SECTION 643 - CAST-IN-PLACE CONCRETE PIPE

643.01 Description. This work includes constructing cast-in-place concrete pipe in a prepared trench according to the contract. *|

643.02 Materials.

(A) Portland Cement Concrete. Concrete shall be Class A and shall conform to Section 601 - Structural Concrete. The slump of the concrete shall be two and a half (2-1/2) inches ± half (1/2) inch when established by AASHTO T 119. *|

(B) Wall Thickness. The minimum wall thickness for the various sizes of pipe shall conform to the following table:

Internal Diameter - Inches	Minimum Wall Thickness - Inches
24	3
30	3
36	3-1/2
42	4
48	5
54	5-1/2
60	6
66	6-1/2
72	7
78	7-1/2
84	8

(C) Other Materials. Other materials shall conform to the following: *|

Bed Course Material for Pipe	703.16(B)
Curing Materials	711.01

643.03 Construction Requirements.

(A) Pipe Making Equipment. The Contractor shall construct the pipe with equipment designed for constructing cast-in-place monolithic concrete pipe. The equipment shall be acceptable to the Engineer. The Engineer may require the Contractor to furnish evidence of successful operation on the equipment the Contractor proposes to use. The Engineer will not permit equipment not suitable to produce the quality of work required for the pipeline to operate on the work.

(B) Excavation. The Contractor shall excavate the trenches according to Section 206 - Excavation and Backfill for Conduits and Structures and below.

The Contractor shall excavate the trench to the lines and grades according to the contract. The trench shall be of the proper width and the Contractor shall shape the bottom of the trench to the external diameter of the pipe that the Contractor will construct.

If the Contractor meets rock in trench excavation, the Contractor shall remove the rock at least six (6) inches below the grade of the bottom of the pipe. The Contractor shall backfill and compact the trench up to the bottom of the pipe:

(1) to a relative compaction of not less than ninety-five (95) percent

(2) in maximum six (6) inch lifts and

(3) with bed course material.

The test method to establish maximum densities and relative compaction shall be according to Subsection 106.09 (B) - Relative Compaction Test.

If the Contractor meets soft, spongy or unsuitable material, Contractor shall remove such material from a width equal to the diameter of the culvert plus one (1) foot on each side and to a depth specified by the Engineer. The Contractor shall backfill the resulting space according to the above. If the Contractor places the culverts in embankment fill, the Contractor shall make the excavation after the Contractor completes the embankment to the required elevation shown in the contract.

(C) Construction. The Contractor shall remove the water that enters the trench before constructing the pipe. Surfaces that the Contractor plans to place concrete against shall be free of standing water, mud and debris.

The Contractor shall moisten the surfaces that the Contractor plans to place concrete against thoroughly with water, if necessary, so that moisture will not be drawn from the freshly placed concrete.

The Contractor shall place concrete around the full circumference of the pipe by traveling forms in either one (1) or two (2) operations. The second operation shall follow before the concrete placed in the first operation has taken an initial set. When the Contractor uses metal forms, the metal forms shall be of sufficient strength:

(1) to withstand vibrating or

(2) to withstand concrete tamping and

(3) to permit workers to walk on the forms without causing springing or bulging.

The forms shall not vary more than 0.04-foot from the lower edge of a straightedge laid parallel to the center line of the form and shall be free of holes larger than 0.05-foot in diameter.

The Contractor shall vibrate, ram, tamp, or work the concrete with suitable appliances until the Contractor has consolidated the concrete to the maximum practicable density free of rock pockets and the concrete closes snugly against the surfaces of forms. The concrete shall completely fill the form.

If the Contractor stops placement for such period that initial set takes place, the Contractor shall form a stoppage joint. Before resuming placement, the Contractor shall make an excavation along the sides and bottom of the joint to permit casting of a concrete collar around the outer portion of the joint. This collar shall have a minimum thickness of one and a quarter (1-1/4) times the wall thickness of the pipe and shall lap the entire joint by at least two (2) times the wall thickness. Immediately before resuming concrete placement, the Contractor shall:

(1) clean the surfaces of laitances, coatings, foreign materials, and loose or defective concrete,

(2) wet the surface thoroughly and

(3) and coat the surface with a layer of bonding mortar about quarter (1/4) inch thick.

Instead of the bonding mortar, the Contractor may scrub neat cement paste thoroughly onto the wet surface of the previously placed concrete.

Instead of the stoppage joint mentioned above, the Contractor may choose to form stoppage joints shown in the contract.

After removal of the forms, the Contractor shall inspect the inner portion of the pipe. The Contractor shall make the required repairs. The Contractor shall remove porous and fractured concrete by chipping openings into the concrete pipe as ordered by the Engineer. The Contractor shall repair the chipped openings and holes cut in the pipe for inspection or to ease removing the forms by filling with concrete or dry patching mortar.

The flow line grade of the finished pipe shall not vary more than 0.10 of a foot from the grade line according to the contract.

The finished surface of the concrete pipe shall be free of fractures, cracks and surface roughness.

(D) Curing and Protecting Concrete. The Contractor shall cure the concrete forming the cast-in-place concrete pipe by either a white pigmented membrane forming compound or a polyethylene sheeting. The Engineer will permit hand spraying of the compound. During the period following the placement of the concrete, the Contractor shall cover the ends of the pipeline with suitable material to maintain a humid condition within the pipe for a minimum of seven (7) days.

(E) Backfill. The Engineer will not allow backfilling until the concrete has developed a strength of at least three thousand (3,000) pounds per square inch. The Contractor shall backfill the pipe trench with material obtained from excavation, except unsuitable material.

Backfilling shall be loose, except for the top one (1) foot of backfill. The Contractor shall compact the top one (1) foot of backfill to a relative compaction of not less than ninety (90) percent. The Contractor shall place the top one (1) foot of backfill material in uniform horizontal layers not exceeding six (6) inches in loose thickness. The test method to establish maximum densities and relative compaction shall be according to Subsection 106.09 (B) - Relative Compaction Test.

(F) Connection to Manholes, Inlets and Catch Basins. The Contractor shall submit to the Engineer for acceptance shop drawings for connectors to manholes, inlets and catch basins.

643.04 Method of Measurement. The Engineer will measure cast-in-place concrete pipe by the linear foot in place. The Engineer will measure pipes with slope of skewed ends along its invert.

643.05 Basis of Payment. The Engineer will pay for the accepted quantities of cast-in-place concrete pipe at the contract unit price per linear foot complete in place. *|

The price shall be full compensation for furnishing labors, materials, tools, equipment, and incidentals necessary to complete the work. *|

The Engineer will make payment under: *|

Pay Item	**Pay Unit**
Cast-In-Place Concrete Pipe	Linear Foot

The Engineer will pay for excavation including excavation below flow line grade, bedding and backfill for cast-in-place concrete pipe, under Section 206 - Excavation and Backfill for Conduits and Structures. *| |

SECTION 644 - (Reserved)