basins
4. Stormwater inlets
5. Pipe outlets.
6. Stormwater disposal systems.

1.3 SUBMITTALS

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

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

C. Product Certificates: The contractor shall provide a material certification for each material supplied. All concrete pipe and pre-cast concrete storm drainage boxes shall include certification which indicates compliance with Alabama Department of Transportation Standard Specifications for Highway Construction, 2022 Edition.

D. Field quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

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

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

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

A. Pipe: ASTM A 716, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.2 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.

2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.

3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Sewer Piping:

1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.

2. Fittings: ASTM D 3034, PVC with bell ends.

3. Gaskets: ASTM F 477, elastomeric seals.

2.3 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: Shall be in compliance with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 530. All pipe shall be Class III unless specified otherwise.

2.4 CLEANOUTS

A. Plastic Cleanouts:

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

2.5 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Diameter: 48 inches minimum unless otherwise indicated.

3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.

4. Base Section: 6-inch minimum thickness for floor slab and 4-inchminimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.

6. Top Section: Concentric-cone type, and top of cone of size that matches grade rings.

7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.

9. Steps: Individual FRP steps, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inchintervals.

10. Adjusting Rings: Interlocking cast iron rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.

2.6 CONCRETE

A. All concrete material for storm drainage manhole shall be in accordance with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 621.

2.7 CATCH BASINS

A. Standard Precast Concrete Catch Basins: All storm drainage catch basins shall be in accordance with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 621

2.8 STORMWATER INLETS

A. Curb and Grate Inlets: All storm drainage inlets shall be in accordance with ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 621.

PART 3 - EXECUTION

3.1 EARTHWORK

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

3.2 PIPING INSTALLATION

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

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

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

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

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
2. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
3. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
2. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
3. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
4. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
5. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
6. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
7. Join reinforced-concrete sewer piping according to ALDOT Standard Specifications for Highway Construction, 2022 Edition, Section 530.

3.4 CLEANOUT INSTALLATION

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

1. Use Heavy-Duty, top-loading classification cleanouts in all areas.

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

3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.6 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.7 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, with end sections as indicated that match pipe, where indicated.

D. Construct energy dissipaters at outlets, as indicated.

3.8 CONCRETE PLACEMENT

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

3.9 FIELD QUALITY CONTROL

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

1. Submit separate reports for each system inspection.

2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

c. Damage: Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.

e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

3.10 CLEANING

A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 334100

SECTION 334200 - STORMWATER CONVEYANCE

1.1 SUMMARY

A. Section Includes:

1. Ductile-iron culvert pipe and fittings.
2. PE pipe and fittings.
3. PVC pipe and fittings.
4. Concrete pipe and fittings.
5. Non-pressure transition couplings.
6. Expansion joints.
7. Cleanouts.
8. Encasement for piping.
9. Manholes.
10. Polymer-concrete, channel drainage systems.
11. Catch basins.
12. Stormwater inlets.
13. Stormwater detention structures.
14. Pipe outlets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. **Catch basins and stormwater inlets**. Include plans, elevations, sections, details, frames, covers, and grates.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of cast-iron soil pipe and fitting.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76 (ASTM C76M).

1. **Bell-and-spigot or tongue-and-groove** ends and **gasketed joints with ASTM C443 (ASTM C443M), rubber gaskets**
2. Class III, Wall **A**

2.2 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478 (ASTM C478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch (102-mm) minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C990 (ASTM C990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923 (ASTM C923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: **Individual FRP steps; FRP ladder; or ASTM A615/A615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D4101, PP**, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than **60** inches.

2.3 CONCRETE

A. General: Cast-in-place concrete in accordance with ACI 318, ACI 350, and the following:

1. Cement: ASTM C150/C150M, Type II.
2. Fine Aggregate: ASTM C33/C33M, sand.
3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

    a. Invert Slope: **2** percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

    a. Slope: **4** percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed steel.

2.4 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C990 bitumen or butyl rubber.
6. Steps: **Individual FRP steps; FRP ladder; or ASTM A615/A615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D4101, PP**, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than **60** inches.
7. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.

2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.5 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

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

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

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

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

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of micro tunneling.

F. Install gravity-flow, nonpressure drainage piping in accordance with the following:

1. Install piping pitched down in direction of flow.
2. Install piping **NPS 6** and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with **36** inch minimum cover.
4. Install ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
5. Install PVC sewer piping in accordance with ASTM D2321 and ASTM F1668.
6. Install reinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping in accordance with the following:
   1. Join ductile-iron culvert piping in accordance with AWWA C600 for push-on joints.
   2. Join ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
   3. Join PVC sewer piping in accordance with ASTM D2321 for elastomeric-seal joints.
   4. Join reinforced-concrete sewer piping in accordance with ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.

B. Join force-main pressure piping in accordance with the following:

   1. Join PVC pressure piping in accordance with AWWA M23 for gasketed joints.
   2. Join dissimilar pipe materials with pressure-type couplings.

3.4 CLEANOUT INSTALLATION

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

   1. Use Light-Duty, top-loading classification cleanouts in **earth or unpaved foot-traffic** areas.
   2. Use Medium-Duty, top-loading classification cleanouts in **paved foot-traffic** areas.
   3. Use Heavy-Duty, top-loading classification cleanouts in **vehicle-traffic service** areas.
   4. Use Extra-Heavy-Duty, top-loading classification cleanouts in **roads**.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, [**18 by 18 by 12** inches deep. Set with tops **1** inch above surrounding earth grade.

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

3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops **3** inches above finished surface elsewhere unless otherwise indicated.

3.6 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.7 STORMWATER INLET **AND OUTLET** INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete in accordance with ACI 318.

3.9 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Connect force-main piping to building's storm drainage force mains specified in Section 221413 "Facility Storm Drainage Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.

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

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

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

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

3.10 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

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

3.11 FIELD QUALITY CONTROL

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

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

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

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

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

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems in accordance with requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping in accordance with ASTM F1417.

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

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

3.12 CLEANING

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

END OF SECTION 334200