

## SECTION 7.0 DRAINAGE STRUCTURES

### 7.01 Scope of Work

This item shall consist of installation and construction of storm drainage pipes, culverts, basins, headwalls, manholes, junction boxes, head ditches, tail ditches and berm ditches. All drainage construction shall conform to the requirements and dimensions as shown on the project plans, City Standard drawings, or as stated in these specifications.

### 7.02 Masonry

This work consists of the general requirements for all unreinforced brick masonry construction. Dampen brick when necessary to reduce the rate of absorption. Build brick masonry plumb and true to the required dimensions. Place a header course approximately mid height of the structure in structures less than nine (9) courses high. Place a header course every third course in structures nine (9) courses high or more. Use other types of bonding where indicated on the plans.

Use spalls or bats only when shaping around irregular openings or when unavoidable to finish out a course. Place a full brick at the corner and place the bat in the interior of the course when necessary to finish out the course.

**Completely** fill brick joints and cavities with mortar. Make mortar joint thickness at least 3/8" but not more than 5/8". Finish joints that will remain exposed after backfill with a concave jointer. Flush cut all other joints.

Do not place masonry when the temperature is below 35° F unless adequate protection is provided by a pre-approved method. When it is anticipated that the temperature will fall below 35°F, protect the masonry for three curing days per NCDOT 830-5.

### 7.03 Materials for Masonry Construction

Materials for masonry construction shall meet the requirements as set forth in the following test designations and specifications.

- (a) All materials and masonry construction including cement, sand, aggregate, water, brick and mortar shall comply with Section 1040 of the NCDOT Standard Specifications.
- (b) Reinforcing Steel

Reinforcing steel shall be new billet stock of grade 40 and shall conform to ASTM 615 latest revision. The contractor shall furnish the City Engineer with a certificate from the manufacturer stating that the product is open hearth steel and giving those chemical and physical properties of the heat required by ASTM 615. Bars shall be deformed to conform to ASTM 615. Bars when placed in the work shall be free from loose rust, loose mill scale, oil, structural defects and other foreign material and shall be kept protected at all times on the job.

All reinforcing steel within the limits of a days pour shall be in place and firmly wired before concrete pouring is started. Wire supports, laps splices, and construction shall comply with the "Manual of Standard Practice" published by the Concrete Reinforcing Steel Institute.

On exterior exposed work, no ties or spacers shall be permitted to remain within three eighths (3/8") of an inch of the finished surfaces.

(d) Frames, Grates, and Hoods

Frames, grates, and hoods for catch basins shall conform to City of Gastonia standard drawings 71C-1, 71C-2, and 71C-3 and shall be equal to those used presently by the City; grates shall include "City of Gastonia" in the casting. All castings shall conform to ASTM A-48-74 Class 30 or latest addendum. All castings shall be true to pattern in form and dimensions, free from faults, sponginess, cracks, blowholes, and other defects affecting their strength. Bearing surfaces between cast frames, covers, and grates shall be machined, fitted, and match-marked to prevent rocking. Steps shall be those as shown on Standard Detail 71B-2 or approved equal. All gray iron castings shall be supplied with "no paint".

#### 7.04 Concrete Pipe Culverts

All reinforced pipe supplied under this item shall be Modified Bell and Spigot or Tongue and Groove. For Modified Bell and Spigot pipe supplied under this item, the nominal Bell diameter shall not exceed the nominal diameter of the pipe by more than two inches (2"). Unless installation depth or loading requires otherwise, all such pipe shall be Class III "Wall B" as determined by ASTM Test Designation C-76. The pipe class, type of wall, and date of manufacture shall be clearly marked on each section of pipe. Test data for reinforced concrete pipe supplied to the City shall be made available to the City within 7 days of such request.

Lift holes shall be constructed in all reinforced pipe 60 inches or larger in diameter. The maximum allowable lengths per joint for reinforced pipe shall be 8 feet.

All reinforced concrete pipe shall be delivered to the City's stockpile or to the job site as may be designated by the City Engineer. Any pipe damaged during shipping or handling by supplier or hauler's personnel or equipment shall not be accepted and shall be removed from the City at the expense of the supplier or hauler.

Under materials only contracts, any and all cost for delivery of this material shall be included in the unit price of the pipe. The City will try to request delivery of the materials specified in the proposal in truck or mixed-truck loads; however, the materials may, from time to time, be requested in smaller quantities. The contractor shall be required to deliver these materials as requested by the City to a minimum load size of forty (40) linear feet of pipe.

All RCP joints shall be sealed using a Butyl Rubber Sealant; refer to City of Gastonia specifications, Section 8.07

Materials and construction methods shall conform to the specifications as set forth in Section 310 and Section 412 of the NCDOT "Standard Specifications for Roads and Structures" latest revision, and all materials shall be approved by the City Engineer before installation. Specifically, pipe shall be laid on prepared foundation, bell or groove end upgrade with spigot or tongue fully inserted. Butyl Rubber Sealant shall be placed just behind the leading edge of the spigot or tongue to provide maximum contact. Before any pipe may be covered with backfill, the City Construction Inspector shall approve such lines as to grades, alignment, and joints. Any line disapproved by the City Construction Inspection shall be removed and new pipe relaid and inspected.

7.05 Catch Basins

Masonry structures shall be as per Standard Details 71C-4 through 71C-7.

Precast Catch Basins are allowed with approval from the City Engineer, precast structures shall be as per NCDOT standard drawing 840.45, except that traffic bearing structures shall be as per 840.46. The contractor is solely responsible for the depth/height finally incorporated in the work. The Contractor shall take care to coordinate with the Surveyor to ensure that the pipe alignment will allow for the pre-cast structure to properly conform to the line and grade of the Curb and Gutter. **No field modifications will be permitted to pre-cast structures.**

7.06 Headwalls

This item shall include installation of materials and construction of all headwalls, complete in place (dimensions shall be as shown in the plans and standard drawings No. 71C-9 thru 71C-24).

On reinforced concrete pipe of thirty six inches (36") or less in diameter, standard flared end sections may be used in place of headwalls provided that written permission is granted by the City Engineer for each installation and construction is made in accordance to City Standard No. 71C-8.

Where flared end sections are used, concrete footings and splash pads shall be used.

Standard headwalls shall be either plain concrete, reinforced concrete, concrete block meeting NCDOT Standard 1040-2 or kiln dry red clay brick and shall be constructed to the dimensions and limits shown on the plans and standard drawings No. 71C-9 through 71C-24.

7.07 **HDPE Pipe\_Provisional Specification only. City Engineer approval required on a project by project basis.**

All HDPE pipe shall be double wall, corrugated exterior and smooth interior wall pipe, meeting AASHTO M294 Type S, ranging in diameter from 15" to 36". HDPE pipe with nominal diameter 42" and 48" will be approved by the City Engineer on a per project basis, and conform to AASHTO Provisional MP6-95. All pipes shall conform to ASTM D3350 Cell Classification of 345420C, or ASTM 1248 Type III, Class C, Category 5, Grade P34. The pipe joints shall be gasketed bell and spigot, meeting ASTM F-477. All pipe shall be clearly marked in the factory showing the AASHTO designation, date of manufacture, and name/trademark of the manufacturer.

Any pipe damaged during delivery to or unloading at the job site will not be accepted and shall be removed at the suppliers or haulers expense. Pipe shall not be stockpiled in a manner that will expose it to direct sunlight for more then a total accumulation of six months.

Pipe shall be installed straight and true to line and grade, bell end facing upgrade. The pipe is to be handled, belled up, and placed in the trench in accordance with manufacturers recommendations and established engineering practices as described in the various publications referenced in this document.

Trench widths for HDPE pipe shall be the outside diameter of the pipe plus two (2) feet, with the pipe being placed in the center of the trench. The pipe is to be bedded and backfilled to the spring line with evenly graded Class Ib or II material and in a manner consistent with ASTM D2321. In cases where fines from the trench walls and subsequent backfill on top of the trench could migrate into the voids in the Class Ib or II initial backfill, a filter fabric will be placed surrounding the Class Ib or II backfill, in a manner to prevent such migration. The initial backfill of Class Ib or II material to the springline of the pipe is to be placed such that the pipe does not shift in the trench and remains true to line and grade. No backfill is to be placed over the pipe until the Engineer has visually inspected the bedding, haunching and pipe installation. If for any reason backfill is placed over the pipe prior to the inspection, the contractor will be required to remove the backfill to allow for this visual inspection. All costs for this removal and replacement of backfill, as well as correction of any defects found, shall be at the contractor's expense.

A deflection test will be performed not less then 30 days following completion of backfill operations. The contractor shall supply all labor, equipment, and materials necessary to pull a mandrel sized for a maximum of 5% deflection of the actual pipe inside diameter. The mandrel shall be pulled through each section of pipe, from structure to structure, and must slide freely through the pipe with only nominal hand force applied. No mechanical force shall be used in pulling the mandrel. Any pipe that refuses the mandrel shall be removed and replaced according to standard specifications, and retested. All costs for removal, replacement and retest shall be at the contractor's expense.

Where requested by the Field Engineer, the contractor shall provide CCTV video taping of placed pipe within 30 days of completion of backfill operations. Video taping will be done in accordance with Section 2.34 of the Standard Specifications. Any areas found to be deficient by the Field Engineer will be removed and replaced at the contractor's expense, and could be cause for videoing of all pipe on the project.

HDPE pipe is to only be used where 18" minimum cover to the grassed surface or bottom of the pavement structure can be attained.