

**DIVISION 600**  
**Incidental Construction**

## Section 601—Mobilization

### Description

**601.01 Work.** Move personnel, equipment, material, and incidentals to the project, and perform all activities necessary to accomplish work at the project site. Obtain permits, insurance, and bonds.

### Measurement

**601.02 Method.** Measure mobilization by the lump sum.

### Payment

**601.03 Basis.** The accepted quantity, measured as provided above, will be paid at the contract price per unit of measurement for the PAY ITEM listed below that is DESIGNATED IN THE SCHEDULE OF ITEMS.

The mobilization lump sum will be paid as follows:

- (a) If applicable, bond premiums will be reimbursed according to FAR clause 52.232-5, Payment Under Fixed-Price Construction Contracts, after receipt of evidence of payment.
- (b) Fifty percent of the lump sum, not to exceed 5 percent of the original contract amount, will be paid following completion of 5 percent of the original contract amount, not including mobilization.
- (c) Payment of the remaining portion of the lump sum, up to 10 percent of the original contract amount, will be paid following completion of 10 percent of the original contract amount, not including mobilization.
- (d) Any portion of the lump sum in excess of 10 percent of the original contract amount will be paid after final acceptance.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
601 (01) Mobilization .....	Lump Sum

## Section 602—Minor Concrete Structures

### Description

**602.01 Work.** Construct reinforced or unreinforced minor concrete structures.

### Materials

**602.02 Requirements.** Furnish materials that meet the requirements specified in the following subsections:

Air-Entraining Admixtures .....	711.02
Cement .....	701.01
Chemical Admixtures .....	711.03
Coarse Aggregate for Portland Cement Concrete .....	703.02
Curing Material .....	711.01
Fine Aggregate for Portland Cement Concrete .....	703.01
Fly Ash .....	725.04
High-Strength Nonshrink Grout .....	701.02
Latex Modifier .....	711.04
Reinforcing Steel .....	709.01
Water .....	725.01

**602.03 Concrete Composition.** Use the concrete composition method DESIGNATED IN THE SCHEDULE OF ITEMS.

(a) **Method A.** Furnish to the CO a mix design showing the proposed weights of aggregate, water, and cement per cubic meter of concrete a minimum of 7 days prior to beginning placement. Proportion the cement, aggregate, and water to obtain concrete with good workability. Ensure that slump is 100 mm or less, as determined by AASHTO T 119. Ensure that air-entrainment is  $6 \pm 1$  percent, as determined by AASHTO T 152 or T 196.

Ensure that the concrete develops a 28-day minimum compressive strength of 20 MPa, unless otherwise SHOWN ON THE DRAWINGS. Furnish concrete for specimens. Strength will be determined by test cylinders made and cured in accordance with AASHTO T 23 and tested in accordance with AASHTO T 22.

Failure of any test cylinder to meet the required strength, for any structural element tested, will be considered evidence of noncompliance with the strength requirement of this specification.

**(b) Method B.** Submit for approval the following information a minimum of 7 days prior to beginning placement:

- (1) Type, grading, and sources of aggregate.
- (2) Type and source of cement, blended cement, or fly ash.
- (3) Saturated surface dry weights of the fine and coarse aggregate in kilograms per cubic meter of concrete.
- (4) Weight of mixing water in kilograms per cubic meter of concrete.
- (5) Weight of cement in kilograms per cubic meter of concrete.
- (6) Admixture type, quantity, and certification by manufacturer.
- (7) Air content.
- (8) Slump.
- (9) 28-day compressive strength.

Ensure that the concrete contains not less than 310 kg of cement per cubic meter. Ensure that slump is 100 mm or less, as determined by AASHTO T 119.

When a commercial supplier is used, furnish a certification with each truckload of concrete certifying that the material and mix proportions used are in conformance with the approved mixture.

**(c) Method C.** Make the concrete using a dry, preproportioned, blended, and bagged mix meeting the requirements of ASTM C 387 and mixed at the jobsite in accordance with the manufacturer's recommendations.

**(d) Fly Ash- or Pozzolan-Modified Concrete.** Fly ash may be substituted for cement at the rate of 550 g of fly ash per 450 g of Portland cement. After substitution, reduce the design aggregate volumes by an amount equal to the net increase in volume of the combined cement and fly ash. Replace no less than 10 percent and no more than 20 percent of the weight of Portland cement required with fly ash at the above rate. For purposes of controlling the maximum water/cement ratio of 0.49, make the water/cement ratio for fly-ash-modified concrete the ratio of the weight of water to the combined weights of Portland cement and 60 percent of the weight of the fly ash.

Extend the standard 28-day curing period for compressive-strength tests for fly-ash-modified concrete by 1 day (rounded to the nearest whole day) for each 1.5 percent of

Portland cement replaced with fly ash at the selected rate. (Example: If the maximum of 20 percent cement is replaced, the curing period for cylinders is 41 days.)

### **Construction**

**602.04 Forms.** Design and construct forms so they can be removed without damaging the concrete. Make them free of bulge and warp, and constructed so that the finished concrete has the form and dimensions SHOWN ON THE DRAWINGS and is true to line and grade. Concrete may be placed without forms where SHOWN ON THE DRAWINGS.

Design forms for concrete that contains a retarding admixture, fly ash, or other pozzolan replacement for cement so that the lateral pressures exerted by the full anticipated height of fluidized concrete are contained, unless documented information in regard to initial set is provided by the manufacturer.

**602.05 Placing Concrete.** Place all reinforcing steel in position as SHOWN ON THE DRAWINGS, and ensure that it is securely held in place by approved supports during placing of concrete. Do not place concrete until the grading, forms, and steel reinforcements have been inspected and approved by the CO. Give the CO 24 hours written notice prior to placement of any concrete.

Ensure that reinforcing steel material and construction requirements are in accordance with Section 554.

Discharge all concrete prepared using methods A and B into the forms within the time limits shown in table 602-1. These time limits are based on jobsite ambient air temperature, cement type, and admixture used. Begin counting time from when the cement is introduced into the aggregate. Discharge concrete prepared using method C into the forms within 1-1/2 hours after introducing water to the mixture. Do not retemper concrete. Cement must be added to the mixer at the jobsite when required in the SPECIAL PROJECT SPECIFICATIONS. Do not mix or place concrete when the daily minimum atmospheric temperature is, or is expected to be, less than 5 °C unless adequate provisions are made to protect the concrete.

Place concrete to avoid segregation. Use high-frequency internal vibrators for consolidating concrete in the forms. Operate vibrators to produce concrete free of voids, but do not hold them in one place long enough to result in segregation or formation of laitance on the surface.

Method C concrete may be rodded instead of internally vibrated as necessary to remove voids.

Table 602-1.—Concrete discharge time limits.

Cement Type With and Without Admixtures	Time Limit (hour)	
	< 30 °C <sup>a</sup>	≥ 30 °C <sup>a</sup>
Type I, IA, II, or IIA	2.0	1.5
Type I, IA, II, or IIA with water-reducing or -retarding admixture	3.0	2.0
Type III	1.5	1.0
Type III with water-reducing or -retarding admixture	2.0	1.5

a. Ambient air temperature.

Do not use aluminum pipe, conduit, or troughs for transporting concrete. When concrete is pumped, take samples from the discharge stream at the point of placement.

**602.06 Finishing.** Perform finishing of concrete surfaces as follows:

(a) **Formed Surfaces.** Unless otherwise SHOWN ON THE DRAWINGS, remove all fins and irregular projections exceeding 6 mm from the exposed surfaces. Fill holes produced by removing form ties with dry-pack mortar or other approved patching compounds.

(b) **Unformed Surfaces.** Strike off unformed surfaces with a straightedge, and finish them to a smooth uniform texture by floating and troweling. Prepare final finish of the surface as SHOWN ON THE DRAWINGS.

**602.07 Curing Concrete.** Beginning immediately after finishing, cure all concrete a minimum of 7 days or, if high-early-strength cement is used, a minimum of 3 days. For fly-ash-modified concrete placed in structures, the required moisture-controlled curing period shall be:

Percentage of Cement Replaced by Weight	Required Curing Period
10%	9 days
11–15%	10 days
16–20%	11 days

For cold weather concreting, maintain a controlled temperature for the required curing period. The above requirement for an extended curing period may be waived if a compressive strength of 65 percent of the specified 28-day design strength is achieved in 6 days.

Cure by maintaining a minimum concrete temperature of 5 °C and keeping the concrete continuously moist. Keep moist by supplying additional moisture or preventing moisture loss.

Acceptable methods of supplying additional moisture are ponding or sprinkling, and covering with burlap cloth that is kept saturated. Surfaces SHOWN ON THE DRAWINGS may be covered with saturated sand or 150 mm of saturated hay or straw to retain moisture.

Acceptable methods of preventing moisture loss are applying liquid membrane-forming compounds, or waterproof paper or polyethylene sheet materials. Apply liquid membrane-forming compounds by spraying at the coverage rates and patterns recommended by the manufacturer. Ensure that sheet material has overlapped sealed joints and forms a complete waterproof cover over the entire concrete surface.

**602.08 Backfilling.** Backfill in accordance with Subsection 206A.10. Do not backfill concrete until it has completed the required curing period.

**Measurement**

**602.09 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

**Payment**

**602.10 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
602 (01) Concrete, method _____	Cubic Meter
602 (02) Concrete, method _____	Lump Sum

## Section 603—Metal Pipe

### Description

**603.01 Work.** Furnish and install, or install only, metal pipe and pipe appurtenances, including all bedding and backfilling required to complete the work. The term “metal” refers to aluminum and steel.

### Materials

**603.02 Requirements.** Furnish materials that meet the requirements specified in the following subsections:

Aluminum-Alloy Corrugated Pipe .....	707.03
Aluminum-Alloy Spiral Rib Pipe .....	707.12
Asphalt-Coated Pipe .....	707.04
Concrete-Lined Corrugated Steel Pipe .....	707.13
Ductile Iron Culvert Pipe .....	707.01
Fiber-Bonded Bituminous-Coated Steel Pipe .....	707.09
Invert-Paved Corrugated Steel Pipe .....	707.14
Metallic-Coated Corrugated Steel Pipe .....	707.02
Metallic-Coated Spiral Rib Pipe .....	707.11
Polymer-Coated Steel Pipe .....	707.08
Repair of Damaged Coatings .....	707.15
Slotted Drain Pipe .....	707.10
Watertight Gaskets .....	712.03

Furnish bedding material that meets the requirements specified in Subsection 603.04.

Furnish backfill materials that meet the requirements specified in Subsection 603.08.

Clean and paint damaged spelter coating caused by welding, field cutting, or mishandling, as specified in Subsection 707.15.

To prevent electrolysis or physical failure, use materials in each pipe installation that are compatible with each other.

Either annular or helical pipe corrugations will be acceptable. Helical corrugated pipe containing annular rerolled ends may be used in conjunction with annular pipe of like or compatible materials.



Provide fabricator's certification that the sheet and pipe fabrication are in accordance with AASHTO M 36, M 196, and M 245, as applicable. Submit the certification before installing the pipe.

The lengths and locations of individual pipe SHOWN ON THE DRAWINGS are approximate. Do not order pipe until culvert locations are DESIGNATED ON THE GROUND and a written list of the correct lengths is approved by the CO.

### **Construction**

**603.03 Excavation.** Excavate in accordance with the requirements specified in Section 206A.

Specific pipe installation time restrictions and installation plan requirements are SHOWN ON THE DRAWINGS.

**603.04 Bedding.** Bed the pipe to a depth of not less than 10 percent of its total height. After excavating in accordance with Subsection 206A.04(b), compact the foundation surface in accordance with Subsection 603.08 and shape it to fit the pipe.

As bedding material, provide selected mineral soil that meets the requirements for backfill specified in Subsection 603.08. When SHOWN ON THE DRAWINGS, ensure that completed bedding has a longitudinal camber.

**603.05 Laying Pipe.** Lay the lower segment of the pipe so that it is in contact with the bedding for the required depth throughout its length. Place outside circumferential laps facing upstream.

Lay paved or partially lined pipe so the longitudinal centerline of the paved segment coincides with the flowline. Place elliptical pipe with the major axis within 5° of a vertical plane through the longitudinal axis of the pipe.

Ensure that the final installed alignment allows no reverse grades, and does not permit any point to vary from a straight line drawn from inlet to outlet by more than 2 percent horizontally and vertically of the culvert length, or 300 mm, whichever is less.

Do not place any pipe in service until a suitable outlet is provided.

Install helically corrugated lock-seam pipe with the seam at the inlet end placed below the horizontal centerline. This requirement applies to the outlet end when the outlet is less than 1.5 m below subgrade.

Position longitudinal laps on riveted or spot-welded pipe at any location between 45° above or below horizontal.

**603.06 Joining Pipes.** Firmly join pipe using form-fitting coupling bands. Attach end sections to the pipe using connecting bands or other means, as recommended by the manufacturer. Install gaskets at each joint to form a watertight connection when SHOWN ON THE DRAWINGS. Do not use dimpled bands when the slope of the pipe is greater than 15 percent.

Ensure that coupling bands meet the strength requirements of field joints for Nonerodible Soil Condition—Special Joint Type, according to division II, section 26, of the “Standard Specifications for Highway Bridges” by AASHTO.

When aluminum alloys come in contact with other metals, coat the contacting surfaces with an asphalt mastic or other impregnated caulking compound approved by the CO.

**603.07 Shop Elongation.** When SHOWN ON THE DRAWINGS, increase the vertical diameter of round pipe 5 percent by shop elongation.

**603.08 Backfilling.** Do not place or backfill pipe that meets any of the following conditions until the excavation and foundation have been approved by the CO:

- Embankment height greater than 3 m at subgrade centerline.
- Installation in a live stream.
- Round pipe with a diameter of 1,200 mm or greater.
- Pipe arches with a span of 1,270 mm or greater.

After the bedding is prepared and the pipe is placed, place selected material in layers not exceeding 150 mm loose thickness, and compact the material under the haunches and alongside the pipe. Use material that is readily compactible and free of frozen lumps, chunks of highly plastic clay (with a plasticity index greater than 10), or other objectionable material. Do not use rocks larger than 75 mm in greatest dimension within 300 mm of the pipe. On each side of the pipe, place an area of compacted material at least as wide as the diameter of the pipe. Compact the backfill without damaging or displacing the pipe.

Continue backfilling and compacting until the backfill is a minimum of 300 mm above the top of the culvert.

After bedding and backfilling the pipe, protect it with an adequate cover of embankment before heavy equipment is permitted to cross during roadway construction.

Replace any pipe that is distorted by more than 5 percent of nominal dimensions, or that is ruptured or broken.

Compact backfill using method A, B, or C, as DESIGNATED IN THE SCHEDULE OF ITEMS.

(a) **Method A.** Ensure that backfill density exceeds the density of the surrounding embankment.

(b) **Method B.** Ensure that backfill density exceeds 95 percent of the maximum density as determined by AASHTO T 99, method C or D.

Determine density of the compacted material during the process of the work in accordance with AASHTO T 191, T 205, or T 238; and AASHTO T 217, T 239, or T 255. Corrections for coarse particles may be made in accordance with AASHTO T 224.

(c) **Method C.** Ensure a moisture content suitable for obtaining compaction. Compact each layer using compaction equipment designed for this purpose until visual displacement ceases.

**Measurement**

**603.09 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

When DESIGNATED IN THE SCHEDULE OF ITEMS, measure backfill material adjacent to the pipe 300 mm horizontally and vertically from the outside dimensions of the pipe, with a deduction for the volume of the pipe along the full length of the backfill.

**Payment**

**603.10 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
603 (01) _____-mm corrugated metal pipe, _____-mm thickness for steel or _____-mm thickness for aluminum, method _____	..... Meter

Section 603

- 603 (02) \_\_\_\_\_-mm span, \_\_\_\_\_-mm rise  
corrugated metal pipe arch, \_\_\_\_\_-mm  
thickness for steel or \_\_\_\_\_-mm thickness  
for aluminum, method \_\_\_\_\_ ..... Meter
- 603 (03) \_\_\_\_\_-mm metal end section ..... Each
- 603 (04) \_\_\_\_\_-mm span, \_\_\_\_\_-mm rise metal  
end section ..... Each
- 603 (05) \_\_\_\_\_-mm corrugated steel pipe,  
\_\_\_\_\_ -mm thickness, method \_\_\_\_\_ ..... Meter
- 603 (06) \_\_\_\_\_-mm span, \_\_\_\_\_-mm rise  
corrugated steel pipe arch, \_\_\_\_\_-mm  
thickness, method \_\_\_\_\_ ..... Meter
- 603 (07) \_\_\_\_\_-mm steel end section ..... Each
- 603 (08) \_\_\_\_\_-mm span, \_\_\_\_\_-mm rise steel end  
section ..... Each
- 603 (09) \_\_\_\_\_-mm \_\_\_\_\_-type \_\_\_\_\_-coated  
corrugated steel pipe, \_\_\_\_\_-mm thickness,  
method \_\_\_\_\_ ..... Meter
- 603 (10) \_\_\_\_\_-mm \_\_\_\_\_-type \_\_\_\_\_-coated  
paved invert corrugated steel pipe, \_\_\_\_\_-mm  
thickness, method \_\_\_\_\_ ..... Meter
- 603 (11) \_\_\_\_\_-mm span, \_\_\_\_\_-mm rise \_\_\_\_\_-type  
\_\_\_\_\_ -coated corrugated steel pipe arch,  
\_\_\_\_\_ -mm thickness, method \_\_\_\_\_ ..... Meter
- 603 (12) \_\_\_\_\_-mm \_\_\_\_\_-type \_\_\_\_\_-coated steel  
section end ..... Each
- 603 (13) \_\_\_\_\_-mm span, \_\_\_\_\_-mm rise \_\_\_\_\_-coated  
steel end section ..... Each
- 603 (14) \_\_\_\_\_-mm corrugated aluminum pipe,  
\_\_\_\_\_ -mm thickness, method \_\_\_\_\_ ..... Meter
- 603 (15) \_\_\_\_\_-mm paved invert corrugated aluminum  
pipe, \_\_\_\_\_-mm thickness, method \_\_\_\_\_ ..... Meter

- 603 (16) \_\_\_\_\_-mm span, \_\_\_\_\_-mm rise corrugated aluminum pipe arch, \_\_\_\_\_-mm thickness, method \_\_\_\_\_ ..... Meter
- 603 (17) \_\_\_\_\_-mm aluminum end section ..... Each
- 603 (18) \_\_\_\_\_-mm span, \_\_\_\_\_-mm rise aluminum end section ..... Each
- 603 (19) Pipe elbow, \_\_\_\_\_-mm diameter, \_\_\_\_\_-mm thickness ..... Each
- 603 (20) Branch connection, \_\_\_\_\_-mm diameter, \_\_\_\_\_-mm thickness ..... Each
- 603 (21) Furnishing and placing backfill material for pipe ..... Cubic Meter

## Section 603A—Concrete Pipe

### Description

**603A.01 Work.** Furnish and install, or install only, concrete pipe and pipe appurtenances, including all bedding and backfilling required to complete the work.

### Materials

**603A.02 Requirements.** Furnish materials that meet the requirements specified in the following subsections:

Nonreinforced Concrete Pipe .....	706.01
Precast Reinforced Concrete Box Sections .....	706.07
Reinforced Arch-Shaped Concrete Pipe .....	706.04
Reinforced Concrete Pipe .....	706.02
Reinforced D-Load Concrete Pipe .....	706.06
Reinforced Elliptical-Shaped Concrete Pipe .....	706.05
Watertight Gaskets .....	712.03

Furnish end sections constructed of the same material as the main section of the pipe.

Furnish bedding material that conforms to the requirements of Subsection 603A.04. Furnish backfill material that conforms to the requirements of Subsection 603A.06, or as SHOWN ON THE DRAWINGS.

The lengths and locations of individual pipe SHOWN ON THE DRAWINGS are approximate. Do not order pipe until culvert locations are designated on the ground and a written list of the correct lengths is approved by the CO.

### Construction

**603A.03 Excavation.** Conduct excavation in accordance with the requirements are specified in Section 206A. Excavate the trench a minimum of 100 mm below grade.

Specific pipe installation time restrictions and installation plan requirements are SHOWN ON THE DRAWINGS.

**603A.04 Bedding.** Unless otherwise SHOWN ON THE DRAWINGS, backfill the trench with bedding material to grade. Extend bedding material to a minimum height

of one-sixth the pipe diameter above the bottom of the pipe, and compact it in accordance with Subsection 603A.06.

Bed pipe with select excavated material from the roadway in the vicinity of the pipe, or with material from the source SHOWN ON THE DRAWINGS. Use material that contains no rocks greater than 25 mm in size. Ensure that the bedding surface provides a foundation of uniform density and support throughout the entire length of the pipe; provides for camber as SHOWN ON THE DRAWINGS; and has recesses shaped to receive the bell, of the bell and spigot pipe.

**603A.05 Placing & Joining.** Do not place or backfill any pipe until the excavation and foundation have been approved by the CO and a suitable outlet has been constructed. Ensure that the bell or groove ends face upstream. Join the pipe section so that the inner surfaces are reasonably flush and even, and the ends are entered as required. Make joints with a cold applied bituminous mastic, with rubber, or with plastic ring gaskets, as SHOWN ON THE DRAWINGS. When using mastic material, fill the joints with the material prior to joining the pipe.

**603A.06 Backfilling.** Furnish readily compactible backfill material that is free from frozen lumps and chunks of highly plastic clay or other objectionable material. Use no rock larger than 75 mm in greatest dimension within 300 mm of the pipe.

Place backfill material at or near optimum moisture content, and compact it in layers not exceeding 150 mm loose thickness on both sides, and to an elevation of 300 mm above the top of the pipe. Thoroughly compact the backfill under the haunches of the pipe. Bring the backfill up evenly on both sides of the pipe for the full length. Make the width of backfill on each side of the pipe equal to the diameter of the pipe.

Compact the backfill to at least 95 percent of the maximum density, as determined by AASHTO T 99, method C or D, unless otherwise SHOWN ON THE DRAWINGS.

Determine density of the compacted material during the process of the work in accordance with AASHTO T 191, T 205, or T 238; and AASHTO T 217, T 239, or T 255. Corrections for coarse particles may be made in accordance with AASHTO T 224.

Ensure that the final installed alignment of all pipe allows no reverse grades, and does not permit horizontal and vertical alignments to vary from a straight line drawn from center of inlet to center of outlet by more than 2 percent of pipe center length or 300 mm, whichever is less.

**Measurement**

**603A.07 Method**

Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

When DESIGNATED IN THE SCHEDULE OF ITEMS, measure backfill material adjacent to the pipe 300 mm horizontally and vertically from the outside dimensions of the pipe, with a deduction for the volume of the pipe along the full length of the backfill.

**Payment**

**603A.08 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
603A (01) _____-mm reinforced concrete pipe, class _____ .....	Meter
603A (02) _____-mm span, _____-mm rise reinforced concrete pipe, class _____ .....	Meter
603A (03) _____-mm reinforced concrete end section .....	Each
603A (04) _____-mm span, _____-mm rise reinforced concrete end section .....	Each
603A (05) Furnishing and placing backfill material for pipe .....	Cubic Meter



## Section 603B—Plastic Pipe

### Description

**603B.01 Work.** Furnish and install, or install only, plastic pipe and pipe appurtenances, including all bedding and backfilling required to complete the work.

### Materials

**603B.02 Requirements.** Furnish materials that meet the requirements specified in the following subsections:

Plastic Pipe .....	706.08
Watertight Gaskets .....	712.03

Furnish bedding material that meets the requirements specified in Subsection 603B.04, or as SHOWN ON THE DRAWINGS.

Furnish backfill materials that meet the requirements specified in Subsection 603B.06, or as SHOWN ON THE DRAWINGS.

The lengths and locations of individual pipe SHOWN ON THE DRAWINGS are approximate. Do not order pipe until culvert locations are designated on the ground and a written list of the correct lengths is approved by the CO.

### Construction

**603B.03 Excavation.** Conduct excavation in accordance with the requirements specified in Section 206A. Excavate a minimum of 200 mm below the designed invert elevation.

Specific pipe installation time restrictions and installation plan requirements are SHOWN ON THE DRAWINGS.

**603B.04 Bedding.** Place bedding material in the excavated section, and compact the material to ensure a uniform foundation bed for the pipe.

As bedding material, use selected mineral soil that meets the requirements for backfill specified in Subsection 603B.06.

When SHOWN ON THE DRAWINGS, ensure that the completed bedding has a longitudinal camber.

**603B.05 Placing & Joining.** Join to form a watertight connection, when SHOWN ON THE DRAWINGS.

Protect portions of the pipe that will be exposed, when SHOWN ON THE DRAWINGS.

Ensure that the final installed alignment allows no reverse grades, and does not permit any point to vary from a straight line drawn from center of inlet to center of outlet by more than 2 percent horizontally and vertically of the culvert length, or 300 mm, whichever is less, unless otherwise SHOWN ON THE DRAWINGS.

**603B.06 Backfilling.** Furnish readily compactible backfill material that is free of frozen lumps and chunks of highly plastic clay (with a plasticity index greater than 10) or other objectionable material. Do not use rocks larger than 25 mm in greatest dimension within 300 mm of the pipe.

Place backfill material that is at or near optimum moisture content, and compact it in layers not exceeding 150 mm loose thickness on both sides, and to an elevation of 300 mm minimum above the top of the pipe. Thoroughly compact the backfill under the haunches of the pipe. Bring the backfill up evenly on both sides of the pipe for the full length. Extend the width of the compacted backfill a minimum of 300 mm on each side of the pipe.

Continue backfilling and compacting until the backfill is a minimum of 300 mm above the top of the culvert.

After bedding and backfilling the pipe, protect it with an adequate cover of embankment before heavy equipment is permitted to cross during roadway construction.

Replace any pipe that is distorted by more than 5 percent of nominal dimensions, or that is ruptured or broken.

Compact backfill using method A, B, or C, as DESIGNATED IN THE SCHEDULE OF ITEMS.

*(a) Method A.* Ensure that backfill density exceeds the density of the surrounding embankment.

*(b) Method B.* Ensure that backfill density exceeds 95 percent of the maximum density, as determined by AASHTO T 99, method C or D.

Determine density of the compacted material during the process of the work in accordance with AASHTO T 191, T 205, or T 238; and AASHTO T 217, T 239, or T 255. Corrections for coarse particles may be made in accordance with AASHTO T 224.

(c) **Method C.** Ensure a moisture content suitable for obtaining compaction. Compact each layer using compaction equipment designed for this purpose until visual displacement ceases.

**Measurement**

**603B.07 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

When DESIGNATED IN THE SCHEDULE OF ITEMS, measure backfill material adjacent to the pipe 300 mm horizontally and vertically from the outside dimensions of the pipe, with a deduction for the volume of the pipe along the full length of the backfill.

**Payment**

**603B.08 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
603B (01) _____ -mm plastic pipe, method _____	Meter
603B (02) Furnishing and placing backfill material for pipe .....	Cubic Meter

## Section 605—Underdrains

### Description

**605.01 Work.** Furnish and install underdrains, sheet drains, and pavement edge drains.

The term “metal” refers collectively to aluminum and steel.

### Materials

**605.02 Requirements.** Furnish materials that meet the requirements specified in the following subsections:

Aluminum-Alloy Corrugated Pipe .....	707.03
Asphalt-Coated Pipe .....	707.04
Geocomposite Drains .....	714.02
Geotextile, Type I (A, B, C, D, E, or F) .....	714.01
Granular Backfill .....	703.03
Metallic-Coated Corrugated Steel Pipe .....	707.02
Perforated Concrete Pipe .....	706.03
Plastic Pipe .....	706.08
Repair of Damaged Coatings .....	707.15
Structural Backfill .....	704.04

### Construction

**605.03 General.** Use the same material and coating on all contiguous drain sections, extensions, elbows, branch connections, and other special sections.

Type of backfill material and underdrain pipe material, orientation of geosynthetic material, and approximate location are SHOWN ON THE DRAWINGS. Determine the final location and length in the field.

Conduct excavation in accordance with the requirements specified in Section 206A.

If geotextile or geocomposite is used, smooth the trench surfaces by removing all projections that may damage the geotextile or geocomposite. Replace geotextile or geocomposite damaged during installation. Make repairs to geocomposites in accordance with the manufacturer’s recommendations.

Do not permit soil materials or other foreign matter to enter the drain systems. Plug the upgrade end of installations.

Backfill in 150-mm layers by first dampening the granular backfill and then compacting each layer with two or more passes of a mechanical tamper.

Furnish nonperforated pipe for outlet pipe. Install outlet pipe as specified in Sections 603, 603A, and 603B. Immediately place and secure a screen made of 1.4-mm-diameter galvanized wire with approximately  $13 \times 13$ -mm mesh openings over the outlet ends of all exposed pipes and weep holes.

**605.04 Underdrain & Trench.** Place a layer of granular backfill at least 100 mm in thickness in the bottom of the trench.

Furnish a collector pipe at least 125 mm in diameter with all underdrains.

Join pipe sections securely with coupling fittings or bands. Join PVC and acrylonitrile-butadiene-styrene (ABS) pipe using either a flexible elastomeric seal or solvent cement. Join polyethylene pipe with snap-on, screw-on, or wrap-around coupling bands, as recommended by the manufacturer.

When underdrain is placed in drainages, prevent infiltration of surface water by placing material conforming to AASHTO M 145 classifications A-4, A-5, A-6, or A-7 in the top 300 mm of the trench.

*(a) Standard Underdrain.* When geotextile is required, place the long dimension of the geotextile parallel to the centerline of the trench. Position the geotextile, without stretching, such that it lies smoothly in contact with the trench surface. Overlap the joints a minimum of 600 mm with the upstream geotextile placed over the downstream geotextile.

Place collector pipe with the perforations down. Firmly embed the underdrain pipe in granular backfill material.

Place granular backfill to a height of 300 mm above the top of the collector pipe and compact. Do not displace the collector pipe. Place and compact the remainder of the granular backfill material as specified in Subsection 603.08, method A or B.

Fold the geotextile over the top of the granular backfill with a minimum overlap of 300 mm.

*(b) Geocomposite Underdrain or Sheet Drain.* Extend the geotextile from the bottom of the drainage core around the collector pipe.

Construct splices, joints, and outlet fittings as recommended by the manufacturer and in a manner that prevents infiltration of soil into the geocomposite core and does not impede flow through the geocomposite core or damage the core.

Place the assembled geocomposite in the trench with the geocomposite placed against the inflow side of the trench. If the trench wall is irregular such that flow along or through the geocomposite may be impeded, smooth the trench or place a layer of granular backfill between the geocomposite and the trench wall.

Temporarily support the drain against the trench side while backfilling.

When the trench is less than 0.5 m in width, backfill the trench using fine granular backfill. Except as otherwise indicated, backfilling in layers and compacting are not required. After the backfill is in place, densify by wheel rolling, vibrating, tamping with a mechanical tamper, or flooding with water.

When the trench is 0.5 m or more in width, place granular coarse or fine backfill to a height of 300 mm above the top of the collector pipe and compact the material. Finish backfilling the trench as indicated in Subsection 605.03.

**605.05 Geocomposite Sheet Drain.** Do not place sheet drain against a mortar course less than 4 days old.

When a geocomposite is used in conjunction with a waterproof membrane, install drainage panels compatible with the membrane using methods recommended by the membrane manufacturer. Assemble and place the geocomposite drain against the surface to be backfilled according to the manufacturer's recommendations.

Splice geocomposite drains so the flow across the edges is continuous. Overlap the geotextile a minimum of 75 mm in the direction of waterflow. For vertical splices, overlap the geotextile in the direction that backfill proceeds.

Connect the drainage core to the collector pipe or weep holes so the flow is continuous through the system. Extend the geotextile from the bottom of the drainage core around the collector pipe.

Backfill with structural backfill material, and compact it as specified in Subsection 605.03.

**605.06 Geocomposite Pavement Edge Drain.** Assemble the geocomposite pavement edge drain and outlet material according to the manufacturer's recommendations and place them in the trench. If the trench is irregular such that flow along or through the geocomposite may be impeded, smooth the trench or place a layer of fine granular backfill between the geocomposite and the trench wall.

Temporarily support the drain against the trench while backfilling.

When the trench is less than 0.5 m in width, backfill the trench using fine granular backfill. Backfilling in layers and compacting are not required. After the backfill is in place, densify by wheel rolling, vibrating, tamping with a mechanical tamper, or flooding with water.

When the trench is 0.5 m or more in width, place coarse or fine backfill to a height of 300 mm above the top of the collector pipe and compact. Finish backfilling the trench as indicated in Subsection 605.03.

When underdrain is placed in drainages, prevent infiltration of surface water by placing material conforming to AASHTO M 145 classifications A-4, A-5, A-6, or A-7 in the top 300 mm of the trench.

**Measurement**

**605.07 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure geotextile material on surface area covered according to the dimensions, as SHOWN ON THE DRAWINGS.

**Payment**

**605.08 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
605 (01) Standard underdrain system .....	Meter
605 (02) Geocomposite underdrain system .....	Meter
605 (03) Geocomposite sheet drain system .....	Square Meter
605 (04) Geocomposite pavement edge drain system .....	Meter
605 (05) ____-mm collector pipe .....	Meter
605 (06) ____-mm outlet pipe .....	Meter

Section 605

- 605 (07) Coarse granular backfill ..... Cubic Meter
- 605 (08) Fine granular backfill ..... Cubic Meter
- 605 (09) Geotextile material ..... Square Meter
- 605 (10) Structural backfill ..... Cubic Meter



## Section 606—Guardrail

### Description

**606.01 Work.** Construct guardrail systems, and/or modify, remove, reset, and/or raise existing guardrail systems.

(a) Guardrail systems are designated as follows:

G1	Cable guardrail
G2	W-beam (weak post)
G3	Box beam
G4	Blocked-out W-beam standard barrier
G9	Blocked-out three-beam standard barrier
MB4	Blocked-out W-beam median barrier
SBTA	Steel-backed timber guardrail/timber posts and blackout
SBTB	Steel-backed timber guardrail/timber posts and no blackout
CRT	W-beam guardrail and no blackout
STLG	Steel-backed log rail

(b) Steel guardrail types are designated as follows:

I	Zinc-coated, 550 g/m <sup>2</sup>
II	Zinc-coated, 1,100 g/m <sup>2</sup>
III	Painted rails
IV	Corrosion-resistant steel

(c) Steel guardrail classes are designated as follows:

A	Metal thickness—2.67 mm
B	Metal thickness—3.43 mm

(d) Terminal section types are designated as follows:

BCT	Breakaway cable terminal
CRT	Cable releasing terminal
MELT	Modified eccentric loader terminal
G4–BAT	Back slope anchor terminal

**Materials**

**606.02 Requirements.** Furnish materials that meet the requirements specified in the following section and subsections:

Box Beam Rail .....	710.07
Corrosion-Resistant Steel Rail .....	710.06(b)
Galvanized Steel Rail .....	710.06(a)
Guardrail Hardware .....	710.10
Guardrail Hardware (Reflector Tabs) .....	710.10
Guardrail Posts .....	710.09
Minor Concrete Structures .....	602
Precast Concrete Units (Precast Anchors) .....	725.11
Retroreflective Sheeting, Type I or Type II .....	718.01
Steel-Backed Timber Rail .....	710.08
Treated Structural Timber & Lumber .....	716.03
Welding .....	555.18
Wire Rope or Wire Cable .....	709.02

**Construction**

**606.03 Posts.** When pavement is within 1 m of the guardrail, set posts before placing the pavement.

Do not shorten guardrail posts unless the cut end is set in concrete. Do not shorten posts in terminal sections.

Drive posts into pilot holes that are punched or drilled. The dimensions of the pilot hole shall not exceed the dimensions of the post by more than 15 mm. Set posts plumb, backfill, and compact in accordance with Subsection 206A.10.

When longer posts are specified, do not use them in the terminal sections.

Alternate hole arrangements, when specified, do not apply to posts in the anchorage assembly.

Protect posts from traffic at all times by attaching rail elements and all associated hardware, or by other approved methods.

**606.04 Rail Elements.** Install the rail elements after the pavement adjacent to the guardrail is complete. Do not modify specified hole diameters or slot dimensions. Install guardrail systems of the type and class SHOWN ON THE DRAWINGS.

*(a) Steel Rail.* Shop bend all curved guardrail with a radius of 45 m or less.

Erect rail elements in a smooth continuous line with the laps in the direction of traffic flow. Use bolts that extend at least 6 mm, but not more than 25 mm beyond the nuts. Tighten all bolts.

Paint all scrapes on galvanized surfaces that are through to the base metal with two coats of zinc-oxide paint.

Where installation of the rail elements interferes with paving operation, rail elements may be temporarily attached directly to the posts without blockouts. Install blockouts within 15 days following the paving operation. Securely bolt a type 1 end section assembly to the last post at the end of each day on guardrail sections that have an exposed end toward oncoming traffic. Diaphragms are optional in the end section assembly.

**(b) Timber Rail.** Align timber guardrail along the top of the rail.

Field cut timber rails to produce a close fit at joints. Treat field cuts with two coats of the preservative originally used for treatment.

**(c) Log Rail.** Construct log rail as SHOWN ON THE DRAWINGS.

**606.05 Terminal Sections.** Construct terminal sections at the locations shown. Terminal sections consist of posts, railing, hardware, and anchorage assembly necessary to construct the type of terminal section specified.

Where concrete anchors are installed, construct either cast-in-place or precast units. Do not connect the guardrail to cast-in-place anchors until the concrete has cured 7 days. Install end anchor cables tightly, without slack.

Use either the steel tube anchor or the concrete anchor in the construction of the anchorage assembly for the type BCT terminal section.

When required, construct earth berms as specified in Section 203.13.

**606.06 Connection to Structure.** Construct connection to structure and, where required, reinforced concrete transition as SHOWN ON THE DRAWINGS.

**606.07 Removing & Resetting Guardrail.** Remove and store the existing guardrail, posts, and appurtenances. Remove and dispose of posts that are set in concrete. Replace all guardrail, posts, and hardware damaged during removal, storage, or resetting. Backfill all holes resulting from the removal of guardrail posts and anchors with granular material as specified in Subsection 206A.10.

**606.08 Raising Guardrail.** Remove the existing guardrail and appurtenances. Replace and reset posts as needed. Replace all guardrail, posts, and hardware damaged during the removal and raising.

**Measurement**

**606.09 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure guardrail, except steel-backed timber guardrail and steel-backed log rail, by the meter along the face of the rail, excluding terminal sections. Measure steel-backed timber guardrail and steel-backed log rail by the meter along the face of the rail, including terminal sections. Measure transition sections from G9 rail to G4 rail as G9 rail.

Measure terminal sections, except steel-backed timber guardrail terminal sections and steel-backed log rail terminal sections, by the each.

Measure removing and resetting guardrail and raising guardrail by the meter along the face of the rail, including reset terminal sections.

Measure replacement posts (except replacement posts for posts damaged by construction operations) used in removing, resetting, or raising guardrail by the each.

Measure reinforced concrete flared back parapet wall and safety shape transition by the each.

**Payment**

**606.10 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
606 (01) Guardrail system ____, type ____, class ____ .....	Meter
606 (02) Terminal section, _____ .....	Each
<i>Description</i>	
606 (03) Removing and resetting guardrail .....	Meter
606 (04) Raising guardrail .....	Meter
606 (05) Replacement posts .....	Each
606 (06) Connection to structure .....	Each
606 (07) Reinforced concrete transition .....	Each

## Section 607—Fences, Gates, & Cattleguards

### Description

**607.01 Work.** Furnish and install, or install only, fences, gates, and cattleguards.

### Materials

**607.02 Requirements.** Furnish materials that meet the requirements specified in the following sections and subsections:

Barbed Wire .....	710.01
Chain Link Fence .....	710.03
Fence Posts .....	710.04
Material for Timber Structures .....	716
Precast Concrete Units .....	725.11
Reinforcing Steel .....	709.01
Structural Metal .....	717
Timber Rails .....	710.13
Woven Wire .....	710.02

Furnish materials for gates and cattleguards that meet the requirements as SHOWN ON THE DRAWINGS. Concrete for cattleguard units may be cast-in-place or precast. Furnish concrete that meets the requirements specified in Subsection 602.03, method A or B, as SHOWN ON THE DRAWINGS.

### Construction

**607.03 Fences & Gates.** Remove trees, brush, and other obstacles along the fence line that interfere with the fence. Do not perform continuous grubbing or grading along the fence line. Where possible, erect the fence on natural ground. Establish clearing width and dispose of materials as SHOWN ON THE DRAWINGS.

When drilling into solid rock is required to set a post, the post may be shortened, provided a minimum of 300 mm of post is grouted into the rock.

Where breaks in a run of fencing are required, or at intersections with existing fences, adjust post spacing to meet the requirements for the type of closure.

When posts, braces, or anchors are to be embedded in concrete, install temporary guys or braces as required to hold the posts in proper position until the concrete has set. Install no materials on posts, and place no strain on guys and bracing set in concrete, until 7 days have elapsed from the time the concrete was placed.

Set all posts vertically and to the grade and alignment SHOWN ON THE DRAWINGS. Do not cut tops of posts unless approved by the CO.

Stretch wire or fencing taut, and firmly attach it to the posts and braces, as SHOWN ON THE DRAWINGS.

At each location where a high-voltage overhead electric transmission line crosses a fence containing metal, ground the fencing by installing a galvanized or copper-coated steel grounding rod 2.5 m long, with a minimum diameter of 13 mm, directly below the point of crossing. Drive the rod vertically until the top is 150 mm below the ground surface. Use a number 6 solid copper conductor or equivalent to connect each metal fence element to the grounding rod. Braze the connections or fasten them with noncorrosive clamps approved by the CO.

When a powerline is within 150 m and runs parallel or nearly parallel to the fence, ground the fence at each end, at gate posts, and at intervals not to exceed 450 m.

When acceptable vertical penetration of the grounding rod cannot be obtained, submit an equivalent horizontal grounding system for approval by the CO.

Ensure that the bottom of the fence fabric generally follows the contour of the ground. Grade where necessary to provide a neat appearance. Where abrupt changes in the ground profile make it impractical to maintain the specified ground clearance, longer posts may be used and multiple strands of barbed wire stretched between them. Make the vertical spacing between strands of barbed wire 150 mm, unless otherwise SHOWN ON THE DRAWINGS. At grade depressions, where stresses tend to pull posts from the ground, install sag bracing, as SHOWN ON THE DRAWINGS.

Splice wire as SHOWN ON THE DRAWINGS.

Repair all posts in accordance with approved procedures after cutting or drilling.

**607.04 Cattleguards.** Complete work required under Section 203 or 306 at the location of the cattleguard before beginning excavation for the cattleguard. Install the cattleguard at the grade elevation that is SHOWN ON THE DRAWINGS or as staked on the ground. Provide drainage at time of installation so the cattleguard will drain. Construct the bypass and gate as SHOWN ON THE DRAWINGS.

Conduct excavation and backfill in accordance with Section 206A.

After cattleguard is bedded, place selected material in layers not exceeding 150 mm loose thickness, uniformly compacted on all sides, along the cattleguard. Use readily compactible backfill material that is free of frozen lumps, chunks of highly plastic clay, or other objectionable material. Compact the backfill without damaging or

displacing the cattleguard. Continue backfilling and compacting to the top of the cattleguard foundation.

Raise cattleguards by modifying the cattleguard base as SHOWN ON THE DRAWINGS. Replace or recondition cattleground wings, posts, or decks as SHOWN ON THE DRAWINGS.

After bedding and backfilling, protect the cattleguard with adequate ramps on each side before heavy equipment is permitted to cross during roadway construction.

**Measurement**

**607.05 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure the length of the fence along the top of the fence between the outsides of the end posts for each continuous run of fence.

When brace panels and bypass gates are SHOWN ON THE DRAWINGS, payment for cattleguards will include these items.

**Payment**

**607.06 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
607 (01) Cattleguard, _____ foundation, loading _____, width _____ .....	Each
607 (02) Fence _____, type _____, height _____ .....	Meter
607 (03) Gate _____, type _____, size _____ .....	Each
607 (04) Cattleguard modification .....	Each
607 (05) Recondition .....	Each
607 (06) Replace .....	Each

## Section 609—Curb or Curb & Gutter

### Description

**609.01 Work.** Construct or reset curb, gutter, or combination curb and gutter.

### Materials

**609.02 Requirements.** Furnish materials that meet the requirements specified in the following sections and subsections:

Aggregate for Lean Concrete Backfill .....	703.13
Curing Material .....	711.01
Emulsified Asphalt (for Tack Coat) .....	702.03
Joint Mortar .....	712.02
Precast Concrete Curbing .....	725.06
Reinforcing Steel .....	709.01
Sealants, Fillers, Seals, & Sleeves .....	712.01
Stone Curbing .....	705.06

Furnish concrete that meets the requirements of Subsection 602.03, method A or B, as SHOWN ON THE DRAWINGS.

Furnish bituminous mixtures that meet the requirements as SHOWN ON THE DRAWINGS or in the SPECIAL PROJECT SPECIFICATIONS.

Concrete, bituminous mixes, and manufactured curbing materials will be subject to inspection and tests at the plants for compliance with quality requirements.

### Construction

**609.03 Cast-in-Place Portland Cement Concrete Curbing or Curb & Gutter.**

For cast-in-place Portland cement concrete curbing or curb and gutter, meet the requirements in the following subsections:

*(a) Excavation.* Excavate to the depth SHOWN ON THE DRAWINGS. Compact the foundation to a firm, even surface. Remove all soft, yielding material and replace it with acceptable material.

*(b) Forms.* Use forms of wood, metal, or other suitable material and extend them to the full depth of the concrete. Ensure that all forms are straight, free of warp, and of sufficient strength to resist the pressure of the concrete without displacement. Brace and stake the forms to keep them in both horizontal and vertical alignment until their



removal. Clean all forms and coat them with an approved form-release agent before concrete is placed. Use divider plates made of metal. After the forms have been set to line and grade, bring the foundation to the grade required, and wet it well approximately 12 hours before placing the concrete. Machine slip forming may be used.

(c) **Mixing & Placing.** Proportion, mix, and place the concrete in accordance with the requirements specified in Subsection 602.03, method A or B, and as SHOWN ON THE DRAWINGS. Deposit the concrete without segregation in a single course. Use vibration or other acceptable methods to consolidate concrete placed in the forms. Leave forms in place for 24 hours or until the concrete has set sufficiently so that forms can be removed without damage to the curbing. Strike off the concrete to the cross section SHOWN ON THE DRAWINGS, then finish the concrete smooth and even by means of a wooden float.

For the purpose of matching adjacent concrete finishes or for other reasons, the CO may permit other methods of finishing. No plastering shall be permitted.

(d) **Contraction Joints.** Construct curbing in sections of a uniform length of 3 m, unless otherwise approved by the CO. Separate sections by open joints approximately 3 mm wide and at least 25 mm deep, except at expansion joints. Where the curb is constructed adjacent to concrete pavement, match the contraction or open joints in the curb to the contraction joints in the pavement.

(e) **Expansion Joints.** Form expansion joints at the intervals SHOWN ON THE DRAWINGS using a preformed expansion joint filler with a thickness of 13 mm. When the curb is constructed adjacent to or on concrete pavement, locate expansion joints at expansion joints in the pavement.

(f) **Curing.** Immediately upon completion of the finishing, moisten the curb and keep it moist for 3 days, or use membrane-forming material to cure the curbing. Ensure that all materials meet the requirements specified in Subsection 711.01.

(g) **Backfilling.** After the concrete has set sufficiently, backfill the curb to the required elevation with suitable material, and compact the material in accordance with Subsection 203.16(b), method 4, in layers of not more than 150 mm loose thickness.

(h) **Curb Machine.** The curb or curb and gutter may be constructed using a curb-forming machine that meets the requirements of Subsection 609.06(c).

(i) **Curb Template.** Exposed curb face may be constructed and finished using trowel-type templates shaped to produce the desired contours when operated along approved forms set to the established lines and grades.

While the concrete is green, float the top, front, or other exposed surfaces of the curb or combined curb and gutter with a moist wooden float. Remove form marks and any other irregularities.

**609.04 Precast Concrete Curbing.** Set the curb so that the top surfaces of adjoining sections are true and even. Fill all spaces under the curbing with material that meets the requirements of the material for bed course, and compact this material.

**609.05 Reflecting Concrete Curbing.** Use construction methods for this item that meet the requirements specified in Subsection 609.03, with the following exceptions:

- (a) Use a mortar mix consisting of one part white Portland cement to 1.75 parts light-colored washed mortar sand to create the reflecting surface of the curbing. Make this mortar mix approximately 25 mm thick.
- (b) Alternatively, construct the entire curbing of concrete with white Portland cement.

Use washed mortar sand that meets all the requirements for mortar sand and is light in color. Place the reflecting surface mortar immediately after the base concrete. Never let more than 20 minutes elapse between placing the base concrete and the reflecting surface.

Perform scoring or surface deformation and finishing of the reflecting surface in accordance with the details SHOWN ON THE DRAWINGS.

**609.06 Bituminous Concrete Curbing.** For bituminous concrete curbing, meet the requirements in the following specifications:

(a) **Excavation.** Excavate as specified in Subsection 609.03(a).

(b) **Preparation of Bed.** When curbing is to be constructed on a cured or aged Portland cement concrete base, on bituminous pavement, or on a bituminous-treated base, thoroughly sweep the bed and clean it using compressed air. Thoroughly dry the surface, and immediately before placing the bituminous mixture, apply a tack coat of bituminous materials of the type and grade SHOWN ON THE DRAWINGS. Apply the tack coat material at a rate between 0.23 and 0.68 L/m<sup>2</sup> of surface area. Prevent the tack coat from spreading to areas outside of the area to be occupied by the curb.

(c) **Placing.** Construct bituminous curbing using a self-propelled automatic curber or curb machine, or a paver with curbing attachments. Use an automatic curber or machine that meets the following requirements:

- (1) The weight of the machine must provide compaction without the machine riding above the bed on which curbing is constructed.
- (2) The machine must form curbing of uniform texture, shape, and density.
- (3) The construction of curbing by means other than the automatic curber or machine is acceptable when short sections or sections with short radii are required. Ensure that the resulting curbing conforms in all respects to the curbing produced by using the machine.

Place the mixture only when the bed is dry and weather conditions are suitable for properly handling and finishing the mixture.

Place the bituminous mixture at a workable temperature of not less than 105 °C. Place the curbs to an accurate alignment and with a high density such that material is free of honeycombs. When joining to a section of curb that has become cold, give the contact surface of the cold curb a thin uniform tack coat of bituminous material prior to placing the fresh bituminous mixture against the cold joint. Protect the curb from traffic using barricades or other suitable methods until the curb has hardened.

**(d) *Painting & Sealing.*** Seal or paint only on a curbing that is clean and dry and has reached an ambient temperature.

**(e) *Backfilling.*** Backfill as specified in Subsection 609.03(g).

**609.07 Resetting Curb.** In resetting curb, meet the requirements in the following specifications.

**(a) *Salvage of Curbing.*** Carefully remove, store, and clean curbing that is specified for resetting. Replace any curbing to be reset that is lost from storage or damaged through improper handling.

**(b) *Excavation.*** Excavate and provide bedding as specified in Subsection 609.03(a).

**(c) *Resetting Curb.*** Set the curb on a firm bed with the top surface of adjoining sections true and even. Set all sections of curbing so that the maximum opening between adjacent sections is not more than 19 mm wide for the entire exposed top and face. Dress the ends of the curbing as necessary to meet this requirement.

After the curb has been set, completely fill the joints with mortar as SHOWN ON THE DRAWINGS.

**(d) Backfilling.** Backfill the curb with suitable material to the required elevation. Thoroughly tamp backfill material in layers of not more than 150 mm loose thickness.

**(e) Cutting & Fitting.** Cut or fit as necessary to install the curbing.

**Measurement**

**609.08 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure curbing along the front face of the section at the finished grade elevation. Measure the length of combination curb and gutter along the face of the curb. Make no deduction in length for drainage structures installed in the curbing section, or for driveway openings where the gutter is carried across the drive.

**Payment**

**609.09 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
609 (01) Portland cement concrete curb, _____ -mm depth, type _____ .....	Meter
609 (02) Portland cement concrete gutter, type _____ .....	Meter
609 (03) Portland cement concrete curb and gutter, _____ -mm depth, type _____ .....	Meter
609 (04) Bituminous concrete curb, _____ -mm depth .....	Meter
609 (05) Reset curb .....	Meter
609 (06) Bed course material .....	Ton
609 (07) Bed course material .....	Cubic Meter

## Section 610—Stone Masonry Structures

### Description

**610.01 Work.** Construct stone masonry structures and stone masonry portions of composite structures.

**610.02 Classes of Masonry.** The class of masonry required for each part of a structure will be SHOWN ON THE DRAWINGS.

- (a) *Cement rubble masonry* shall consist of roughly dressed stones of various sizes and shapes laid in random courses in cement mortar.
- (b) *Class A and class B masonry* shall consist of stones shaped, dressed, and laid broken-coursed in cement mortar.
- (c) *Dimensioned masonry* shall consist of broken-coursed ashlar masonry composed of stones with two or more dimensions SHOWN ON THE DRAWINGS.

### Materials

**610.03 Stone.** Furnish stone that is sound and durable. Use stone for dimensioned masonry that is free of reeds, rifts, seams, laminations, and minerals that, by weathering, would cause discoloration or deterioration.

(a) *Sizes & Shapes.* Furnish stones in the sizes and face areas necessary to produce the general characteristics and appearance SHOWN ON THE DRAWINGS.

In general, furnish stones with a thickness of not less than 125 mm, a width not less than 300 mm and one and one-half times the thickness of the stones, and a length not less than one and one-half times their width. Where headers are required, use stones with lengths not less than the width of the bed of the widest adjacent stretcher, plus 300 mm.

Ensure that at least 50 percent of the total volume of the masonry is made up of stones with a volume of at least 0.03 m<sup>3</sup> each.

(b) *Dressing.* Dress the stone to remove any thin or weak portions. Dress face stones to provide bed and joint lines with a maximum variation from true line as follows:

Type of Masonry	Maximum Variation
Cement rubble masonry	37 mm
Class A masonry	19 mm
Class B masonry	6 mm
Dimensioned masonry	Reasonably true

(c) **Bed Surfaces.** Ensure that bed surfaces of face stones are normal to the faces of the stones for about 75 mm. From this point, they may depart from normal, not to exceed 25 mm in 300 mm for dimensioned masonry, and 50 mm in 300 mm for all other classes.

(d) **Joint Surfaces.** In all classes of masonry except dimensioned masonry, construct joint surfaces of face stones to form an angle with the bed surfaces of not less than 45°.

In dimensioned masonry, ensure that joint surfaces are normal to the bed surfaces, and normal to the exposed faces of the stone for at least 50 mm. From this point, they may depart from normal by not more than 25 mm in 300 mm.

Do not round the corners at the meeting of the bed and joint lines in excess of the following radii:

Type of Masonry	Dimensions
Cement rubble masonry	37 mm
Class A masonry	25 mm
Class B masonry	No rounding
Dimensioned masonry	No rounding

(e) **Arch Ring Stone Joint Surfaces.** Ensure that arch ring stone joint surfaces are radial and at right angles to the front faces of the stones. Dress them for a distance of at least 75 mm from the front faces and soffits. From these points, they may depart from a plane normal to the face, not to exceed 19 mm in 300 mm. Ensure that the back surface is in contact with the concrete of the arch barrel parallel to the front face, and dress it for a distance of 150 mm from the intrados. Cut the top perpendicular to the front face, and dress it for a distance of at least 75 mm from the front.

When concrete is to be placed after the masonry has been constructed, place adjacent ring stones to vary at least 150 mm in depth.

(f) **Stratification.** Ensure that stratification in arch ring stones is parallel to the radial joints, and in other stones parallel to the beds.

(g) **Finish for Exposed Faces.** Pitch face stones to the line along all beds and joints. The kind of finish for exposed faces will be SHOWN ON THE DRAWINGS. The following symbols will be used, representing the type of surface or dressing specified below:

(1) *Fine Pointed (F.P.).* Make the point depressions approximately 10 mm apart with surface variation not to exceed 3 mm from the pitch line.

(2) *Medium Pointed (M.P.).* Make the point depressions approximately 15 mm apart with surface variations not to exceed 6 mm from the pitch line.

(3) *Coarse Pointed (C.P.).* Make the point depressions approximately 25 to 31 mm apart, with surface variations not to exceed 10 mm from the pitch line.

(4) *Split or Seam Faced (S.).* Make the surface present a smooth appearance without tool marks, without depressions below the pitch line, and with no projection exceeding 19 mm beyond the pitch line.

(5) *Rock Faced (R.F.).* Make the face an irregular, projecting surface without indications of tool marks, without concave surfaces below the pitch line, and with projections beyond the pitch line, when measured in millimeters, not exceeding the figure preceding the symbol as SHOWN ON THE DRAWINGS (for example, "37 R.F." means projections beyond the pitch line not exceeding 37 mm). Where a variable rock face is specified, distribute stones of the same height of projection.

Removal of drill and quarry marks from the faces of stones in cement rubble masonry shall not be required.

**610.04 Quarry Operations.** Organize quarry operations and delivery of stone to the point of use to ensure that deliveries are well ahead of masonry operations. Keep a sufficiently large stock of stone on the site at all times to permit adequate selection of stone by the masons.

**610.05 Mortar.** Use mortar that meets the requirements specified in Subsection 712.05.

## Construction

**610.06 Excavation & Backfill.** Excavate and backfill as specified in Section 206A, modified as follows:

For filled spandrel arches, carefully place the backfill to load the ring uniformly and symmetrically. Use backfill material approved by the CO. Place it in horizontal layers, carefully tamp it, and bring it up simultaneously from both haunches. Do not place wedge-shaped sections of backfill material against spandrels, wings, or abutments.

**610.07 Falsework.** Construct arch centering in accordance with construction drawings submitted. Provide wedges for raising or lowering the forms to the exact elevation for taking up any settlement that occurs during loading. Lower the centering gradually and symmetrically to avoid overstresses in the arch.

Rest centering upon jacks in order to take up and correct any slight settlement that may occur after the placing of masonry has begun. In general, strike the centering and make the arch self-supporting before the railing or coping is placed. For filled spandrel arches, leave these portions of the spandrel walls for construction subsequent to the striking of centers as necessary to avoid jamming of the expansion joints.

**610.08 Sample Section.** When SHOWN ON THE DRAWINGS, build an L-shaped sample section of wall not less than 1.5 m high and 2.5 m long, showing examples of face wall, top wall, method of turning corners, and method of forming joints. The sample section will be subject to the CO's approval. Do not lay any masonry other than the foundation masonry before such samples are approved.

**610.09 Arch Ring Template.** Lay out a full-size template of the arch ring near the quarry site, showing face dimensions of each ring stone and thickness of joints. Do not begin shaping any ring stone before the template is approved by the CO, and do not place any ring stone in the structure that does not correspond to approved configuration.

**610.10 Selection & Placing.** When the masonry is to be placed on a prepared foundation bed, make the bed firm and normal to, or in steps normal to, the face of the wall. Do not place any stone before the bed is approved by the CO. When stone is to be placed on foundation masonry, thoroughly clean the bearing surface of this masonry thoroughly and wet it immediately before the mortar bed is spread.

Set face stones in random bond to produce the effect SHOWN ON THE DRAWINGS and to correspond with the sample section approved by the CO.



Prevent small stones or stones of the same size from bunching. When weathered or colored stones or stones of varying texture are used, uniformly distribute the various kinds of stones throughout the exposed faces of the work. Use large stones for the bottom courses and large selected stones in the corners. In general, ensure that the stones decrease in size from the bottom to the top of work.

Thoroughly clean all stones and wet them immediately before they are set. Clean and moisten the bed before the mortar is spread. Lay the stones with their longest faces horizontal in full beds of mortar, and flush the joints with mortar.

**610.11 Beds & Joints.** Ensure that the exposed faces of individual stones are parallel to the faces of the walls in which the stones are set.

Do not jar or displace stones already set. Provide equipment for setting stones larger than those that can be handled by two people. Do not roll or turn stones on the walls. If a stone is loosened after the mortar has taken initial set, remove it, clean off the mortar, and relay the stone with fresh mortar.

Carefully set arch ring stone to exact positions, and hold the stone in place with hardwood wedges until the joints are packed with mortar.

Ensure that the thickness of beds and joints of face stones are as follows:

Type of Masonry	Beds	Joints
Cement rubble masonry	12–62 mm	12–62 mm
Class A masonry	12–50 mm	12–50 mm
Class B masonry	12–50 mm	12–37 mm
Dimensioned masonry	(See note)	19–25 mm

*Note:* The thickness of beds in dimensioned masonry may vary from 19 to 25 mm from the bottom to the top of the work. However, make the beds of uniform thickness throughout in each course.

Do not allow beds to extend in an unbroken line across more than 5 stones, and joints across more than 2 stones.

Make joints in dimensioned masonry vertical. In all other masonry, joints may be at angles with the vertical from 0° to 45°.

Bond each face stone with all contiguous face stones at least 150 mm longitudinally and 50 mm vertically.

Do not make the corners of four stones adjacent to each other.

Make cross beds for vertical walls level. For battered walls, cross beds may vary from level to normal to the batter line of the face of the wall. Completely fill all arch ring joints with mortar.

**610.12 Headers.** Uniformly distribute headers throughout the walls of structures to form at least one-fifth of the faces.

**610.13 Backing.** Build the backing chiefly of large stones and in a workmanlike manner. Ensure that the individual stones composing the backing and hearting are well bonded with the stones in the face wall and with each other. Completely fill all openings and interstices in the backing with mortar, or with spalls completely surrounded by mortar.

**610.14 Coping.** Prepare copings as SHOWN ON THE DRAWINGS. If copings are not SHOWN ON THE DRAWINGS, finish the top of the wall with stones wide enough to cover the top of the wall, from 0.5 to 1.5 m in length, and of random heights, with a minimum height of 150 mm. Lay stones so the top course is an integral part of the wall. Align the tops of the top courses of stone in both vertical and horizontal planes.

**610.15 Parapet Walls.** Use selected stones, squared and pitched to line and with heads dressed, in the ends of parapet walls and in all exposed angles and corners. Interlock headers well, and extend as many as possible entirely through the wall. Ensure that both the headers and stretchers in the two faces of the wall are well interlocked in heart and comprise practically the whole volume of the wall. Completely fill all interstices in the wall with cement grout, or with spalls completely surrounded with mortar or grout.

**610.16 Facing for Concrete.** Construct the stone masonry before placing concrete. Concrete may be placed before constructing the stone masonry if approved by the CO.

*(a) Stone Masonry Constructed Prior to Placing Concrete.* Ensure that hooked steel anchors, consisting of number 4 bars each bent into an elongated “S” shape, are spaced 600 mm apart both horizontally and vertically, unless closer spacing is SHOWN ON THE DRAWINGS. To improve the bond between the stone masonry and the concrete backing, make the back of the former as uneven as the stones will permit. Rigidly embed each anchor in a horizontal joint of the masonry, with one end 50 mm from the faces of the stones. Project the other end approximately 250 mm into the concrete hacking.

When the stone facing has been laid and the mortar has attained sufficient strength, carefully clean all surfaces against which concrete is to be placed and remove all

dirt, loose material, and accumulations of mortar droppings. If necessary, use picks, scrapers, and wire brooms for this purpose. If compressed air is available, use it to blow out the dust and dirt. Just before the concrete is placed, wash the surfaces thoroughly. Forcibly dash water against the stones and into the joints, preferably using a hose. In depositing concrete, hold the top surface immediately adjacent to the stones, slightly low, and carry a neat cement grout of the consistency of cream on top of the concrete and against the masonry at all times, coating the entire exposed areas of all the stones with grout. Fill all interstices of the masonry, and thoroughly spade the concrete, working it until it is brought into intimate contact with every part of the back of the masonry.

**(b) Concrete Placed Before Constructing Masonry.** Except where otherwise SHOWN ON THE DRAWINGS, allow a thickness of 225 mm for facing. Set galvanized metal slots with anchors for the stone work, or other approved type of metal anchor, vertically in the concrete face at a horizontal spacing of no more than 600 mm. Temporarily fill the slots with felt or other material to prevent them from being filled with concrete. During the setting of the stone facing, fit the metal anchors tightly in the slots at an average vertical spacing of 600 mm. The CO will mark on the concrete backing the approximate location of the anchors. Place the anchor in the stone joint nearest to the mark. Ensure that at least 25 percent of the metal anchors have a short right-angle bend to engage a recess to be cut into the stone. Extend the anchors to within 75 mm of the exposed face of the stone work.

Where the shape of the concrete face is unsuitable for the use of metal slots, place ties consisting of U.S. Standard Gauge number 9 galvanized iron wire, as approved by the CO, with not less than one wire tie for each 0.14 m<sup>2</sup> of exposed stone surface. In laying the stone, continuously keep the concrete face wet for 2 hours before placing the stone, and thoroughly fill all spaces between the stone and concrete with mortar. Immediately after laying, clean all exposed stone surfaces, and keep them clean of loose mortar and cement stains.

**610.17 Pointing.** Point or finish all joints as SHOWN ON THE DRAWINGS.

When raked joints are called for, rake out all mortar in exposed faced joints and beds to the depth SHOWN ON THE DRAWINGS. Clean stone faces in the joints free of mortar.

When weather joints are called for, weather strike the bed. Slightly rake the joints to conform to the bed weather joint. Never make the mortar flush with the faces of the stones.

To provide drainage, slightly crown the mortar in joints on top surfaces at the center of the masonry.

**610.18 Weep Holes.** Provide all walls and abutments with weep holes, as SHOWN ON THE DRAWINGS.

**610.19 Cleaning Exposed Faces.** Immediately after being laid and while the mortar is fresh, thoroughly clean all face stone of mortar stains, and keep it clean until the work is completed. Before the final acceptance, clean the surface of the masonry using wire brushes and acid, if necessary.

**610.20 Weather Limitations.** Do not lay stone in freezing weather unless the CO approves in writing, and then only using precautionary methods prescribed for doing the work and protecting it at all times. This permission and the use of the prescribed methods shall not release the Contractor from the obligation to build a satisfactory structure. Remove and replace all work damaged by cold weather. In hot or dry weather, use satisfactory means to protect the masonry from the sun, and keep it wet for at least 3 days after completion.

**Measurement**

**610.21 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Do not include sample sections of wall, unless they are permitted to be incorporated in the work.

When computing quantities, use the dimensions determined by the lines SHOWN ON THE DRAWINGS. Make no deductions for weep holes, drain pipes, or other openings of less than 0.2 m<sup>2</sup> in area, or for chamfers or other ornamental cuts that amount to 5 percent or less of the volume of the stone in which they occur.

**Payment**

**610.22 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
610 (01) Cement rubble masonry .....	Cubic Meter
610 (02) Class A masonry .....	Cubic Meter
610 (03) Class B masonry .....	Cubic Meter
610 (04) Dimensioned masonry .....	Cubic Meter

**Section 610A—Simulated Stone Masonry Surface**

**Description**

**610A.01 Work.** Design, furnish, and install textured form liners. Apply a surface finish (color/stain application) that will duplicate the unique coloring and mottled appearance of stone masonry. Prepare a simulated stone masonry test wall and demonstrate the surface finish before beginning production work.

In accordance with the intent of the contract, simulate the texture and color of native stone masonry. Construct the simulated stone masonry stone pattern as SHOWN ON THE DRAWINGS.

**Materials**

**610A.02 Requirements.** Furnish material as specified in the following subsections:

Form Liner .....	725.26
Low-Strength Grout (Plaster Mix) .....	701.03(b)
Penetrating Stain .....	708.05
Preformed Expansion Joint Fillers .....	712.01(b)

**Construction**

**610A.03 Form Liner Fabrication.** Take an impression of the stone shape, texture, and mortar joints from a designated location. Design form liners from the impressions according to the stone pattern, as SHOWN ON THE DRAWINGS.

**610A.04 Form Liner Installation.** Attach the form liners to the form. Attach adjacent form liners to each other, with less than a 3-mm seam. Do not repeat the form liner pattern between expansion joints or within 6-m intervals, whichever is greater.

Form expansion joints at the intervals as SHOWN ON THE DRAWINGS. Blend the butt joints into the pattern and the final concrete surface.

Coordinate the forms with wall ties. Place form tie holes in the high point of rustication or in the mortar joint.

Clean off buildup before reusing form liners. Visually inspect each liner for blemishes and tears. Repair the liner before installation.

**610A.05 Top Surface.** Emboss the plastic concrete in the exposed top surface by stamping, tooling, troweling, or hand shaping, or a combination thereof, to simulate the stone masonry texture and mortared joints. Match the side pattern of the formed mortared joints. Immediately after the free surface water evaporates and the finish embossing is complete, cure the concrete for 7 days, as specified in Subsection 552.17(b). Do not use liquid membrane curing compounds.

**610A.06 Form Liner Removal.** Within 24 hours after placing concrete, remove or break free the form liners without causing concrete surface deterioration or weakness in the substratum. Remove all form tie material to a depth of at least 25 mm below the concrete face without spalling and damaging the concrete.

Cure the concrete for 7 days, as specified in Subsection 552.17(b). Do not use liquid membrane curing compounds.

**610A.07 Preparation of Concrete Surface.** Finish all exposed formed concrete surfaces as specified in Subsection 552.18(a). Finish so that vertical seams, horizontal seams, and butt joint marks are not visible. Keep grinding and chipping to a minimum to avoid exposing aggregate.

Provide a completed surface free of blemishes, discolorations, surface voids, and conspicuous form marks. Make the finished texture and patterns continuous without visual interruption.

**610A.08 Color/Stain Application.** Age concrete, including patches, a minimum of 30 days. Use approved methods to clean the surface of all latency, dirt, dust, grease, and any foreign material.

Remove efflorescence with a pressure water wash. Use a fan nozzle held perpendicular to the surface at a distance from 0.6 to 1 m. Use a minimum 20 MPa water pressure at a rate of 12 to 16 L/min. Do not sandblast any surface that will receive color or stain.

Correct any surface irregularities created by the surface cleaning.

Maintain the concrete temperature between 4 °C and 30 °C when applying color or stain, and for 48 hours after applying color or stain.

Color or stain all exposed concrete surfaces. Use a color or stain application suitable to obtain the appearance of the native stone masonry. Use a minimum of three colors or stains.

When required at boundaries between two color tones or between surfaces that receive color at different times, take care to provide protection to avoid overspray and color overlap.

Apply grout of a natural cement color to each form joint. Use sufficient grout so the overspray of the color or stain is not visible. Give the form pattern grout joint the appearance of mortared joints in completed masonry.

Recoat any areas that lack a uniform appearance or are inconsistent in appearance with the approved test wall.

Treat expansion joints with caulk or grout to blend with the appearance of the adjacent stone or mortar joint.

**610A.09 Test Wall.** Before beginning production work on the simulated stone masonry, construct a test wall with a minimum size of 1.0 m height by 0.5 m width by 3.0 m length, in accordance with Section 552 and these specifications.

Cast the test wall on site, using the same forming methods, procedures, form liner, texture configuration, expansion joint, concrete mixture, and color or stain application proposed for the production work. Demonstrate the quality and consistency of joint treatment, end treatment, top embossing methods, back treatment, and the color or stain application on the test wall. Construct a new test wall if results are not acceptable.

Begin production structural concrete work only after the test wall is approved. Begin production color or stain application only after the color or stain application on the test wall is approved. Dispose of the test wall after use as SHOWN ON THE DRAWINGS.

### **Measurement**

**610A.10 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure simulated stone masonry surface treatment by the square meter.

Measure the simulated stone masonry test wall, including concrete and surface finish, by the each.

Do not measure form liners.

### **Payment**

**610A.11 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Section 610A

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
610A (01) Simulated stone masonry surface treatment .....	Square Meter
610A (02) Simulated stone masonry test wall .....	Each



## Section 611—Development of Pits & Quarries

### Description

**611.01 Work.** Clear, grub, strip topsoil, remove overburden, construct access roads, conduct restoration activities, and perform other incidental work required for pit or quarry development.

### Construction

**611.02 General.** Perform all work in accordance with Sections 201, 203, and 625; landscape preservation requirements; and the pit and quarry development and/or restoration plan, as SHOWN ON THE DRAWINGS.

**611.03 Source.** Develop designated sources in accordance with requirements SHOWN ON THE DRAWINGS or in the SPECIAL PROJECT SPECIFICATIONS.

**611.04 Clearing, Grubbing, & Slash Cleanup.** Meet clearing, grubbing, and slash cleanup requirements as specified in Section 201 and as SHOWN ON THE DRAWINGS.

**611.05 Access Roads.** Construct or recondition access roads to the pit or quarry as specified in Section 203 or 306, and as SHOWN ON THE DRAWINGS.

**611.06 Topsoil.** Strip, stockpile, and place topsoil obtained from the site as specified in Section 203 and as SHOWN ON THE DRAWINGS.

**611.07 Overburden.** Remove overburden to expose rock material for aggregate production, and stockpile or place the overburden in the embankment within the limits of the pit or quarry, as specified in Section 203 and as SHOWN ON THE DRAWINGS.

**611.08 Ground Control & Haulways.** Perform the work in accordance with MSHA 30 CFR, part 56, as related to ground control and haulways. Immediately correct any deterioration of overburden slopes, safety benches, or protective berms, or any encroachment on clearing limits.

**611.09 Oversize Material.** Use all suitable material for aggregate, regardless of size, that is developed in stripping, overburden removal, and excavation of rock material, unless other disposition is SHOWN ON THE DRAWINGS.

**611.10 Restoration.** After excavation has been completed in part or all of the area, slope and grade the sides, and smooth the general pit area as SHOWN ON THE DRAWINGS.

Rip and drain access roads that are marked on the drawings for obliteration; block them to traffic; and seed them in accordance with Section 625.

**Measurement**

**611.11 Method.** Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

**Payment**

**611.12 Basis.** The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
611 (01) Pit development .....	Each
611 (02) Quarry development .....	Each