SECTION 4100 STRUCTURES - STORM SEWERS

4101 SCOPE. This section governs the performance of all work necessary for construction of cast-in-place and precast concrete and masonry structures for inlets, manholes, junction boxes, box culverts, headwalls, and incidental structures.

4102 MATERIALS.

A. Concrete Mixes. Concrete shall conform to requirements set forth in Section 2000, "Concrete".

B. Reinforcing Steel. Reinforcing bars shall conform to ASTM A-615, Grade 60 Welded steel wire fabric shall conform to ASTM A-185.

C. Precast Concrete Structures.

1. Manholes. Precast manholes shall conform to ASTM C-478. Joints between concrete manhole sections shall be made with plastic joint compound or preformed plastic compound as specified in Section 4004. Minimum cross sectional area of preformed compound shall be 1 inch square or 1.25 inches diameter.

2. End Sections for Concrete Pipe. Shall be flared end sections of the pipe manufacturer's standard design, and shall meet all applicable requirements of ASTM C-76 for Class II or higher classes of pipe.

3. Rectangular Structures. Shall conform to the inside dimension indicated on the drawings and be designed for the following loads:

a. H-20 live load for all structures in/or under pavement, shoulders, driveways, and other traffic areas.

b. 2,000-lb wheel live load for curb opening inlets and junction boxes in non-traffic areas.

c. 50 pcf, equivalent fluid pressure for soil pressure on vertical walls.

d. 120 pcf for unit weight of soil cover on top slabs.

D. Cement Mortar. Pre-mix mortar non-shrink or expansive grout in mortar for packing pipe in openings of precast structures, setting castings, and other incidental work shall consist of one part portland cement and two parts sand by volume mixed with sufficient water to form a workable stiff grout.

E. Metal Castings. Castings shall be gray iron conforming to ASTM A-48, Class 30. Castings shall be of the shape, dimension and minimum weight indicated on the drawings, and be free from manufacturing defects. Castings shall be cleaned and painted with one coat coal tar before delivery. Bearing surfaces between frames

and covers for installation in traffic areas shall be machined to provide even seating. Manhole rings and covers shall be Clay and Bailey No. 2008BV, Deeter No. 1315 or approved equal. Inlet rings and covers shall be Clay and Bailey No. 2020, Deeter No. 2016 or approved equal. All covers shall have Liberty - Storm cast on the top.

F. End Sections. Metal and HDPE end sections shall be fabricated as specified in Section 4004, and shall be flared end sections of the pipe manufacturer's standard design. End sections shall be furnished with a toe plate. Bituminous coating is not required for metal end sections.

G. Toe Walls. Flared end sections for concrete, metal, and HDPE pipe shall be set on a concrete toe wall centered on the end of the section. Toe walls shall be 6 inches thick by 30 inches deep by the width of the end section.

4103 CONSTRUCTION DETAILS.

A. Concrete Structures. Concrete construction shall conform to the requirements set forth in Section 2000, "Concrete".

1. Precast Structures. The Contractor may, at his option, construct precast concrete inlets, junction boxes, and box culverts, in lieu of the cast-in-place structures indicated on the drawings; except that all concrete base slabs for pre-cast inlets, manholes, and junctions boxes may be cast-in-place. Solid concrete brick or block shall be used to block inlets and similar structures to grade during placement of base slab concrete.

Precast concrete box culvert sections shall be installed on a 4 inch leveling course of untreated compacted aggregate conforming to the following:

U.S. Standard Square Mesh Sieve	Percent Passing Square Mesh Sieve
1 1/4"	100
1"	72-100
3/4"	60-90
3/8"	43-74
No. 4	28-60
No. 10	16-40
No. 40	3-22
No. 200	0-15

In addition to the above limits, the difference between the "Percent Passing Square Mesh Sieve" of successive sieve sizes shall not exceed 25. That fraction of the material passing the No. 40 Sieve shall have a plasticity index not to exceed 8 when tested in accordance with ASTM D-423, and D-424.

Leveling courses shall extend one foot past the line of the box section, and

be finished to a true plane surface to provide uniform bearing for the precast section.

2. Finishing.

a. Formed Surfaces. Immediately following removal of the form, fins and irregular projections shall be removed. Form tie connections, holes, honeycomb spots, and other defects shall be thoroughly cleaned, saturated with water, and pointed with grout. The repaired surfaces shall be cured in accordance with Section 2000, "Concrete".

b. Exposed Slabs. Finish for exposed slabs shall be wood float texture in accordance with MCIB Specification Section 24. Exposed edges shall be beveled or edged with a radial tool.

c. Inlet Stamp. All pre-cast or cast-in-place concrete storm sewer inlet tops shall be stamped with the impression, “NO DUMPING DRAINS TO STREAM” as 2” letters with fish logo per City of Liberty Inlet Stamp detail.

3. Form Removal. Forms shall remain in place until the concrete has attained sufficient strength to support loads imposed by backfilling, construction, and traffic, but not less than:

a. Walls. Forms shall remain in place for a minimum of 3 days or until the concrete reaches a minimum strength of 2000 p.s.i.

b. Slabs. Form shall remain in place for a minimum of 7 days or until the concrete reaches a minimum strength of 3000 p.s.i.

B. Invert Channels. Form concrete invert channels in manholes, inlets, and junction boxes to make changes in direction of flow with smooth curves of as large a radius as permitted by the inside dimension of the structure. Grade changes and transitions shall be smooth and uniform and all parts of the invert channel and adjacent floor shall slope to drain. Channel bottom shall be finished smooth without roughness or irregularity. Invert channels for precast concrete structures may be cast integrally with the structure base slabs at the Contractor's option.

C. Excavation and Backfill. All excavation and backfill shall be in conformance with Section 1100 entitled "Grading" and as specified herein.

1. Excavation. Excavation for structures shall be carried a sufficient distance, but not less than 18 inches outside the limits of the structure to permit efficient erection and removal of forms and laying of masonry units, and shall be sloped, stepped, or braced as required for stability. When unsuitable soils are encountered at the bearing elevation of the structure, they shall be removed and replaced with either fill concrete or compacted granular material at the Contractor's option. Over excavation shall be

corrected in like manner. The Contractor shall maintain the excavation free of standing water until backfilling is complete.

2. Backfilling. Backfilling shall conform to the requirements of Section 4005(C) and as follows:

   a. No backfill shall be placed over or around any structure until the concrete or mortar therein has attained a minimum strength of 2000 p.s.i. and can sufficiently support the loads imposed by the backfill without damage.

   b. The Contractor shall use utmost care to avoid any wedging action between the side of the excavation and the structure that would cause any movement of the structure. Any damage caused by premature backfill or by the use of equipment on or near a structure will be the responsibility of the Contractor.

   c. Backfill shall be placed and compacted on all sides of the structure simultaneously, and operations shall be so conducted that the backfill is always at approximately the same elevation on all sides of the structure.

   d. No excavated rock larger than four (4) inches maximum dimension shall be placed within one (1) foot of the exterior surface of any structure.