

ITEM 461

CORRUGATED METAL PIPE

461.1 Description. This Item shall govern for furnishing and installing corrugated metal pipe conforming to these Standard Specifications. The pipe shall be furnished to the sizes and dimensions required and shall be installed in such places as shown on the drawings or as designated by Engineer, in accordance with these Standard Specifications and in conformity with the lines and grades given.

461.2 Materials. Metal pipe shall be full circle conforming to AASHTO M36, or AASHTO M196, Type I as specified on the plans.

Galvanized Steel coated sheets shall conform to AASHTO M218 and structural plate material shall meet either AASHTO M167 or M219. It may be fabricated with circumferential corrugations, lap joint construction with riveted or spot welded seams or it may be fabricated with helical corrugations with continuous helical lock seam or ultra high frequency resistance butt welded seams.

Pre-coated Galvanized Steel pipe shall be full circle conforming to AASHTO Designation M246, Type I as specified on the drawings. It may be fabricated with circumferential corrugations, lap joint construction with riveted seams, or it may be fabricated with helical lock seams. Unless otherwise noted on the drawings, both the inside and outside coating shall be a minimum of 10 mils.

The shape and minimum gage for pipe shall conform to Height of Cover Tables for corrugated steel conduits as designated by the National Corrugated Steel Pipe Association (NCSPA).

Gaskets to be O ring type. Gasket material shall meet the requirements of ASTM C361. Diameter to be 13/16 inch for 1/2 inch deep corrugations (pipe size 12 inches through 54 inches), and 1-3/8 inch for 1 inch corrugations (60 inches and larger); gasket lengths shall be in accordance with the pipe manufacturer's recommendations.

Coupling bands shall conform to the requirements of AASHTO M36. The coupling bands shall have a Minimum Width of 24" and shall be in accordance with Texas Department of Transportation's Specification Section 460.3. "Coupling Bands". Dimple bands will not be accepted.

Bituminous coated circular pipe shall conform to this Item both as to base metal and fabrication and in addition shall be coated inside and out with a bituminous coating which shall meet the performance requirements set forth herein and with AASHTO M-190. The pipe shall be uniformly coated inside and out to a minimum thickness of 0.05 inch, measured on the crests of the corrugation.

When a paved invert is specified, the pipe, in addition to the fully coated treatment described above, shall receive additional bituminous material, of the same specifications as above, applied to the bottom quarter of the circumference to form a smooth pavement with a minimum thickness of 1/8 inch above the crests of the corrugations.

Fully lined (either asphalt or concrete linings) corrugated metal pipe shall be in conformance with AASHTO M190, Type D or ASTM A849.

Field coating of pipe shall be in conformance with AASHTO M243 if specified. It shall not be allowed as an alternate to hot dip asphalt coating per AASHTO M190.

461.3 Submittals. Submit certification from the manufacturer that the pipe has been tested and meets this Item requirements. The pipe diameter, type of pipe, gauge/thickness, depth of corrugations and span of corrugations shall be submitted for approval, by the Engineer.

461.4 Construction Methods. Trench shall be excavated to the alignment, depth and width required. Brace trench and drain so that the work may be accomplished safely and efficiently. Trenches shall be excavated with suitable type equipment such as ladder type trenching machines or trench hoes or other equipment. Trench widths for pipes less than 30 inches shall as a minimum be the width of outside barrel of pipe plus 12 inches. The maximum trench width shall be the maximum width of the outside barrel of the pipe plus 18 inches.

Where necessary, excavations shall have sheathing and bracing to prevent caving. All sheathing and bracing shall be designed to the requirements of OSHA Standard 1926, Subpart P (Latest Edition). Depth of trenches without sheathing or bracing shall comply with OSHA Regulation 1926.650.

For pipe 30 inch and larger, the minimum width of the trench shall be the width of the outside barrel of the pipe plus 16 inches and the maximum width of the outside barrel of the pipe plus 24 inches.

After the trench has been excavated to the bottom, the trench shall be fine graded to the established subgrade. Any over excavation of the subgrade shall be filled with 1.5 sack/ton of cement stabilized sand.

The Engineer will furnish and set vertical and horizontal control stakes which will establish the base line or centerline and bench marks and will furnish the Contractor with all necessary information relating to lines and grades. The Contractor shall establish the grade line in the trench from grade stakes. The Contractor shall maintain this grade control a minimum of 100 feet behind and ahead of the pipe laying operation. The Contractor shall, at his own expense, furnish and place in position as directed by the Engineer all necessary stakes, grade and batter boards for locating the work. The Contractor may, at his own expense, use a laser beam to maintain line and grade of the work as authorized by the Engineer.

The pipe shall be bedded in a foundation of cement stabilized sand conforming to Item 433 "Cement Stabilized Sand Bedding and Backfill", Item 430 "Construction of Underground Utilities, and the drawings. When requested by the Engineer, the Contractor shall furnish a simple template for each size and shape of pipe to be placed for use in checking the shaping of bedding.

Unless otherwise authorized by the Engineer, the laying of pipes on the prepared foundation shall be started at the outlet end, the separate sections firmly joined together, with outside laps of circumferential joints pointing upstream and with longitudinal laps on the sides. Any metal in joints which is not protected by galvanizing, shall be coated with a suitable asphaltum paint. Proper facilities shall be provided for hoisting and lowering the sections of pipe into the trench without damaging the pipe or disturbing the prepared foundation and the sides of the trench. Any pipe which is not in alignment or which shows any undue settlement after laying, or is damaged, shall be taken up and re-laid without extra compensation.

Multiple installations of corrugated metal pipe shall be laid with the center lines of individual barrels parallel. Unless otherwise indicated on the plans, the following clear distances between outer surfaces of adjacent pipes shall be maintained as shown in Table 1.

TABLE 1

Diameter of Pipe	Clear Distance Between Pipes Full Circle
18"	1' - 2"
24"	1' - 5"
30"	1' - 8"
36"	1' - 11"
42"	2' - 2"
48"	2' - 5"
54"	2' - 10"
60"-84"	3' - 2"
90"-120"	3' - 5"

Where new structures are constructed as extensions to structures in place or as jointed to existing structures, the construction shall include all work necessary to provide a proper connection between the new structure and the old as indicated on the drawings, including coating of the connection with bituminous material when required.

After the metal pipe structure has been completely assembled on the proper line and grade and headwalls constructed when required by the drawing details, selected material from excavation or borrow shall be placed along both sides of the completed structure(s) equally, in uniform layers not exceeding 6 inches in depth (loose measurement), wetted if

required and thoroughly compacted between adjacent structures and between the structure(s) and between the sides of the trench, or for a distance each side of the structure equal to the diameter of the pipe. Backfill material shall be compacted to the same density requirements as specified for the adjoining section of the embankment. Above the three-fourths point of the structure, the fill shall be placed uniformly on each side of the pipe in layers not to exceed 12 inches. For backfilling, until a minimum cover of 12 inches is obtained, only hand operated tamping equipment will be allowed within vertical planes two feet beyond the horizontal projection of the outside surfaces of the structure.

Pipe damaged by the Contractor's backfilling operation shall be removed and replaced by the Contractor at no additional cost to Harris County. Unless otherwise shown on the drawings or permitted in writing by the Engineer, no heavy earth moving equipment will be permitted to haul over the structure until a minimum of 4 feet of permanent or temporary, compacted fill has been placed thereon. Pipe damaged by the Contractor's equipment shall be removed and replaced by the Contractor at no additional cost to Harris County.

During the backfilling operations, special emphasis shall be placed upon the need for obtaining uniform backfill material and uniform compacted density throughout the length of the pipe. Prior to adding each new layer of loose backfill material, until a minimum of 12 inches of cover is obtained, and inspection will be made of the inside periphery of the structure for local or unequal deformation caused by improper construction methods. Evidence of such will be reason for corrective measures as directed by the Engineer.

461.5 Measurement. Corrugated metal pipe will be measured by the linear foot. Such measurements will be made between the ends of the barrel along its flow line. Coupling bands shall be incidental to the measured pipe. Where spurs of branches or connections to existing pipe lines are involved, measurement of the spur of new connecting pipe will be made from the intersection of its flow line with the outside surface of the pipe into which it connects. Where inlets, headwalls, catch basins, manholes, junction chambers or other structures are included in lines of pipe, the length of pipe tying into the structure wall will be included for measurement but no other portion of the structure length and width will be so included.

461.6 Payment. Payment for corrugated metal pipe measured and prescribed above, will be made at the contract unit price bid per linear foot for the various sizes of "Corrugated Metal Pipe" of the material and protective coating as indicated on the plans.

There are line code(s), description(s), and unit(s) for this Item.

NOTE: This Item requires other Standard Specifications

Item 430 "Construction of Underground Utilities"
Item 433 "Cement Stabilized Sand Bedding and Backfill Material"

END OF ITEM 461