SECTION 334000

STORM SEWER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. This section specifies materials and procedures for construction of outside, underground storm sewer systems that are complete and ready for operation. This includes piping, structures and all other incidentals.

B. Related Sections:

1. Section 312000 Earthwork.
2. Section 334600 Subdrainage.

1.3 DEFINITIONS AND ABREVIATIONS

A. Definitions: None.

B. Abbreviations:

HDPE: High-density polyethylene.
PE: Polyethylene.
PVC: Poly Vinyl Chloride.

1.4 REFERENCES

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

1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

a. C139-10 – Concrete Masonry Units for Construction of Catch Basins and Manholes
b. C150/C150M-11 - Portland Cement
c. C443-10 - Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
d. C478-09 - Precast Reinforced Concrete Manhole Sections
e. C857-07 - Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
f. C891-09 - Installation of Underground Precast Concrete Utility Structures
g. C913-08 - Precast Concrete Water and Wastewater Structures

h. C923-08 - Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
i. C990-09 - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
j. C1173-08 - Flexible Transition Couplings for Underground Piping Systems
k. C1433-10 - Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
l. C1479-10 - Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
m. D448-08 - Sizes of Aggregate for Road and Bridge Construction
n. D698-07e1 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))
o. D2751-05 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
p. D3350-10 - Polyethylene Plastics Pipe and Fittings Materials
q. F894-07 - Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
r. F949-10 - Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
s. F1417-11 - Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
t. F1668-08 - Construction Procedures for Buried Plastic Pipe

2. American Association of State Highway and Transportation Officials (AASHTO):

a. M198-10 – Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
b. M252-09 – Corrugated Polyethylene Drainage Pipe
c. M294-10 – Corrugated Polyethylene Pipe, 12 to 60 In. (300 to 1500 mm) Diameter

3. American Concrete Institute (ACI):

a. 318-05 – Structural Commentary
b. 350/350M-06 – Environmental Engineering Concrete Structures and Commentary

4. National Stone, Sand, and Gravel Association (NSSGA): Quarried Stone for Erosion and Sediment Control

1.5 ACTION SUBMITTALS

A. General:

1. Make submittal in compliance with all provisions of Division 01 pertaining to submittals and quality assurance.

2. Render submittals and receive approval prior to delivery of installation.

3. Approval in writing by the Engineer of submitted products, samples, test reports, and certificates, does not constitute final acceptance.

B. Manufacturers' Literature and Data shall be submitted, as one package, for pipes, fittings and appurtenances, including jointing materials, hydrants, valves and other miscellaneous items.

C. Shop Drawings:

1. Cleanouts and Drains. Include plans, elevations, sections, details, frames, covers, grates, outlet control structures, weir walls, dome risers, infiltration trenches, and all connections to existing drainage infrastructure.

1.6 INFORMATION SUBMITTALS

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

B. Qualification Data: For qualified installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of Owners' contact persons.

1.7 QUALITY ASSURANCE

A. Products Criteria:

1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.

2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

B. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of two years from final acceptance. Further, the Contractor will furnish all manufacturers' and suppliers' written guarantees and warranties covering materials and equipment furnished under this Contract.

1.8 DELIVERY STORAGE AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight.

B. Handle manholes, structures, catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.9 PROJECT CONDITIONS

A. Existing Conditions

1. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work.

2. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Engineer, it will be his duty to inform the Engineer immediately in writing for clarification. Work done after such discovery, unless authorized by the Engineer, shall be done at the Contractor's risk.

B. Field Measurements: Verify actual grade elevations, service and utility locations, structural components, and dimensions of footings, walls, pavement areas, subbase materials and construction contiguous with storm sewer utilities by field measurements before proceeding with work.

C. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

1. Notify the Construction Manager and Owner no fewer than three days in advance of proposed interruption of each service or utility.

2. Do not proceed with interruption of services or utilities without the Owner’s written permission.

D. Weather Limitations: Proceed with work only when existing and forecasted weather conditions permit the work to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 FACTORY ASSEMBLED PRODUCTS

A. Standardization of components shall be maximized to reduce spare part requirements. The Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

2.2 HDPE PIPE AND FITTINGS

A. Corrugated HDPE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

B. Water-tight Couplings: AASHTO D3212, corrugated, matching tube and fittings.

C. Water-tight flexible connections at manholes and other concrete structures: Rubber corrugated pipe adapter and flexible boot-type connector meeting or exceeding ASTM 2510, ASTM C 1478, ASTM D 2321.

1. Adapter: ADS Pipe Adapter as manufactured by Press-Seal Corporation, Fort Wayne, Indiana, or approved equal.

2. Flexible Boot-Type Connector: PSX: Direct Drive as manufactured by Press-Seal Corporation, Fort Wayne, Indiana, or approved equal.

3. Finished connections shall provide sealing to 10.8 psi minimum.

4. Finished connection shall accommodate angular deflection of the pipe to 7 degrees (minimum) and diametric deflection of 5% minimum with no loss of seal.

5. Testing of installed adapters and connectors shall be conducted in strict conformance with the requirements of the adapter and connector manufacturer.

2.3 PE PIPE AND FITTINGS

A. Corrugated PE drainage pipe and fittings, NPS 3 to NPS 10 (DN 80 to DN 250); ASTM F714, SDR 21 with smooth waterway for coupling joints.

1. Water-tight Couplings: AASHTO D3212, corrugated, matching tube and fittings.

B. PVC Pipe And Fittings

1. PVC Cellular-Core Pipe And Fittings: ASTM F891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.

2. Fittings: ASTM D3034, SDR 35, PVC socket-type fittings.

2.4 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials

1. For plastic pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.

2. For dissimilar pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings: Couplings shall be an elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, flexible couplings shall be elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, flexible couplings shall be elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.5 EXPANSION JOINTS AND DEFLECTION FITTINGS (NOT USED)

2.6 CLEANOUTS

A. General: Provide cleanouts per the locations and extents indicated on the Drawings.

B. Plastic Cleanouts shall have PVC body with PVC threaded plug. Pipe fitting and riser to cleanout shall be of same material as main line pipe.

1. Basis of Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following, or approved equal:

a. Canplas LLC.
b. IPS Corporation.
c. NDS Inc.
d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.

C. Lid Manufacturers: Subject to compliance with requirements, the basis of design is the following or approved equal:

1. East Jordan Iron Works Product #41610102.

2.7 OBSERVATION WELLS

A. General: Provide cleanouts per the locations and extents indicated on the Drawings.

B. Plastic observation wells shall have PVC body with PVC threaded plug.

1. Slotted well screen: 0.01 slot size.
2. Atlantic Screen and Manufacturing Inc. Item #OES40400 or approved equal.
3. Observation Well Cover: Gray iron frame

a. East Jordan Iron Works product #00157024 or approved equal.

2.8 DRAINS

A. Plastic Polymer Concrete Trench Drains: ASME A112.6.3, rectangular body with anchor flange or other anchoring device, and rectangular grate. Include units of total length indicated and quantity of bottom outlets with inside calk or spigot connections, of sizes indicated.

1. Top-Loading Classification(s): Load Class F

2. Grate openings shall be ADA compliant.

3. Grate Material: 16 Gauge, Grade 304 Stainless Steel or approved equal

4. Manufacturers: Subject to compliance with requirements, the basis of design is the following or approved equal:

a. ACO, Inc.: S300K Trench Drain System.
b. 8” nominal size.
c. Ductile Iron Grate – Heavy Duty Ductile Iron Slotted Grate Part NO. 93502
d. Catch Basin – K2-902G Series.

B. Nyloplast In-Line Drain

1. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a water tight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals.

2. The flexible elastomeric seals shall conform to ASTM F477.

3. The pipe bell spigot shall be joined to the inline drain body by use of a swage mechanical joint.

4. The inline drain body and pipe stubs of the surface drainage inlets shall conform to ASTM D178 cell class 12454.

5. The grates furnished for all surface drainage inlets shall be ductile iron grates and shall be made specifically for each fitting so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet.

6. Grates for inline drains shall be capable of supporting H-20 wheel loading for traffic areas or H-10 loading for pedestrian areas.

7. 12” and 15” square grate will be hinged to the frame using pins.

8. Metal used in the manufacture of the castings shall conform to ASTM A536 grade 10-50-05 for ductile iron.

2.9 WATER QUALITY INSERTS FOR CATCH BASINS, STORMWATER INLETS, AND OUTLET CONTROL STRUCTURES

A. General: Permanent water quality filtration screen provided in inlets and outlet control structures where shown on the Drawings.

1. Manufacturers: Subject to compliance with requirements, the basis of design is the following or approved equal:

a. Advanced Drainage Systems, Inc.: Flexstorm Pure Permanent Inlet Protection.
b. Suntree Technologies, Inc.: Grate Inlet Skimmer Box or High Capacity Curb-inlet Box.

2.10 RESILIENT CONNECTORS AND DOWNSPOUT BOOTS FOR BUILDING ROOF DRAINS

A. Resilient connectors and downspout boots: Flexible, watertight connectors used for connecting pipe to manholes and inlets, and shall conform to ASTM C923.

2.11 WARNING TAPE

A. Standard, 4-Mil polyethylene 3 inch (76 mm) wide tape detectable type, purple with black letters, and imprinted with “CAUTION BURIED STORM SEWER BELOW”.

PART 3 - EXECUTION

3.1 PIPE BEDDING

A. The bedding surface of the pipe shall provide a firm foundation of uniform density throughout the entire length of pipe. Concrete pipe requirements are such that when no bedding class is specified, concrete pipe shall be bedded in a soil foundation accurately shaped and rounded to conform with the lowest one-fourth of the outside portion of circular pipe. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall not be more than the length, depth, and width required for properly making the particular type of joint. Plastic pipe bedding requirements shall meet the requirements of ASTM D2321. Bedding, haunching and initial backfill shall be either Class IB or Class II material. Corrugated metal pipe bedding requirements shall conform to ASTM A798.

3.2 PIPING INSTALLATION

A. Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping with 48 inch minimum cover or as shown on the Drawings.

C. 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.

1. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.

2. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.

3. Inspect pipes and fittings, for defects before installation. Defective materials shall be plainly marked and removed from the site. Cut pipe shall have smooth regular ends at right angles to axis of pipe.

4. Clean interior of all pipe thoroughly before installation. When work is not in progress, open ends of pipe shall be closed securely to prevent entrance of storm water, dirt or other substances.

5. Lower pipe into trench carefully and bring to proper line, grade, and joint. After jointing, interior of each pipe shall be thoroughly wiped or swabbed to remove any dirt, trash or excess jointing materials.

6. Do not walk on pipe in trenches until covered by layers of shading to a depth of 12 inches over the crown of the pipe.

7. Warning tape shall be continuously placed 12 inches above storm sewer piping.

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

E. 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.

F. Install gravity-flow, nonpressure drainage piping according to 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 fittings; or cast in-place concrete supports or anchors.

3. Install PE corrugated sewer piping according to ASTM D2321 with gasketed joints.

4. Install PVC cellular-core piping, PVC sewer piping, and PVC profile gravity sewer piping, according to ASTM D2321 and ASTM F1668.

3.3 REGRADING

A. Raise or lower existing manholes and structures frames and covers in regraded areas to finish grade. Carefully remove, clean and salvage cast iron frames and covers. Adjust the elevation of the top of the manhole or structure as detailed on the drawings. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover as specified for new construction.

B. During periods when work is progressing on adjusting manholes or structures cover elevations, the Contractor shall install a temporary cover above the bench of the structure or manhole. The temporary cover shall be installed above the high flow elevation within the structure, and shall prevent debris from entering the wastewater stream.

3.4 CONNECTIONS TO EXISTING PUBLIC UTILITY MANHOLES

A. Comply with all rules and regulations of the public utility.

B. Cleanout Installation

1. 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.

2. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.

3. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.

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

5. 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.

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

3.5 IDENTIFICATION

A. Install green warning tape directly over piping and at outside edge of underground structures.

3.6 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Prior to final acceptance, provide a video record of all piping from the building to the City connection to show the lines are free from obstructions, properly sloped and joined.

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.

3.7 TESTING OF STORM SEWERS

A. Submit separate report for each test.

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 test gravity sewers. Concrete Pipes conform to ASTM C924, Plastic Pipes conform to ASTM F1417, all other pipe material conform to ASTM C828 or C924, after consulting with pipe manufacturer. Testing of individual joints shall conform to ASTM C1103.

C. Leaks and loss in test pressure constitute defects that must be repaired. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.8 CLEANING

A. Clean Interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION