547.5 Payment

Pile encasements will be paid for at the Contract Price per linear foot (meter) for the pile size indicated, complete in place as specified.

This payment will be full compensation for furnishing all materials, tools, labor, equipment, and other items necessary to complete the Work.

Payment will be made under:

Item No. 547	Pile encasement, ___in.(mm) pile	Per linear foot (meter)

547.5.01 Adjustments

General Provisions 101 through 150.

Section 550—Storm Drain Pipe, Pipe-Arch Culverts, and Side Drain Pipe

550.1 General Description

This work includes furnishing and installing the following:

- Storm drain pipe
- Pipe-arch culverts
- Side drain pipe flared end sections
- Tapered pipe inlets

Install structures according to the Specifications and the details shown on the Plans, or as directed by the Engineer.

550.1.01 Definitions

General Provisions 101 through 150.

550.1.02 Related References

A. Standard Specifications

Section 205—Roadway Excavation

Section 207—Excavation and Backfill for Minor Structures

Section 208—Embankments

Section 645—Repair of Galvanized Coatings

Section 834—Masonry Materials

Section 840—Corrugated Aluminum Alloy Pipe

Section 841—Iron Pipe

Section 843—Concrete Pipe

Section 844—Steel Pipe

Section 845—Smooth Lined Corrugated Polyethylene (PE) Culvert Pipe

Section 846—Polyvinyl chloride (PVC) Profile Wall Drain Pipe

Section 847—Miscellaneous Pipe

Section 848—Pipe Appurtenances

B. Referenced Documents

General Provisions 101 through 150.

550.1.03 Submittals

General Provisions 101 through 150.

550.2 Materials

Ensure that materials meet the requirements of the following Specifications:

Material	Section
Backfill Materials	207
Reinforced Concrete Pipe	843.2.01
Nonreinforced Concrete Pipe	843.2.02
Mortar And Grout	834.2.03
Bituminous Plastic Cement	848.2.05
Rubber Type Gasket Joints (Concrete Pipe)	848.2.01
Preformed Plastic Gaskets	848.2.06
Corrugated Steel Pipe	844.2.01
Bituminous Coated Corrugated Steel Pipe	844.2.02
Corrugated Aluminum Alloy Pipe	840.2.01
Bituminous Coated Corrugated Aluminum Pipe	840.2.03
Aluminized Type 2 Corrugated Steel Pipe	844.2.06
Ductile Iron Pipe, Fittings and Joints	841
Precoated, Galvanized Steel Culverts	844.2.05
Smooth Lined Corrugated Polyethylene Pipe	845.2.01
Poly vinyl chloride (PVC) Profile Wall Drain Pipe	846
Miscellaneous Pipe	847

Use any of the following types of pipe:

- Reinforced concrete
- Nonreinforced concrete
- Corrugated steel or Aluminum
- Smooth-lined corrugated polyethylene
- Ductile iron
- Poly Vinyl Chloride (PVC) Profile Wall Drain Pipe

Use the type of pipe designated on the Plans, or acceptable alternate types when applicable.

550.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

550.3 Construction Requirements

550.3.01 Personnel

General Provisions 101 through 150.

550.3.02 Equipment

General Provisions 101 through 150.

550.3.03 Preparation

Before installing pipe and pipe-arches, shape the foundation material as shown on the Plans.

Prepare structure excavations and foundation according to Section 207. Except, do not use Class II B3 or II B4 soils as backfill for smooth-lined corrugated polyethylene pipe or polyvinyl chloride (PVC) profile wall drain pipe.

550.3.04 Fabrication

General Provisions 101 through 150.

550.3.05 Construction

A. Drainage

Provide necessary temporary drainage. Periodically remove any debris or silt that constricts the pipe flow to maintain drainage throughout the life of the Contract.

B. Damage

Before allowing traffic over a culvert, protect the structure by providing sufficient depth and width of compacted backfill. Repair damage or displacement from traffic or erosion that occurs after installing and backfilling at no additional cost to the Department.

C. Installation

1. Concrete Pipe

   Lay flat-bottom and circular sections in a prepared trench with the socket ends pointing upstream. To join sections, use any of the following joint types:

   - Mortar
   - Bituminous plastic cement
   - Rubber-type gasket
   - O-ringed gasket
   - Preformed plastic gasket

   If using mortar and bituminous plastic cement joints:

   a. Fill the annular space with the joint material and wipe the inside of each joint smooth.
   b. Construct mortar joints in the same manner, but thoroughly wet the annular space before filling it with joint material.
   c. After the initial set, protect the outside mortar from air and sun with thoroughly wet earth or burlap cover. Install rubber-type, O-ring, and preformed plastic gasket joints according to the manufacturer's recommendations.

2. Ductile Iron Pipe

   Lay pipe sections in a prepared trench, with bells pointing upstream. Construct joints according to Subsection 841.2.02.A.

3. Corrugated Aluminum or Steel Pipe and Pipe-Arches

   Lay pipe sections in a prepared trench, with outside laps of circumferential joints pointing upstream and longitudinal joints at the sides. Join the sections with coupling bands, fastened by two or more bolts. Keep no more than 2 in (50 mm) of space between adjoining sections.

   Before backfilling the structure:

   a. Repair exposed base metal in metal coating according to Section 645.
   b. Recoat exposed base metal in bituminous coating with asphalt.

4. Smooth-Lined Corrugated Polyethylene Pipe

   Install smooth-lined corrugated polyethylene pipe according to ASTM D 2321. Use fitting and couplings that comply with the joint performance criteria of AASHTO Standard Specifications for Highway Bridges, Division II. Ensure that all joints are "soiltight" as stated in the AASHTO bridge specifications.

5. Specials (Wyes, Tees, and Bends)

   Install wyes, tees, and bends as shown on the Plans or as directed.

6. Tapered Pipe Inlets

   Locate and install tapered pipe inlet end sections as shown on the Plans or as directed.

7. Elongation

   Elongate metal pipe as shown on the Plans. Order the elongation of the vertical axis of the pipe to be done in the shop.

Have the manufacturer ship metal pipe with wire ties in the pipe ends. Remove wire-ties immediately after completing the fill.

8. Flared End Sections

   Use flared end sections on the inlet, outlet, or on both ends of storm drain pipe, according to Plan details.

9. Polyvinyl Chloride (PV) Profile Wall Drain Pipe

   Install polyvinyl chloride (PVC) profile wall pipe according to ASTM D 2321. Use fittings and couplings that comply with the joint performance criteria of AASHTO Standard Specifications for Highway Bridges, Division II. Ensure that all joints are "soiltight" as stated in the AASHTO bridge specifications.

550.3.06 Quality Acceptance

Clean pipes and pipe-arch culverts before final acceptance of the Work.

The Department may conduct video surveillance on storm drain (cross drain and longitudinal drain) installations after all activities are complete that may damage the pipe, but before the placement of the base and paving when applicable. If video surveillance shows problems such as pipe deformation, cracking, or joint separation, the Contractor shall repair or replace these pipes at no cost to the Department.

Use a nine-point mandrel to test a minimum of 25% of the installed length of smooth-lined corrugated polyethylene or PVC profile wall drain pipe for deformation (pieces will be selected by the Engineer). Use a mandrel that has an effective diameter equal to 95% of the base inside diameter. Provide the Engineer with a proving ring to verify the mandrel size. Mandrel testing shall not be paid for separately.

Ensure that smooth-lined corrugated polyethylene or PVC profile wall drain pipe installations have a maximum of 5% deflection when checked after completing all construction activities that may damage the pipe, but before placing the base and paving when applicable. If mandrel testing reveals problems, the Engineer may require that up to 100% of the storm drain installations be checked for deformation. Remove and replace pipe with over 5% deflection at no cost to the Department.

550.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

550.4 Measurement

A. Excavation and Backfill

Backfill materials types II and III are measured according to Subsection 207.4, "Measurement."

B. Flat Bottom and Circular Pipe (All Types)

The overall length of pipe installed, excluding tapered inlets, is measured in linear feet (meters), along the central axis of the diameter of the pipe. Wyes, tees, and bends are included in this measurement.

C. Pipe-Arches

The overall length of pipe-arch installed is measured in linear feet (meters), along the bottom center line of the pipe.

D. Multiple Installations

In multiple installations, each single line of culvert structure is measured separately.

E. Tapered Pipe Inlets

Tapered pipe inlet sections are measured as a unit; do not include them in the overall length of the pipe.

F. Flared-End Sections

Flared-end sections are measured separately by the unit and not included in the overall pipe length.

G. Smooth-Flow Pipe

Smooth-flow pipe is measured by the linear foot(meter) along the pipe invert.

H. Elliptical Pipe

Elliptical pipe is measured in linear feet (meters) along the bottom center line of the pipe.

550.4.01 Limits

Excavation and normal backfill are not measured for payment.

550.5 Payment

A. Backfill

Backfill will be paid for according to Section 207.

B. Pipe Installations

Pipe installations complete in place and accepted will be paid for at the Contract Pipe for each item.

This payment is full compensation for excavating, furnishing, and hauling materials; installing, cutting pipe where necessary; repairing or replacing damaged sections; making necessary connections; strutting, elongating, providing temporary drainage; joining an extension to an existing structure where required; and removing, disposing of, or using excavated material as directed by the Engineer.

1. Smooth Flow Pipe

   The quantity of each diameter and steel thickness of smooth flow pipe as measured will be paid for at the Contract Unit Price per linear foot (meter) bid for the various sizes. Payment is full compensation for furnishing labor, materials, tools, O-ring mechanical joints, equipment, and incidentals to complete this Item, including removing and disposing excavation material.

2. Flared-End Sections

   Flared-end sections, measured as specified above, will be paid for at the Contract Unit Price for each section of the specified size.

Payment will also include sawing, removing, and replacing existing pavement removed to install a new drainage structure.

Payment will be made under:

Item No. 550	Storm drain pipe___ in (mm), H=___	Per linear foot (meter)
Item No. 550	Side drain pipe___ in (mm), H=___	Per linear foot (meter)
Item No. 550	Pipe arch (span) ____in (mm) x (rise) ___in(mm)	Per linear foot (meter)
Item No. 550	Tapered pipe inlet ___ in (mm),	Per each
Item No. 550	Flared-end section ___ in (mm),	Per each
Item No. 550	Elliptical pipe___ in (mm) wide x ___ in (mm) high	Per linear foot (meter)

550.5.01 Adjustments

Excavation will not be paid for separately, but the other provisions of Section 205 and Section 208 shall govern.

Section 551—Pile Protection in Earth Walls

551.1 General Description

This work includes protecting bridge end bent piles located in the stabilized backfill of earth retaining walls.

551.1.01 Definitions

General Provisions 101 through 150.

551.1.02 Related References

A. Standard Specifications

Section 535—Painting Structures

Section 801—Fine Aggregate

Section 806—Aggregate for Drainage