SECTION 02530

SANITARY SEWERAGE

PART 1 GENERAL

1.1 SUMMARY

1. Section Includes:
    a. Work for each system includes design and location of system, connections to existing work, required components, related earthwork, structures, concrete work and testing, necessary to provide complete, functioning systems.
    b. Work required to provide properly functioning systems per applicable codes, manufacturer's instructions and standards and best accepted safe practice of Trades.
2. Sanitary Drainage (SAN)
    a. Type CISP, Cast Iron Soil Pipe where indicated.
    b. Type PVC-PSM Polyvinyl Chloride Sewer Pipe from 5 feet outside building perimeters for sizes up to and including 15inches diameter.
    c. Type RCP, Reinforced Concrete Pipe from 5 feet outside building perimeters for piping over 12 inches except as shown.
    d. Type DIWP, Ductile Iron to be used for force mains in pumping stations and valve pits.
3. Sanitary Drainage Force Main (San-F)
    a. Type BCS-PS, Black Carbon Steel-Polyethylene Sheathed.

B. Related Sections:
1. Submittals - Division 1 General Requirements.
2. Site Demolition - Division 2.
3. Earthwork other than that specified in this section - Division 2.
4. Soils and Aggregates – Division 2.
5. Water Distribution - Division 2.
6. Cast-In-Place Concrete other than that specified in this section – Division 3.
7. Riprap. Refer to Division 2, Soils and Aggregates.

1.2 REFERENCES

A. Reference Sections
1. Geotechnical Data.

B. ASTM
1. ASTM A 674 "PE Encasement for Ductile-Iron Piping:"
2. ASTM A 74, "Standard Specification for Cast Iron Soil Pipe and Fittings"
3. ASTM C 139, "Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes"
4. ASTM C 32, "Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale)"

5. ASTM C 443, “Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets”
6. ASTM C 478, “Standard Specification for Precast Reinforced Concrete Manhole Sections”
7. ASTM C 497, “Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile”
8. ASTM C 507, “Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe”
9. ASTM C 564, “Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings”.
10. ASTM C 76, “Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe”
11. ASTM C 877, “Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections”
12. ASTM C 94, “Standard Specification for Ready-Mixed Concrete”
13. ASTM D 2321, “Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications”
14. ASTM D 3034, “Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings”
15. ASTM F 477, “Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe”

C. AWWA
1. AWWA C104
2. AWWA C105
3. AWWA C110
4. AWWA C111
5. AWWA C115
6. AWWA C151 CLASS 350

1.3 SUBMITTALS

A. Furnish submittals for items that are identified in this Section by different typeface and bracketed code (e.g., *Item [L]*). Refer to Division 1 General Requirements, for definition of codes for types of submittals and administrative requirements governing submittal procedure. Additional submittal requirements pertaining to this Section are specified in this section under this Article.

B. Product Data
1. *Product Data [P]:* Include materials and equipment classification and identification, required supports, and special installation requirements.

C. Samples
1. [S]: Submit typical precast components for underground structures; do not submit specific configurations of each structure.

D. Quality Assurance/Control Submittals
   1. *Test reports [T]*: Submit structural integrity, leakage and performance test data.

E. Closeout Submittals
   1. Submit as-built drawings per Division 1, General Requirements.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store and protect plastic pipe to prevent ultraviolet deterioration and to minimize bowing.

PART 2 PRODUCTS

2.1 MATERIALS

A. Ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps shall be of same Type and Class of materials as pipe, or of material having equal strength and chemical resistance properties.

B. Type CISP, Cast Iron Soil Pipe
   1. Hub and spigot: Per ASTM A 74, “Standard Specification for Cast Iron Soil Pipe and Fittings”, coated inside and outside with coal tar enamel. Pipe with eccentrically cast, thin walls will not be accepted.
   2. Elastomer gaskets. Single pipe weight use, per ASTM C 564, “Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings”.

C. Type RCP, Reinforced Concrete Pipe
   1. Pipe and fittings: Include modified tongue and groove joints, per ASTM C 76, “Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe”, Class III or as shown. Stencil class identification inside bore of pipe and fittings. Elliptical reinforcement in circular pipe is not acceptable.
   2. Compression elastomer joints. Per ASTM C 443, “Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets”. Provide neoprene elastomer for services related to building drainage.

D. Type PVC-PSM, Polyvinyl Chloride Sewer Pipe
   1. Pipe, fittings and jointing materials: Per ASTM D 3034, “Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings”, SDR 35 with elastomer gasket joints per ASTM F 477, “Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe”.

E. Type BCS-PS, Black Carbon Steel Polyethylene Sheathed
   1. Pipe: Per ASTM A 53, Buttwelded, ERW or Seamless, Schedule 40 in sizes through 12 inches.
   2. Buttweld fittings: Black carbon steel per ASTM A 234 and ANSI B16.9, wall thickness to match pipe wall.
   3. Slip-on or weld neck flanges: Forged steel per ASTM A 181, Grade 1 or 2, ANSI B16.5.
   4. *Polyethylene sheath [D]:* Per FS L-C-530 C and AWWA C-215, with heat shrunk sleeves or manufacturer's standard tape wrapping for butt joints and fittings. Manufacturer:
   5. Bredero Shaw, "Pritec".

F. Piping Transitions: Provide for joining of different types of pipe materials different pipe sizes, and cut pipe, where approved. Fabricate transitions with materials capable of resisting normal corrosion.
   a. Can-Tex Industries Division of Harsco Corp. "CT-Adapters".
   b. Fernco Joint Sealer Co. "PVC Donut".
   c. Joints, Inc. "Caulder".

G. Type DIWP, Ductile Iron Pipe:
   1. Ductile Iron Water Pipe: Underground Service. Centrifugally cast, per American National Standards Institute (ANSI)/American Water Works Association (AWWA) C151/A21.51 CLASS 350 minimum with push-on or mechanical joints per ANSI/AWWA C111/A21.11 with ductile iron fittings, 350 psig pressure rating per ANSI/AWWA C110/A21.10 or C153/A21.53, rubber gaskets with duct tips. Cor-Ten A T-head bolts and nuts for mechanical joints.
   2. Ductile Iron Flanges Pipe: Pit Service. Ductile iron flanged pipe per ANSI/AWWA C115/A21.15; and ductile iron fittings, 250-psig pressure rating, per ANSI/AWWA C110/A21.10.
   3. Cement Lining: Cement line pipe and fittings to "standard thickness" and seal coat per ANSI/AWWA C104/A21.4.
   4. Restrained joints: Use joints that allow deflection and field disassembly. Retainer glands with set screws in pipe surface are strictly prohibited.
      a. American Ductile Iron Pipe Company, Birmingham, AL, "LOK-FAST".
      b. United States Pipe & Foundry Co., Birmingham, AL, "TR Flex".
      c. Ebaa Iron Sales, Inc., East Land, TX, "Megalug".
   5. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

2.2 MANUFACTURED UNITS

A. VALVES
   1. Flap Valves: Cast iron flap and flush valve. Frame and lid with hub connection. Bronze mounted and fitted with lifting chain of length to suit depth of pit or structure.
      a. Neenah R-5040-B Series.
      b. Clow F-3016.
   2. Shear Gate: Cast iron shear gate:
      a. Clow F-3004.

b. Neenah R-5005-B Series.

3. Sluice Gate: Cast Iron. Light service, flush bottom closure, size as shown with tracks, gate, handwheel and rod.
   a. Rodney Hunt HYQ-240L with Type S-2500 handwheel.

B. CASTINGS
1. Sanitary manhole frame and cover:
   a. Neenah R-1642 with Type B solid cover.
   b. East Jordan Iron Works No. 1040 with Type A solid cover.
2. Provide each manhole cover with lettering identifying respective service: “SANITARY”.
3. Manhole steps:
   a. Ductile iron, 16 inches wide.
      1) Neenah R-1980-M.
   b. Stainless steel per local code and OSHA requirements.
   c. Formed steel with plastic jacketed exposed surfaces per local code and OSHA requirements.
   d. Fiberglass reinforced plastic per local code and OSHA requirements.

C. Precast Manholes
1. General. Use HS-20 live load for design purposes.
2. Precast Concrete Manholes:
   a. Grade Rings. ASTM C 478, “Standard Specification for Precast Reinforced Concrete Manhole Sections”, reinforced concrete rings with total thickness from 6 to 9 inches (150 to 229 mm) that coordinate with diameter of frame and cover.
   b. Top or Cone Section. ASTM C 478, “Standard Specification for Precast Reinforced Concrete Manhole Sections”, eccentric cone, concentric cone, or flat slab top as shown on drawings. Coordinate cone diameter with grade ring diameter.
   c. Riser Sections. ASTM C 478, “Standard Specification for Precast Reinforced Concrete Manhole Sections”, with factory formed openings and installed steps.
   d. Base. ASTM C 478, “Standard Specification for Precast Reinforced Concrete Manhole Sections”.
   e. Flat Slab. ASTM C 478, “Standard Specification for Precast Reinforced Concrete Manhole Sections”.
   f. Manhole Tee Section. ASTM C 76, “Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe”, Class IV minimum (Class V if required to match adjacent pipe) with joints to match adjacent pipe.
3. Manhole Joints: Compression Elastomer Joints, ASTM C 443, “Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets”.

2.3 COMPONENTS

A. Manhole Masonry:
1. Brick. Type MB per ASTM C 32, “Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale)”, Grade MS.

2. Block. Type CMU per ASTM C 139, “Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes”, formed units to structure diameter with cones battered vertically and curved horizontally if circular.

B. Leveling Course:
   1. 1:10 ratio cement/sand dry mixture.

C. Plaster Coating:
   1. Cement plaster coating 1/2 inch thick.

D. Pipe:

2.4 ACCESSORIES

A. Flexible joint material for use at joint between pipe and manhole.
   1. Res-Seal
   2. Link-Seal
   3. Press Wedge II

B. Wall Pipes: Cast iron. Class D, bell and flange or flange and plain end.
   1. Clow F-1424 or F-1426.
   2. American Cast Iron Pipe.
   3. United States Pipe & Foundry Co.

C. P-Trap: Extra heavy cast iron for connection to Type CISP piping.
   1. Josam.
   2. Smith.
   3. Tyler Pipe.
   4. Zurn.

2.5 MISCELLANEOUS MATERIALS

A. Bituminous coating:
   1. Koppers “Bitumastic 50”.
   2. Porter Coatings Division of Porter Paint Co. “Tarmastic 101”.

B. Gasket Joint Lubricant. Pipe manufacturer’s recommended gasket lubricant.

C. Epoxy Bonding Compound. 2-component system suitable for bonding wet or dry concrete to each other and to other materials.
   1. Copolymer Chemicals, Inc., Detroit, MI. “Crete-Tac”.
   2. H. B. Fuller Co., St. Paul, Minn. “BC-013-14”.
   3. W. R. Grace Co., A. C. Horn Products, Chicago, IL., “Thiopoxy-63”.

D. Embedment (bedding and initial backfill). Refer to Division 2, Soils and Aggregates.

E. Concrete: Compressive strength of 3000 PSI at 28-days, per ASTM C 94, "Standard Specification for Ready-Mixed Concrete", with 5-7 percent entrained air.

F. Marking tape. Service identified 3-inch wide, brown color foil-backed polyethylene tape, or non-foil tape.
   1. Reef Industries, Inc., "Terra Tape", Houston, Texas.
   2. Seton Co., New Haven, Connecticut.
   3. Thor Enterprises, Sun Prairie, Wisconsin.

G. Exterior cleanout
   1. Josam Series 56050.
   2. Zurn No. Z-1450-1.

H. Interior underdrain cleanout:
   1. Refer to Division 15, Plumbing Fixtures and Equipment.

2.6 FINISHES

A. Shop coat ferrous metal surfaces with "Bituminous Coating", except where other equivalent types of protective coatings are manufacturer's standard.

B. Manhole Coating
   1. Provide drainage pit with Manhole Coating System applied as follows:
      a. Brush blast surfaces before application of coal tar epoxy.
      b. Reinforce pit corners with layers of 12, 8, and 4 inch wide strips of closely woven, oil-free glass cloth embedded in successive layers of coal tar epoxy.
      c. Each coat of coal tar shall be 8 mils thick. Apply each successive phase of work involving coal tar epoxy within 24 hours.

C. Manhole coating system. 3-coat, 24-mil thick system of coal tar epoxy and fibrous glass cloth.
   1. Ameron "Amercoat No. 78 HB".
   2. Carboline "Carbomastic No. 15".
   3. Pitt Chem "Tar Set".

2.7 SOURCE QUALITY CONTROL

A. At discretion of Owner and at Owner's expense crushing strength of RCP may be tested per ASTM C 497, "Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile".

B. One half of 1 percent of number of pipe sections of each pipe size and type to be installed may be selected by Owner for testing. Test at least 2 pipes in each size and type. Failure to meet tests may be cause for rejection of entire lot of pipe.

PART 3 EXECUTION

3.1 PREPARATION

A. Excavation And Backfill
   1. Perform excavating and backfilling required for Work, per procedures specified in Division 2, Soils and Aggregates, and Site Demolition and the following requirements.
   2. Trim to lines and elevations in manner specified under Embedment. Embedment starts 4-inches below bottom of pipe elevation and ends 12 inches above top of pipe or component; "Backfill" starts 12 inches above pipe or component. Use manual methods in areas adjacent to buried construction and utilities to avoid damage or unscheduled service interruption. Limit trench width or embankment conditions to preclude excessive earth loads on installed piping system.

B. Embedment (Bedding And Initial Backfill)
   1. Trim rough trench to subgrade and provide embedment as defined in Division 2, Soils and Aggregates and as shown. Provide stable, uniform support consisting of minimum compacted thickness below bottom of exterior surface of pipe, including bell, as shown but not less than 4 inches. Shape bedding to provide full length barrel support and to prevent point loading at pipe joints. Place and compact per Division 2, Soils and Aggregates.
   2. When bottom of excavation cannot support pipe, excavate to further depth and width and refill to pipe laying grade with bedding material per Division 2, Soils and Aggregates.

C. Pipe
   1. Before lowering pipe into trench, clean and visually inspect for apparent defects. Remove defective pipe from site promptly. Before and during laying of pipe, maintain excavations dry and clear of water and extraneous materials. Provide minimum 4 inches of clearance for pipe passing under or through building grade beams or provide surface penetrations as shown.

3.2 INSTALLATION

A. Pipe
   1. Where pipe is embedded in an underground concrete structure, provide joints within 12 inches of exterior surface of structure, capable of absorbing movement without leakage.
   2. Clean and lubricate elastomer joints before assembly. Check recessed gaskets with feeler gages.
   3. During progress of construction, protect open ends of 18 inch and smaller pipe, fittings to prevent admission of foreign matter. Place plugs or end boards in ends of installed work whenever work stops. Plugs shall be commercially manufactured products.
   4. Type CISP, Cast Iron Soil Pipe
      a. Install per CISPI Cast Iron Soil Pipe and Fittings Handbook except as modified by Contract Documents.
      b. Provide lead and oakum joints in vertical piping or where rigid joint alignment is required or where floor drains are caulked. Make joints with 1 pouring of molten lead,

calked to produce liquid-tight joints without stressing hub or spigot. Where lead is driven 1/4 inch or more below face of hub, remove lead and remake joint.

5. Type RCP, Reinforced Concrete Pipe
    a. Install per ACPA Concrete Pipe Installation Manual except as modified by Contract Documents.
    b. Method of field tapping for branch connections is subject to approval by Registered Design Professional. Use “Epoxy Bonding Compound” to join cleaned piping and wet or dry cement.
    c. Do not install pipe with chipped or otherwise damaged joint areas.
6. Type PVC-PSM, Polyvinyl Chloride Sewer Pipe
    a. Install per ASTM D 2321, “Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications”, except as modified by Contract Documents.
    b. At no point shall completed installations have out-of-round pipe deflections greater than 7 1/2 percent. Registered Design Professional may require deflectometer or go/no-go gauging tests run on pipeline acceptance. Remove and replace pipe that has deflected more than 7-1/2 percent per ASTM D 3034, “Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings”. Test pipe for deflection not less than 30 days following completion of installation.
7. Type BCS-PS, Black Carbon Steel-Polyethylene Sheathed
    a. Provide welded assembly with welding work per ANSI B31.1, except where flanged or threaded components are provided.
    b. Remove damaged polyethylene sheathing and replace with heat-shrinkable sleeves set in fresh adhesive primer.

B. Special Techniques
1. Epoxy Bonding To Existing Materials
    a. Use Epoxy Bonding Compound to set sleeves or pipes in existing concrete or to bond dissimilar materials.
    b. Bonding Compound, when applied per manufacturer’s instructions, shall be capable of initial curing within 48 hours at temperatures as low as 40 degF and shall be capable of bonding any combination of following properly prepared materials. Wet or dry, cured or uncured concrete or mortar; vitrified clay; cast iron, and carbon steel.
2. Jacking Of Pipe
    a. Do not jack pipe in place except upon prior approval of proposed materials and complete details of methods.
3. Concrete Work
    a. Perform concrete work per ACI and to details shown, including reinforcing.

3.3 CONSTRUCTION

A. Interface with Other Work
1. Adjusting Existing Structure Top Elevation
    a. Adjust top elevations of manholes and catch basins where indicated. If elevation is raised 12 inches or less, add brick courses below castings. If elevation is raised more than 12 inches, remove structure to bottom of cone or corbelling and rebuild

structure. Where elevation is lowered, remove brick courses from under castings if cone is not enlarged. If cone is enlarged, remove sufficient structure and maintain cone profile. Do not batter brick masonry steeper than 2.5:1.

2. Where connections between different piping materials are made, use manufactured "specials" and "transitions" to produce permanently tight joints.

B. Site Tolerances
   1. Maximum deviation from design elevation at any point along sewer shall not exceed 0.04 feet.

3.4 FIELD QUALITY CONTROL

A. Site Tests
   1. After backfilling is completed, flash light between manholes. Remedy any displaced pipe, misalignment or poor joints revealed by these tests.

B. Sewer Testing
   1. General
      a. Test per local codes.
   2. Hydrostatic Leakage Test
      a. Test system in sections not exceeding 500 feet in length.
      b. Tests shall be made by bulkheading sewer at lower end of test section and filling pipe with water to an elevation 2 feet above top of upstream end of pipe or 2 feet above highest ground water elevation along section under test, whichever is higher. Leakage measurement is measured quantity of water added to maintain water at this elevation. Tests shall be run for at least 4 hours.
      c. No additional leakage is allowed for leakage from manholes, plugs or cleanouts.
      d. Allowable leakage:
         1) Sanitary sewers. 0.2 gph/inch dia./100 feet of pipe.

3.5 CLEANING

A. Upon completion of work in each respective area, clean and protect Work.

B. Just before final acceptance, perform additional necessary cleaning to provide clean equipment and areas to Owner.

3.6 PROTECTION

A. Marking Tape
   1. Install approximately 6 to 8 inches below grade per manufacturer's instructions.

END OF SECTION

Revision History	
Date	**Rev. No.**
A	0
B	0
C	0
D	0
E	0
F	0
02-19-09	0

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