SECTION 02722

STORM SEWER COLLECTION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. This section addresses the installation of storm sewer collection mains and includes the acceptable products, materials, and construction practices that are to be used in the installation of storm sewer collection systems.

B. The minimum allowable pipe diameter of public storm sewer mains shall be 18 inches, unless accepted by the City.

C. Related Work Specified Elsewhere:
1. Reinforced Concrete Pipe for Storm Sewers: Section 02615.
2. High Density Polyethylene Corrugated (HDPE) Pipe for Storm Sewers: Section 02622.
3. Profile Wall Polyethylene (HDPE) Pipe for Storm Sewers; Section 02622
4. Steel Reinforced Ribbed Thermoplastic (HDPE) Pipe for Storm Sewers: Section 02622
5. Polyvinyl Chloride (PVC) Pipe for Storm Sewers: Section 02622.
6. Trenching, Bedding, Backfilling and Compacting: Section 02221.
7. Testing of the Storm Sewer System: Section 01666.
8. Manholes: Section 02605.
9. Cast-in-place Concrete: Section 03300.
10. Precast Concrete: Section 03400.
11. Metal Coatings and Fabrications: Section 05500.

D. Measurement and Payment Procedures.
1. For public funded capital improvement projects, measurement and payment procedures will be determined on a project by project basis.
2. For privately funded development projects, Owner will determine measurement and payment requirements.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. C891 – Installation of Underground Precast Concrete Utility Structures.
2. D2321 – Underground Installation of Flexible Thermoplastic Sewer Pipe.
3. F1417 – Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
4. C1821 – Installation of Underground Circular Precast Concrete Manhole Structures.

B. Where reference is made to one of the above standards, the latest revision shall apply.

1.03 SYSTEM DESCRIPTION AND SUBMITTALS

A. See Section 02615 – 1.03 B and the following:
1. System schematic description is shown on the plan and profile drawings. Furnish additional schematic drawings necessary to clearly show all details of the system layout and construction. The schematic drawings shall clearly identify the location of connecting pipes, manholes, water quality

structures, inlets, outlets, storage and water quality ponds, and other structures. Standard Graphic Drawing 01010-1 shows typical storm sewer layout requirements.

1.04 SUBMITTALS

A. Pipes: See Sections 02615 and 02622.

B. Manholes: See Section 02605.

C. Bedding and Backfill Materials: See Section 02221.

D. Concrete: See Sections 03300 AND 03400.

1.05 QUALITY ASSURANCE

A. See Sections 01010 – 1.08, 02221 – 1.02, and the following:
   1. The only acceptable methods for the laying of storm sewer shall be using either a laser or batter boards.

B. Construction staking.
   1. Reference paragraph 1.02B of Section 02221.

C. Do not deviate from horizontal alignment between consecutive manholes by more than 6 inches maximum or by more than 1-inch in 100 feet.

D. Vertical alignment shall remain uniform between manholes, with deviation from the grade specified on the Construction Drawings of no greater than ± 1 inch/100 feet except that sags that would pond water are not permitted.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Reference Sections 02605, 02615, and 02622 and the following:

B. Handle in a manner to ensure installation in sound and undamaged condition.
   1. Do not drop or bump.
   2. Use slings, lifting lugs, hooks, and other devices designed to protect pipe, joint elements, linings, and coatings.

C. Ship move, and store with provisions to prevent movement or shock contact with adjacent units.

D. Handle with equipment capable of work with adequate factor of safety against overturning or other unsafe procedures.

1.07 PROJECT AND SITE CONDITIONS

A. Reference Section 02221-1.03.

1.08 MAINTENANCE AND CORRECTION

A. Reference Section 02221 – 1.04.

PART 2 PRODUCTS

2.01 MANHOLES

A. Reference Section 02605.

2.02 PLASTIC STORM PIPE

A. Reference Section 02622.

2.03 CONCRETE STORM PIPE

A. Reference Section 02615.

2.04 CAST-IN-PLACE CONCRETE

A. Reference Section 03300.

2.05 PRECAST CONCRETE

A. Reference Section 03400.

2.06 BEDDING AND BACKFILL MATERIALS

A. Reference Section 02221.

2.07 STEEL REINFORCED RIBBED THERMOPLASTIC PIPE (HDPE)

A. Reference Section 02622.

PART 3 EXECUTION

3.01 INSTALLATION – GENERAL

A. Storm pipe construction shall be done in accordance with engineered construction plans and specification found in Section 01666 for possible deflection testing.

B. No storm pipe may be covered or backfilled until inspection of pipe and bedding has been made.

C. Stabilization materials shall be required for storm sewers where unstable soil and ground water exist. Bedding material shall be placed in the trench bottom, to a minimum of 6 inches and bell holes and depression shall be dug in the bedding to provide a uniform and continuous bearing support for the pipe at every point between bell holes.

D. Install pipe of size, materials, strength class, and joint type with embedment indicated for plan location.

E. Use equipment, methods, and materials ensuring installation to lines and grades indicated.

F. Install Plastic Pipe in accordance with ASTM D2321 as modified and expanded by Section 02221 and the following requirements:
   1. See Section 01666 for deflection testing.

3.02 INSPECTION

A. Pipe, fittings, and manholes shall be free of dirt or other objects prior to installation. Exclude entrance of foreign matter during installation, interruption, or completion of installation.

B. Pipe and fittings shall be inspected for cracks, dents, abrasions or other flaws prior to installation.
   1. Defective pipe and fittings shall be marked and remain on the site until removal is accepted by the City.

C. Manholes and other precast structures shall be inspected for cracks or other flaws prior to installation.
   1. Damaged manholes and other precast structures shall be marked and remain on the site until removal is accepted by the City.

3.03 PREPARATION

A. Trenching, backfilling and compaction.
   1. Reference: Section 02221.

B. Cutting the pipe.
   1. The pipe shall be cut smooth, straight, and at right angles to the pipe axis, with saws or pipe cutters which are designed specifically for the material.
   2. The cut end of the pipe shall be beveled in accordance with the manufacturer's recommendations.
   3. Burrs shall be moved and all dust shall be wiped off of the jointing surface.

C. Connections
   1. The location and elevation of the existing pipes and manhole inverts shall be verified prior to construction.
   2. Connections to existing pipes shall be made with an approved coupling device or method accepted by the City.

D. Joints
   1. Dirt, oil, grit, and other foreign matter shall be removed from the inside of the bell or grove and the outside of the spigot or tongue. Keep all joint surfaces clean and dry.
   2. A thin film of lubricant shall be applied to the inside surface of the gasket and the spigot or tongue end of the pipe, per the pipe manufacturer's recommendations.
   3. The lubricated joint surface shall be kept clean until joined.
   4. The pipe shall be joined to the tolerances recommended by the manufacturer.
   5. Stabbing of the pipe shall not be allowed. Use approved method of leverage.
   6. Previously completed joints shall not be disturbed during the jointing operation.
   7. All joints shall be watertight and free from leaks.
   8. After the initial acceptance of the storm sewer line, the Contractor shall be responsible for the repair of any leak, resulting from improper workmanship or materials, which is discovered within a two-year period.

3.04 PIPE INSTALLATION

A. Pipe installation shall begin at the lowest elevation and proceed upstream to the highest, unless prior written accepted is obtained from the City.
   1. Pipe shall be installed so that the bells and groves are pointing upstream.
   2. The pipeline shall be installed so that a uniform grade is maintained between manholes.

B. The joint shall be completed in accordance with the pipe material specification, and the pipe shall be adjusted to the correct line and grade as each length of pipe is placed in the trench.
   1. Pipe shall be laid to and maintained at required lines and grades as specified in the accepted construction drawings.
   2. Maintain within tolerances specified or acceptable laying schedule.
      a. Alignment: ± 1 inch per 100 feet in open cut.
      b. Grade: ± 1 inch per 100 feet with no sags that would pond water.

C. Do not lay on blocks unless pipe is to receive total concrete encasement.

D. The pipe shall be secured in place with the careful placement of the specified granular bedding material consolidated under and around the pipe up to the springline.

E. The Contractor shall prevent the opening of joints during bedding and backfilling operations.
   1. Bedding material shall not be dropped onto unsupported pipe, which has been set to alignment and grade.
   2. Water setting or jetting is prohibited.

F. The Contractor shall grout shut all pick holes with water stop grout (non-shrink). Cups or mastic shall not be used.

G. Concrete encasement or extruded butyl adhesive tape shall be provided where indicated on the Construction Drawings or required by these specifications.
   1. Cast-In-Place Concrete
      a. Reference: Section 03300.
   2. At any location where a water main crosses a storm main, and the storm main is above the water main, the crossing shall be constructed by one of the following methods:
      a. One length of storm main pipe, with a laying length of 18 feet or greater, shall be encased by installing the pipe in a larger storm main.
      b. The structural storm pipe shall be centered on the water main, and shall be the same size as the remainder of the storm main.
      c. All structural storm pipe shall be ductile iron pipe or an approved equal.
      d. Any joint bells 10 feet from the centerline of the pipe being crossed shall be encased in reinforced concrete per City of Loveland Standard Drawing WW-11 or WW-10.
      e. All joint bells 10 feet from centerline of the pipe being crossed shall be sealed with a butyl rubber-based flexible joint wrap such as EZ-WRAP or approved equal.
   3. Suitable backfill or other structural protection shall be provided to prevent settling or failure of the higher pipe.

3.05 MANHOLE INSTALLATION

A. Reference Section 02605.

B. Manholes shall be installed at the location and to the elevation shown on the Construction Drawings, or as accepted by the City to accommodate field conditions.

C. Measurements of the actual location and elevations of storm main inverts shall be made for recording in the Record Drawings by the Design Engineer.

D. Installation shall conform to requirements of ASTM C1821.

3.06 LATERAL CONNECTIONS

A. Lateral connections include connection to private parking lot drainage systems, roof drains, or other private storm water drains accepted by the City. No connections shall be made until after acceptance by the City.

B. Lateral connections shall be installed at the locations designated on the accepted construction drawings.

C. Lateral connections on existing trunks shall be installed by core drilling and grouting new pipe connections.

3.07 INLETS

A. Reference Section 02605 for manhole risers, Section 03300 for cast-in-place concrete and Section 03400 for precast concrete.

B. See Section 05500 for associated metal coatings, grates, frames, covers and fabrications.

C. See Standard Drawings SW-2, SW-3, SW-4, SW-5A, SW-5B.

D. Furnish detailed design data, shop drawings, structural details, and layouts for all non-standard inlets.

E. Install in accordance with ASTM C891.

3.08 WATER QUALITY STRUCTURES

A. Reference Section 03300 for cast-in-place concrete, and Section 03400 for precast concrete, and Section 05500 for metal castings, grates, frames, covers and fabrications.

B. Detailed requirements for water quality structures shall meet or exceed the following requirements:

1. Maintenance access. Use 27-inch or larger diameter access opening for human and maintenance equipment access.

2. Facilities to bypass flow exceeding designed capacity.

3. Design structure to remove 80% Total Suspended Solids (TSS).

4. Furnish for acceptance certified third party test data on removal rates of trash, suspended sediment, oil or other designed water quality parameters.

5. Furnish schedule of standard maintenance, monitoring, and cleaning equipment.

6. Furnish head loss through structure at design flow rate.

7. Location for maintenance (traffic control) on major streets.

END OF SECTION