SECTION 840
MINOR DRAINAGE STRUCTURES

840-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, excavation; providing protection of employees in excavation; hauling; disposal of materials; removing existing pipe and drainage structures at the site of the work; furnishing, transporting and placing foundation conditioning material, backfill material, subsurface drainage, concrete, brick masonry, block masonry, precast units, mortar, grout, reinforcing steel, hardware, castings and miscellaneous metal; fabrication; welding; and galvanizing to construct cast-in-place concrete, brick masonry, block masonry or precast concrete inlets, catch basins, junction boxes, spring boxes, manholes, concrete aprons and other minor drainage structures excluding endwalls, with all necessary metal grates, covers, frames, steps and other hardware, in accordance with the contract.

Use cast-in place concrete, brick masonry, block masonry or precast concrete construction as shown on approved plans.

840-2 MATERIALS

Refer to Division 10.

Item	Section
Brick	1040-1
Concrete Block	1040-2
Curing Agents	1026
Fabricated Steel Grates	1074-9
Gray Iron Castings	1074-7
Joint Fillers	1028-1
Joint Sealers	1028-2
Mortar	1040-9
Precast Drainage Structure Units	1077
Portland Cement Concrete, Class B	1000
Reinforcing Steel	1070
Select Materials	1016
Steps	1074-8
Structural Steel	1072

Use grout in precast structures consisting of one part Portland cement to two parts of mortar sand.

Use foundation conditioning material meeting Article 1016-3 for Class V or VI select material as shown in the contract or as directed.

840-3 CONSTRUCTION METHODS

(A) Excavation

Perform excavation with equipment of adequate weight, size and capability. Where necessary, provide a competent person and protection of personnel in excavation by sloping, shoring or bracing in accordance with Federal, State or local standards and Article 107-1.

(B) Foundation

Do not place masonry drainage structure until the foundation has achieved adequate strength.

Where the foundation material is found to be of poor supporting value or of rock, minor adjustments in the location of the structure may be approved to provide a more suitable

foundation. Where this is not practical, undercut the foundation and condition by backfilling with an approved select material.

Set precast foundation slabs to within ± 1/2 inch of grade on a 2 inch to 3 inch thick bed of compacted foundation conditioning material.

(C) Cast-In-Place Concrete, Brick and Block Masonry

Install drainage structures to plan line and grade or approved to meet drainage conditions. Do not modify the drainage structure by corbeling or use of concrete slabs unless otherwise directed.

Construct concrete in accordance with Section 825 and give an ordinary surface finish. Construct brick masonry in accordance with Section 830. Construct block masonry in accordance with Section 834. Furnish and place reinforcing steel in accordance with Section 425.

Obtain approval if field conditions necessitate a variance from the plan dimensions of the structure or footings.

(D) Installation of Precast Units

Install drainage structures to plan line and grade or approved to meet drainage conditions. Do not modify the drainage structure by corbeling or use of concrete slabs unless otherwise directed.

Assemble the precast drainage structure units in accordance with the manufacturer's instructions. Subarticle 840-3(C) applies where it is necessary to use cast-in-place concrete, brick masonry or block masonry construction as part of the structure. Fill any void greater than 1 inch with a brick or block bat fully encased in mortar.

Obtain approval if field conditions necessitate a variance from the plan dimensions of the structure or footings.

(E) Fittings and Connections

As the work is built up, accurately space, align and thoroughly bond fittings that enter the structure.

Make pipe connections so the pipe does not project beyond the inside wall of the drainage structure and grout as necessary to make smooth and uniform surfaces on the inside of the structure.

Set metal frames for grates and covers in full mortar beds or secure by approved methods.

(F) Backfill

Complete drainage structure and remove all forms and falsework. Backfill with approved material, compacted to the density required by Subarticle 235-3(C), after the drainage structure has cured for at least 7 curing days, unless otherwise permitted. Define a “curing day” in accordance with Article 825-9 for concrete or Article 830-5 for brick or block masonry.

(G) Pipe Collars and Pipe Plugs

Construct pipe collars and pipe plugs in accordance with the details shown in the plans or as directed.

Use any class of Portland cement concrete contained within Section 1000 for pipe collars.

Construct pipe plugs with either brick masonry or any class of Portland cement concrete contained within Section 1000.

(H) Concrete Aprons

Construct concrete aprons in accordance with the details in the plans. Use Class B or higher compressive strength concrete.

840-4 MEASUREMENT AND PAYMENT

Masonry Drainage Structure that incorporate an opening for circular pipe not exceeding 48 inches in diameter will be measured and paid in units of each for the actual number completed and accepted.

Masonry Drainage Structure exceeding a height of 5.0 feet will be measured and paid in linear feet for the portion of the drainage structure exceeding a height of 5.0 feet. The height will be measured vertically to the nearest 0.1 feet from the top of the bottom slab to the top of the wall. For that portion of *Masonry Drainage Structure* measured above a height of 10.0 feet, payment will be made at 1.3 times the contract unit price per linear foot for *Masonry Drainage Structure*.

Masonry Drainage Structures that incorporate an opening for circular pipe exceeding 48 inches in diameter, or for pipe arch of any size, will be measured and paid on a volume basis as provided below.

Masonry to be paid will be the number of cubic yards of cast-in-place concrete brick or block that has been incorporated into the completed and accepted structure. This quantity will be computed from the dimensions shown in the plans or from revised dimensions authorized by the Engineer. Where the wall thickness is greater than the wall thickness shown in the plans due to the use of oversize brick or for any other reason, the wall thickness shown in the plans will be used to compute quantities except where an increase in wall thickness has been authorized by the Engineer.

Pipe Collars will be measured and paid in cubic yards of concrete or brick that has been incorporated into the completed work. The cubic yards of pipe collars will be computed from the dimensions shown in the plans or from revised dimensions authorized by the Engineer.

Pipe Plugs will be measured and paid in cubic yards of concrete or brick that has been incorporated into the completed and accepted pipe plug. The cubic yards of pipe plugs will be computed from the dimensions shown in the plans or from revised dimensions authorized by the Engineer.

Frame with Grate and Hood, Std. ____ will be measured and paid in units of each for actual number of assemblies incorporated into the completed work. No separate measurement will be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods and covers will be considered to be part of the complete assembly.

Frame with Grate, Std. ____ will be measured and paid in units of each for actual number of assemblies incorporated into the completed work. No separate measurement will be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods and covers will be considered to be part of the complete assembly.

Frame with Two Grates, Std. ____ will be measured and paid in units of each for actual number of assemblies incorporated into the completed work. No separate measurement will be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods and covers will be considered to be part of the complete assembly.

Frame with Cover, Std. ____ will be measured and paid in units of each for actual number of assemblies incorporated into the completed work. No separate measurement will be made of grates, hoods, and covers that are part of the assembly, as the grates, hoods and covers will be considered to be part of the complete assembly.

Steel Frame with Two Grates, Std. ____ will be measured and paid in units of each for the actual number of fabricated steel grates incorporated into the completed work.

No separate payment will be made for concrete aprons shown in *Roadway Standard Drawings* No. 840.17, 840.18, 840.19, 840.26, 840.27 and 840.28, as this work will be incidental to the other work in this section.

Foundation Conditioning Material, Minor Structures will be paid as provided in Article 300-9.

The above prices and payments will be full compensation for all work covered by this section.

Payment will be made under:

Pay Item	Pay Unit
Masonry Drainage Structures	Each
Masonry Drainage Structures	Linear Foot
Masonry Drainage Structures	Cubic Yard
Pipe Collars	Cubic Yard
Pipe Plugs	Cubic Yard
Frame with Grate and Hood, Std. ____	Each
Frame with Grate, Std. ____	Each
Frame with Two Grates, Std. ____	Each
Frame with Cover, Std. ____	Each
Steel Frame with Two Grates, Std. ____	Each

SECTION 846
CONCRETE CURB, CURB AND GUTTER, CONCRETE GUTTER, SHOULDER BERM GUTTER, CONCRETE EXPRESSWAY GUTTER AND CONCRETE VALLEY GUTTER

846-1 DESCRIPTION

Construct Portland cement concrete curb, concrete curb and gutter, concrete gutter, shoulder berm gutter, concrete expressway gutter and 4 inch concrete valley gutter as shown in the contract.

846-2 MATERIALS

Refer to Division 10.

Item	Section
Curing Agents	1026
Joint Fillers	1028-1
Joint Sealers	1028-2, 1028-3
Portland Cement Concrete, Class B	1000

846-3 CONSTRUCTION METHODS

(A) General

Construct concrete in accordance with Section 825, except as provided herein.

Give surface a light broom finish with brush marks parallel to the curb line or gutter line.

Prepare foundation and compact base or subgrade to the degree required by the applicable section of the *Standard Specifications* before placing forms.

(B) Forms

Use forms that have no more than 1/8 inch in 10 feet deflection from true line horizontally and vertically to adequately support the concrete and construction equipment.

Obtain approval before placing concrete.