STRUCTURES FOR SANITARY AND STORM SEWERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manholes and Intakes for Storm Sewers

B. Manholes for Sanitary Sewers

C. Adjustment of Existing Manholes and Intakes

D. Connection to Existing Manholes and Intakes

E. Removal of Manholes and Intakes

F. Special Structures for Storm Sewers

G. Excavation and Backfill of Structures

1.02 DESCRIPTION OF WORK

A. Construct sanitary and storm sewer manholes to provide access to sewer systems for maintenance and cleaning purposes.

B. Construct storm sewer intakes for collection of surface water and conveyance to the storm sewer system.

C. Modify existing manholes and intakes as necessitated by other improvements adjacent to the manholes or intakes.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Shop drawings of steel reinforcement, showing sizes, lengths, bends, and counts, if required.

B. Concrete mix design, if required by Engineer.

C. Shop drawing schedule of new manholes and/or intakes showing total depth, relative elevations of all connecting sanitary or storm sewer lines, all drops, and orientation of connecting lines.

D. Results of required testing.

E. Catalog cuts of iron castings and sewer line connection gaskets.

F. Gradation and soil classification reports for structure bedding and backfill materials.

G. Dewatering plan.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants, as well as the following:

A. Store reinforcing steel only on pallets or lagging.

B. Follow the aggregate storage and concrete transport requirements in Iowa DOT Article 2301.02, C.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

A. Do not place concrete when stormy or inclement weather will prevent good quality work.

B. Cold weather placement is restricted per Iowa DOT Article 2403.03, F.

1.08 MEASUREMENT AND PAYMENT

A. Manhole:

1. **Measurement:** Each type and size of manhole will be counted.

2. **Payment:** Payment will be at the unit price for each type and size of manhole.

3. **Includes:** Unit price includes, but is not limited to, excavation, placing bedding and backfill material, compaction, base, structural concrete, reinforcing steel, precast units (if used), inverts, pipe connections, chimney seals, castings, and adjustment rings.

B. Intake:

1. **Measurement:** Each type and size of intake will be counted.

2. **Payment:** Payment will be at the unit price for each type and size of intake.

3. **Includes:** Unit price includes, but is not limited to, excavation, placing bedding and backfill material, compaction, base, structural concrete, reinforcing steel, precast units (if used), inverts, pipe connections, castings, and adjustment rings.

C. Drop Connection:

1. **Measurement:** Each drop connection will be counted.

2. **Payment:** Payment will be at the unit price for each drop connection.

3. **Includes:** Unit price includes, but is not limited to, the connection to the manhole and all pipe, fittings, concrete encasement, and bedding and backfill material.

D. Casting Extension Rings:

1. **Measurement:** Each casting extension ring will be counted.

2. **Payment:** Payment will be at the unit price for each casting extension ring.

1.08 MEASUREMENT AND PAYMENT (Continued)

E. Manhole or Intake Adjustment, Minor:

1. **Measurement:** Each existing manhole or intake adjusted to finished grade by addition or removal of adjustment rings or adjustment of adjustable casting will be counted.

2. **Payment:** Payment will be made at the unit price for each minor manhole or intake adjustment.

3. **Includes:** Unit price includes, but is not limited to, removing existing casting and existing adjustment rings, furnishing and installing adjustment rings, furnishing and installing new casting, and installing new chimney seal (sanitary sewer manholes only).

F. Manhole or Intake Adjustment, Major:

1. **Measurement:** Each existing manhole or intake adjusted to grade by addition or removal of riser, cone or flat top sections, or the exchange of existing riser sections with sections having different vertical dimensions will be counted.

2. **Payment:** Payment will be at the unit price for each major adjustment.

3. **Includes:** Unit price includes, but is not limited to, removal of existing casting, adjustment rings, top sections, and risers; excavation; concrete and reinforcing steel or precast sections; furnishing and installing new casting; installing new chimney seal (sanitary sewer manholes only); placing backfill material; and compaction.

G. Connection to Existing Manhole or Intake:

1. **Measurement:** Each connection made to an existing manhole or intake will be counted.

2. **Payment:** Payment will be made at the unit price for each sewer connection.

3. **Includes:** Unit price includes, but is not limited to, coring or cutting into the existing manhole or intake, pipe connections, grout, and waterstop (when required).

H. Remove Manhole or Intake:

1. **Measurement:** Each manhole or intake removed will be counted.

2. **Payment:** Payment will be made at the unit price for each manhole or intake.

3. **Includes:** Unit price includes, but is not limited to, removal of casting, concrete, and reinforcement; plugging pipes; filling remaining structure with flowable mortar; and placing compacted fill over structure to finished grade.

PART 2 - PRODUCTS

2.01 MANHOLE AND INTAKE TYPES

Table 6010.01: Manhole and Intake Types

	Figure No.	Type	Previous Type	Description
Sanitary Sewer Manholes	6010.301	SW-301	A	Circular Sanitary Sewer Manhole
	6010.302	SW-302	E	Rectangular Sanitary Sewer Manhole
	6010.303	SW-303	I	Sanitary Sewer Manhole Over Existing Sewer
	6010.304	SW-304	F	Rectangular Base/Circular Top Sanitary Sewer Manhole
	6010.305	SW-305	J	Tee-section Sanitary Sewer Manhole
Storm Sewer Manholes	6010.401	SW-401	M-A	Circular Storm Sewer Manhole
	6010.402	SW-402	M-B	Rectangular Storm Sewer Manhole
	6010.403	SW-403	M-C	Deep Well Rectangular Storm Sewer Manhole
	6010.404	SW-404	M-D	Rectangular Base/Circular Top Storm Sewer Manhole
	6010.405	SW-405	M-E	Tee-section Storm Sewer Manhole
Intakes	6010.501	SW-501	M-A	Single Grate Intake
	6010.502	SW-502	M-B	Circular Single Grate Intake
	6010.503	SW-503	M-C	Single Grate Intake with Manhole
	6010.504	SW-504	M-C (special)	Single Grate Intake with Flush-top Manhole
	6010.505	SW-505	M-D	Double Grate Intake
	6010.506	SW-506	M-E	Double Grate Intake with Manhole
	6010.507	SW-507	M-F	Single Open-throat Intake, Small Box
	6010.508	SW-508	M-F (modified)	Single Open-throat Intake, Large Box
	6010.509	SW-509	M-I	Double Open-throat Intake, Small Box
	6010.510	SW-510	M-I (modified)	Double Open-throat Intake, Large Box
	6010.511	SW-511	M-H	Rectangular Area Intake
	6010.512	SW-512	RCP Area	Circular Area Intake
	6010.513	SW-513	M-G	Open-sided Area Intake

2.02 CONCRETE MATERIALS

A. Precast: Comply with ASTM C 478.

B. Cast-in-place: Use Class C concrete. Comply with the following Iowa DOT Specifications and Materials I.M.s.

1. **Iowa DOT Specifications Sections:**
   a. 2403 – Structural Concrete
   b. 4101 – Portland Cement
   c. 4102 – Water for Concrete and Mortar
   d. 4103 – Liquid Admixtures for Portland Cement Concrete
   e. 4104 – Burlap for Curing Concrete
   f. 4106 – Plastic Film and Insulating Covers for Curing Concrete
   g. 4108 – Supplementary Cementitious Materials
   h. 4109 – Aggregate Gradations
   i. 4110 – Fine Aggregate for Portland Cement Concrete
   j. 4115 – Coarse Aggregate for Portland Cement Concrete

2.02 CONCRETE MATERIALS (Continued)

2. Iowa DOT Materials I.M.s:
a. 316 – Flexural Strength of Concrete
b. 318 – Air Content of Freshly Mixed Concrete by Pressure
c. 403 – Chemical Admixtures for Concrete
d. 528 – Structural Concrete Plant Inspection
e. 529 – Portland Cement Concrete Proportions
f. 534 – Mobile Mixture Inspection

2.03 REINFORCEMENT

Comply with Iowa DOT Article 2404.

2.04 NON-SHRINK GROUT

Comply with Iowa DOT Materials I.M. 491.13.

2.05 PRECAST RISER JOINTS

A. Joint Ends:

1. Use tongue and groove ends.

2. If cast-in-place base is used, provide bottom riser with square bottom edge.

B. Joint Sealant:

1. Sanitary Sewers:
a. Rubber O-ring or Profile Gasket: Flexible joint, complying with ASTM C 443.
b. Bituminous Jointing Material: Use a cold-applied mastic sewer joint sealing compound recommended by the manufacturer for the intended use and approved by the Engineer. Comply with AASHTO M 198.
c. Butyl Sealant Wrap: Comply with ASTM C 877.

2. Storm Sewers: All joint sealants used on sanitary sewers may also be used for storm sewers. The following may also be used.
a. Rubber Rope Gasket Jointing Material: Comply with ASTM C 990.
b. Engineering Fabric Wrap: If specified in the contract documents, supply engineering fabric wrap complying with Iowa DOT Article 4196.01, B.

2.06 MANHOLE OR INTAKE TOP

A. Capable of supporting HS-20 loading.

B. Use eccentric cone on sanitary sewer manholes unless otherwise specified or allowed.

2.07 BASE

A. Sanitary Sewer Manhole:

1. Circular Manhole: Integral base and lower riser section according to ASTM C 478.

2. All Other Manholes: Use precast or cast-in-place concrete base.

B. Storm Sewer Manhole: Use precast or cast-in-place concrete base.

C. Intake: Use precast or cast-in-place concrete base.

2.08 PIPE CONNECTIONS

A. Flexible, Watertight Gasket: Comply with ASTM C 923.

B. Non-Shrink Grout: Comply with Section 6010, 2.04.

C. Waterstop: Provide elastomeric gasket that surrounds pipe and attaches with stainless steel bands and is designed to stop the movement of water along the interface between a pipe and a surrounding concrete collar.

D. Concrete Collar: Comply with Section 6010, 2.02 and 2.03.

2.09 MANHOLE OR INTAKE ADJUSTMENT RINGS (Grade Rings)

A. Use one of the following methods for grade adjustments of manhole or intake frame and cover assemblies:

1. Reinforced Concrete Adjustment Rings: Comply with ASTM C 478. Provide rings free from cracks, voids, and other defects.

2. High Density Polyethylene Adjustment Rings: Comply with ASTM D 1248 for recycled plastic.
   a. Test and certify material properties by the methods in the following table.

Table 6010.02: Test Methods

Property	Test Method	Acceptable Value
Melt Flow Index	ASTM D 1238	0.30 to 30 g/10 min.
Density	ASTM D 792	0.94 to 0.98 g/cm^3
Tensile Strength	ASTM D 638	2,000 to 5,000 lb/in^2

   b. Do not use polyethylene grade adjustment rings when they are exposed to HMA pavement.
   c. When used in a single configuration, provide tapered adjustment ring with thickness that varies from 1/2 inch to 3 inches.
   d. Install adjustment rings on clean, flat surfaces according to the manufacturer's recommendations with the proper butyl rubber sealant/adhesive.

B. Ensure the inside diameter of the adjustment ring is not less than the inside diameter of the manhole frame or not less than the inside dimension of the intake grate opening.

C. Construct manholes and intakes with the following adjustment ring stack heights:

1. Minimum: 4 inches for new manholes and intakes.

2. Maximum: 12 inches for new manholes and intakes; 16 inches for existing manholes and intakes.

2.10 CASTINGS (Ring, Cover, Grate, and Extensions)

A. Gray Cast Iron: AASHTO M 306.

B. Load Capacity: Standard duty unless otherwise shown on the casting figures.

1. Standard Duty: Casting certified for 40,000 pound proof-load according to AASHTO M 306.

2.10 CASTINGS (Ring, Cover, Grate, and Extensions) (Continued)

2. **Light Duty:** Casting certified according to requirements of AASHTO M 306 for a 16,000 pound proof-load (HS-20). 40,000 pound proof-load is not required.

C. Casting Types:

1. **Manholes:** The following table lists the manhole casting types.

Table 6010.03: Manhole Casting Types

	Figure No.	Casting Type	Number of Pieces	Ring/ Cover	Bolted Frame	Bolted Cover (Floodable)	Gasket
Sanitary Sewer	6010.601	SW-601, A	2	Fixed[2]	Yes	No	Yes[1]
	6010.601	SW-601, B	3	Adjustable[3]	No	No	Yes[1]
	6010.601	SW-601, C	2	Fixed[2]	Yes	Yes	Yes[1]
	6010.601	SW-601, D	3	Adjustable[3]	No	Yes	Yes[1]
Storm Sewer	6010.602	SW-602, E[4]	2	Fixed[2]	Yes	No	No
	6010.602	SW-602, F[4]	3	Adjustable[3]	No	No	No
	6010.602	SW-602, G[4]	2	Fixed	No	No	No

[1] Machine bearing surfaces required.
[2] Typically used with non-paved or flexible surfaces, including HMA, seal coat, gravel, and brick.
[3] Typically used with PCC surfaces, including castings in concrete boxouts.
[4] Storm sewer casting may include environmental symbols and/or messages such as "DUMP NO WASTE, DRAINS TO RIVER."

2. **Intakes:**
   a. Comply with Figures 6010.602 through 6010.604 and the contract documents.
   b. Castings may include environmental symbols and/or messages such as "DUMP NO WASTE, DRAINS TO RIVER."

3. **Manhole Casting Extension Ring:**
   a. Match the dimensions of the existing ring and cover with an allowable diameter tolerance of -1/4 inch for the frame ridge and +1/4 inch for the cover recess.
   b. Provide extension ring with height as required to raise the top of the casting to make it level or no more than 1/4 inch below the finished pavement surface. Maximum ring height is 3 inches.

2.11 ADDITIONAL MATERIALS FOR SANITARY SEWER MANHOLES

A. Chimney Seal:

1. **External Rubber Seal:**
   a. Rubber Sleeve and Extension:
      1) Corrugated; minimum thickness of 3/16 inches, according to ASTM C 923.
      2) Minimum allowable vertical expansion of at least 2 inches.
   b. Compression Bands:
      1) One-piece band assembly to compress sleeve or extension against manhole and casting surfaces.
      2) 16 gauge ASTM A 240, Type 304 stainless steel, minimum 1 inch width, minimum adjustment range of 4 inches more than the manhole outside diameter.
      3) For standard two-piece castings, shape top band to lock sleeve to manhole frame's base flange. For three-piece adjustable castings, shape top band to lock sleeve to upper piece of adjustable frame.
      4) Stainless steel fasteners complying with ASTM F 593 and 594, Type 304.

2.11 ADDITIONAL MATERIALS FOR SANITARY SEWER MANHOLES (Continued)

2. Internal Rubber Seal:

a. Rubber Sleeve and Extension:

1) Double pleated, minimum thickness 3/16 inch thick, according to ASTM C 923.
2) Minimum allowable vertical expansion of at least 2 inches.
3) Integrally formed expansion band recess top and bottom with multiple sealing fins.

b. Expansion Bands:

1) One-piece band assembly to compress sleeve or extension against manhole and casting surfaces.
2) 16 gauge ASTM A 240, Type 304 stainless steel, minimum 1 3/4 inch width, minimum adjustment range of 2 inches more than the manhole inside diameter.
3) Stainless steel locking mechanism of studs and nuts complying with ASTM F 593 and ASTM F 594, Type 304.

B. Riser Section Coating:

1. Exterior: When exterior waterproof coating is specified, provide bituminous or coal tar coating.

2. Interior: When interior manhole lining is specified, provide lining according to Section 4010, 2.01 (lined, reinforced concrete pipe).

2.12 INVERT

A. Cast-in-place Base: Provide a cast-in-place invert with concrete complying with the requirements of Section 6010, 2.02.

B. Precast Base Section:

1. For sanitary sewers, provide a precast invert, unless otherwise allowed by the Engineer. Comply with Section 6010, 3.01.

2. For storm sewers, provide a cast-in-place invert with concrete complying with the requirements of Section 6010, 2.02.

2.13 STEPS

A. Provide steps in all circular, precast manholes unless otherwise specified in the contract documents.

B. Comply with ASTM C 478.

C. Manufacture using polypropylene encased steel.

D. Uniformly space steps at 12 to 16 inches.

E. Align with vertical side of eccentric top section.

F. Place first step no more than 36 inches from top of casting.

2.14 PRECAST CONCRETE TEE

A. Tee and Eccentric Reducers: ASTM C 478.

B. Composite Tee: Comply with Figure 6010.305. May be substituted for pipe diameters less than 48 inches.

2.15 ANCHOR BOLTS

A. Material: Stainless steel or hot-dipped galvanized.

B. Diameter: Minimum 1/2 inch diameter.

C. Length: As required to pass through adjustment rings and into manhole or intake structure to embedment depth recommended by anchor manufacturer.

2.16 EXCAVATION AND BACKFILL MATERIAL

Comply with Section 3010 for bedding and backfill materials.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS FOR INSTALLATION OF MANHOLES AND INTAKES

A. Excavation: Excavate according to Section 3010.

B. Subgrade Preparation:

1. **Cut Sections (Undisturbed Soil):** Prepare subgrade to accurate elevation required to place structure base or subbase.

2. **Fill Sections:** Compact to 95% of maximum Standard Proctor Density and hand grade to accurate elevation required to place structure base or subbase, or install stabilization material as directed by the Engineer.

3. **Unstable Soil:** Install stabilization material as directed by the Engineer.

C. Subbase:

1. **Cast-in-place Structures:** No subbase material is required.

2. **Precast Structures:** If precast structure is provided, install 8 inch thick pad of Class I bedding material a minimum of 12 inches outside footprint of the structure.

D. Installation of Manhole or Intake Structure: When necessary, adjust wall height and depth of base to provide a minimum of 48 inches between form grade elevation and top of base.

1. **Cast-in-place:** Comply with Section 6010, 3.02.

2. **Precast:** Comply with Section 6010, 3.03.

E. Pipes: Install and bed pipes and connect to manhole or intake. Install pipe flush with inside wall of structure. Place bedding and pipe embedment material according to Section 3010.

1. **Cast-in-place Structures:**
   a. **Storm:** Form structure walls around pipe.
   b. **Sanitary:** Form or core circular opening and install flexible, watertight gasket according to Section 6010, 2.08. Keep void between pipe and manhole section free of debris and concrete.

2. **Precast Storm Sewer Manholes or Intakes:** If annular space between pipe and structure is less than 2 inches, fill with non-shrink grout. If annular space is 2 inches or greater, construct a concrete collar around the pipe according to Section 6010, 3.05.

3. **Precast Sanitary Sewer Manholes:** Connect to structure with flexible, watertight gasket according to Section 6010, 2.08. Keep void between pipe and manhole section free of debris and concrete.

4. **Sanitary Sewer Manholes on Existing Pipe:** Install waterstop according to Section 6010, 2.08.

F. Joint Sealant:

1. **Sanitary Sewer Manholes:**
   a. Install rubber O-ring or profile gasket (precast structures).
   b. Apply bituminous jointing material or butyl sealant wrap to exterior of all sanitary sewer manhole joints.

3.01 GENERAL REQUIREMENTS FOR INSTALLATION OF MANHOLES AND INTAKES (Continued)

2. **Storm Sewer Manhole and Intakes:**
   a. Apply bituminous jointing material or install rubber rope gasket.
   b. If indicated in the contract documents, apply engineering fabric wrap to joints.

G. Invert:

1. Construct manhole or intake invert up to one-half of pipe diameter to produce a smooth half-pipe shape between pipe inverts.

2. Shape invert to provide a smooth transition between pipe inverts.

3. Slope invert top toward pipe 1/2 inch per foot perpendicular to flow line.

4. For sanitary sewer, keep void between pipe and structure wall free of debris and concrete.

5. For precast inverts, remove any projections and repair any voids to provide a hydraulically smooth channel between ends of pipes.

H. Top Sections: Install manhole eccentric cone or flat top section or install intake top.

I. Adjustment Ring(s): Bed each concrete ring with bituminous jointing material in trowelable or rope form. Bed each polyethylene ring with manufacturer's approved product. Do not install more than a total ring stack height of 12 inches. For greater adjustment, modify lower riser section(s).

J. Casting: Install the type of casting specified in the contract documents and adjust to proper grade. Where a manhole or intake is to be in a paved area, adjust the casting to match the slope of the finished surface. When specified in the contract documents, attach a casting frame to the structure with four anchor bolts.

K. Chimney Seal: For sanitary sewer manholes, install an internal or external rubber chimney seal.

1. Do not use external chimney seal if seal will be permanently exposed to sunlight.

2. Extend seal 3 inches below the lowest adjustment ring.

3. Extend seal to 2 inches above the flange of the casting for a standard two-piece casting, or 2 inches above the top of the base section of the casting for an adjustable three-piece casting.

4. Use multiple seals, if necessary.

5. Install compression bands (external chimney seal) or expansion bands (internal chimney seal) to lock the rubber sleeve or extension into place and to provide a positive watertight seal. Once tightened, lock the bands into place. Use only manufacturer recommended installation tools and sealants.

L. Backfill and Compaction:

1. Place suitable backfill material after concrete in structure has reached at least 3,000 psi compressive strength or 550 psi flexural strength. If concrete strength is not determined, place backfill at least 14 calendar days after initial concrete placement.

3.01 GENERAL REQUIREMENTS FOR INSTALLATION OF MANHOLES AND INTAKES (Continued)

2. Place backfill material simultaneously on all sides of walls and structures so the fill is kept at approximately the same elevation at all times.

3. Compact the 3 feet closest to all walls using pneumatic or hand tampers only. Ensure proper and uniform compaction of backfill around structure.

3.02 ADDITIONAL REQUIREMENTS FOR CAST-IN-PLACE CONCRETE STRUCTURES

A. Forms:

1. Comply with Iowa DOT Article 2403.03, B.

2. Form all cast-in-place manholes and intakes on both the inside and the outside face above the base. Do not form against excavated earthen surface.

B. Reinforcing Steel:

1. Comply with Iowa DOT Section 2404.

2. Lap bars a minimum of 36 diameters, unless otherwise specified in the contract documents.

3. Provide a minimum of 3 inches of clearance for structure bases and 2 inches of clearance for walls and tops.

C. Concrete Mixing:

1. Comply with Iowa DOT Article 2403.02, D.

2. When using ready-mixed concrete, comply with ASTM C 94.

D. Concrete Placing:

1. Comply with Iowa DOT Article 2403.03, C.

2. Do not place concrete when the air temperature is less than 40°F without the approval of the Engineer. When placement of concrete below 40°F is allowed, comply with Iowa DOT Article 2403.03, F.

3. Place concrete continuously in each section until complete. Do not allow more than 30 minutes to elapse between depositing adjacent layers of concrete within each section.

4. Comply with Iowa DOT Article 2403.03, D for concrete vibration.

5. Form 1 1/2 inch by 3 inch keyed construction joints at locations shown in the contract documents.

6. Provide a broom finish on portions of structure that are to become part of exposed pavement.

3.02 ADDITIONAL REQUIREMENTS FOR CAST-IN-PLACE CONCRETE STRUCTURES (Continued)

E. Stripping and Cleaning:

1. Remove forms for manhole and intake walls and tops according to Iowa DOT Article 2403.03, M. References to culverts include all sanitary and storm structures. When allowed by the Engineer, compressive strengths at six times the stated flexural strengths may be used in determining concrete strength of structure tops.

2. Finish surfaces according to Iowa DOT Article 2403.03, P. Give exposed surfaces a Class 2 finish.

F. Curing:

1. Comply with Iowa DOT Article 2403.03, E.

2. For surfaces visible to the public, use only curing compounds complying with ASTM C 309, Type 1-D or Type 2.

G. Exterior Loading:

1. Restrict exterior loads on concrete according to Iowa DOT Article 2403.03, N.

2. When allowed by the Engineer, compressive strengths at six times the stated flexural strengths may be used.

H. Repairs: After visual inspection of the completed manhole or intake, repair honeycomb areas, visible leaks, tie holes, or other damaged areas. Remove concrete webs or protrusions.

I. Concrete Testing: The Engineer will conduct testing.

3.03 ADDITIONAL REQUIREMENTS FOR PRECAST CONCRETE STRUCTURES

A. Substitutions: Precast structures may be substituted for designated cast-in-place structures so long as the structure is constructed as specified in the contract documents and complies with the requirements of Section 6010, 3.02.

B. Cast-in-place Base:

1. Comply with Section 6010, 3.02 for placement of concrete.

2. Ensure proper vertical and horizontal alignment of base riser section.

C. Precast Base or Base with Integral Riser Section: Place base or base with integral riser section and ensure proper vertical and horizontal alignment.

D. Additional Riser Sections: Install additional riser sections as required.

E. Lift Holes: Install rubber plug in lift holes. Cover plug and hole with non-shrink grout.

3.04 ADJUSTMENT OF EXISTING MANHOLE OR INTAKE

A. Casting Extension Rings:

1. Install casting extension rings only when specified in the contract documents, and only in conjunction with pavement overlays.

2. Install according to the manufacturer's recommendation and adjust for proper alignment.

B. Minor Adjustment (Adding or Removing Adjustment Rings):

1. Remove casting.

2. Modify adjustment ring stack height by one of the following methods:
   a. Add adjustment rings as necessary to adjust existing manhole or intake to finished pavement grade or finished topsoil grade, to a maximum ring stack height of 16 inches. Bed each concrete ring with bituminous jointing material. Bed each polyethylene ring with manufacturer's approved product.
   b. Remove one or more adjustment rings, as appropriate, to reduce casting elevation.

3. Install new casting on modified adjustment ring stack. Existing casting may be reinstalled when specified in the contract documents.

4. Replace chimney seal for sanitary sewer manhole using only new materials.

C. Major Adjustment (Adding, Removing, or Modifying Riser or Cone Section): When adjustment is greater than can be accomplished through adding or removing adjustment rings, a major adjustment will be required.

1. Remove casting.

2. Remove top.

3. Remove and replace or modify existing riser section and/or top section, as appropriate.

4. Install new frame and cover or grate. Existing casting may be reinstalled when specified in the contract documents.

5. Replace chimney seal for sanitary sewer manhole using only new materials.

3.05 CONNECTION TO EXISTING MANHOLE OR INTAKE

A. General:

1. Remove existing invert as necessary to install pipe at required elevation and develop hydraulic channel.

2. Insert pipe into structure and trim end flush with inside wall of structure.

3. Place backfill material according to Section 3010.

B. Concrete Collar:

1. For new pipes 12 inches or smaller, install two number 4 steel reinforcing hoops in collar around pipe. Pour concrete collar around pipe/structure junction to a minimum thickness and width of 6 inches, providing a minimum of 4 inches of concrete extending beyond the pipe opening.

3.05 CONNECTION TO EXISTING MANHOLE OR INTAKE (Continued)

2. For new pipes larger than 12 inches, install two number 4 steel reinforcing hoops in collar around pipe. Pour concrete collar around pipe/structure junction to minimum thickness and width of 9 inches, providing a minimum of 4 inches of concrete extending beyond the pipe opening.

C. Sanitary Sewer:

1. General:
a. Core new openings in existing manholes unless otherwise specified in the contract documents.
b. Divert flow as necessary. Obtain approval of the diversion plan from the Engineer. Maintain sanitary sewer service at all times unless otherwise specified in the contract documents.

2. Cored Opening:
a. Insert flexible watertight connector into new opening.
b. Install and tighten internal expansion sleeve to hold flexible connector in place.
c. Insert pipe through flexible connector and tighten external compression ring.
d. Do not install grout or concrete collar for cored opening with flexible connector.

3. Cut and Chipped Opening (Knock-out): Use only when specified or allowed.
a. Saw opening to approximate dimensions with a masonry saw. Saw to depth sufficient to sever reinforcing steel.
b. Remove concrete and expand opening to a diameter at least 6 inches larger than the outside diameter of the new pipe.
c. Cut off all reinforcing steel protruding from the structure wall.
d. Install waterstop around new pipe centered within structure wall.
e. Fill opening between structure and pipe with non-shrink grout.
f. Construct concrete collar around pipe and exterior manhole opening.
g. Provide pipe joint, non-shear coupling, or other approved flexible coupling within 2 feet of structure wall to allow for differential settlement between the new sewer and the structure.

D. Storm Sewer:

1. Cut opening to manhole or intake to 3 to 6 inches beyond the outside of the pipe.

2. Fill opening between manhole or intake wall and outside of pipe with non-shrink grout or construct a concrete collar around the pipe according to Section 6010, 3.05, B.

3.06 REMOVAL OF MANHOLE OR INTAKE

A. Unless otherwise specified, remove the entire structure to a minimum of 10 feet below top of subgrade in paved areas or 10 feet below finished grade in other areas.

B. Pipes:

1. Contact the Engineer to verify the sewer line is not in use.

2. Construct sewer plug by completely filling the end of the pipe with concrete. Force concrete into the end of the pipe for a distance of 16 inches, or one-half the pipe diameter, whichever is greater.

3. If specified in the contract documents, fill the line to be abandoned with flowable mortar or CLSM (comply with Section 3010) by gravity flow or pumping.

3.06 REMOVAL OF MANHOLE OR INTAKE (Continued)

C. Fill remaining structure using flowable mortar.

D. Place compacted backfill over remaining structure as required for embankment or compacted backfill.

3.07 CLEANING, INSPECTION, AND TESTING

Clean, inspect, and test structures according to Section 6030.

END OF SECTION