

DIVISION 3
PIPE CULVERTS
SECTION 300
PIPE INSTALLATION

300-1 DESCRIPTION

Excavate, undercut, provide material, condition foundation, lay pipe, joint and couple pipe sections, and furnish and place all backfill material as necessary to install the various types of pipe culverts and fittings required to complete the project.

Perform the work according to the requirements of the contract for either Method A or Method B pipe installation. Use Method A, except where Method B is called for on the plans.

Do not waste excavation unless permitted. Use suitable excavated material as backfill; or in the formation of embankments, subgrades, and shoulders; or as otherwise directed. Furnish disposal areas for the unsuitable material. The Engineer will identify excavated materials that are unsuitable.

Where traffic is to be maintained, install pipe in sections so that half the width of the roadway is available to traffic.

300-2 MATERIALS

Refer to Division 10.

Item	Section
Select Materials	1016
Joint Materials	1032-9(G)

Provide foundation conditioning material meeting the requirements of Article 1016-3 for Class II or III as shown in the plans and Specifications.

When metal pipe is specified, use fully bituminous coated galvanized pipe in accordance with Subarticle 1032-4(A)(1) in the following counties:

Beaufort, Bertie, Bladen, Brunswick, Camden, Carteret, Chowan, Columbus, Craven, Currituck, Dare, Gates, Hertford, Hyde, Jones, Martin, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell, and Washington.

300-3 UNLOADING AND HANDLING

Unload and handle pipe with reasonable care. Do not roll or drag metal pipe or plates over gravel or rock during handling. Take necessary precautions to ensure the method used in lifting or placing the pipe does not induce stress fatigue in the pipe. Use a lifting device that uniformly distributes the weight of the pipe along its axis or circumference. Repair minor damage to pipe when permitted. Remove pipe from the project that is severely damaged or is rejected as being unfit for use. Undamaged portions of a joint or section may be used where partial lengths are required.

300-4 PREPARATION OF PIPE FOUNDATION

Prepare the pipe foundation in accordance with the applicable method shown on the plans, true to line and grade, and uniformly firm.

Camber invert grade an amount sufficient to prevent the development of sag or back slope in the flow line. The Contractor shall determine the amount of camber required and submit to the Engineer for approval.

Loosely place foundation conditioning material, in a uniform layer, to conform with Method A or Method B pipe installation.

Excavate recesses to receive the bells where bell and spigot type pipe is used. Where material is found to be of poor supporting value or of rock and when the Engineer cannot make adjustment in the location of the pipe, undercut existing foundation material within

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the limits established on the plans. Backfill the undercut with either a suitable local material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material as specified in the contract.

Maintain the pipe foundation in a dry condition.

300-5 INVERT ELEVATIONS

The proposed pipe culvert invert elevations shown on the Drainage Summary Sheets are based upon information available when the plans were prepared. If proposed invert elevations are adjusted during construction based upon actual conditions encountered, no claim for an extension of time for any reason resulting from this information will be allowed.

When a pipe culvert is to be installed in a trench and the average actual elevation of the pipe between drainage structures deviates from the average proposed elevation shown on the Drainage Summary Sheets by more than 0.3 m a pay adjustment will be made as follows:

$$\text{Pay Adjustment (per linear meter)} = [(APE - AAE) \pm 0.3 \text{ m}] (0.15 \times \text{CUP})$$

Where: CUP = Contract Unit Price of Pipe Culvert

$$AAE = \text{Average Actual Elevation} \quad \left(\frac{\text{Actual Inlet elev.} + \text{Actual Outlet elev.}}{2} \right)$$

$$APE = \text{Average Plan Elevation} \quad \left(\frac{\text{Plan Inlet elev.} + \text{Plan Outlet elev.}}{2} \right)$$

When the actual location of a pipe culvert is changed from the location shown on the plans, the Engineer will make a pay adjustment deemed warranted based upon the relation of the pipe culvert as shown on the plans to the finished roadway and the relation of the pipe culvert as constructed to the finished roadway.

The top elevation column on the drainage summary sheet indicates the flow elevation at the top of structures intended to collect surface water.

The top elevation column on drainage structures not intended to collect surface water indicates the elevation at the top of the cover.

300-6 LAYING PIPE

(A) Rigid Pipe

Lay pipe on prepared foundation, bell or groove end upgrade with the spigot or tongue fully inserted to make a watertight joint. Check each joint for alignment and grade as the work proceeds.

Use flexible plastic joint material except when material of another type is specified in the plans or special provisions. Joint material of another type may be used when permitted.

(B) Flexible Pipe (Except Structural Plate Pipe)

Place flexible pipe carefully on the prepared foundation starting at the downstream end with the inside circumferential laps pointing downstream and with the longitudinal laps at the side or quarter points.

Handle bituminous coated pipe and paved invert pipe with special care to avoid damage to coatings. Install paved invert pipe with the paved invert centered on the bottom.

Join pipe sections with coupling band, fully bolted and properly sealed with joints made watertight. Provide coupling bands for annular and helical corrugated metal pipe with circumferential and longitudinal strength sufficient to preserve the alignment, prevent separation of the sections, and prevent backfill infiltration.

Match-mark all pipe 1500 mm or larger in diameter at the plant for proper installation on the project.

At locations indicated in the plans, corrugated steel pipe sections shall be jointed together with rod and lug coupling bands, fully bolted. Sleeve gaskets shall be used in conjunction with rod and lug couplings and the joints properly sealed and made watertight. Coupling bands shall provide circumferential and longitudinal strength sufficient to preserve the alignment, prevent separation of the sections and prevent infiltration of backfill material.

300-7 BACKFILLING

Place fill around the pipe in accordance with the applicable method shown on the plans in layers not to exceed 150 mm loose unless otherwise permitted. Compact to the density required by Subarticle 235-4(C). Approval of the backfill material is required prior to its use. Use select material when called for in the contract.

Take care during backfill and compaction operations to maintain alignment and prevent damage to the joints. Keep backfill free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material.

Grade and maintain all pipe backfill areas in such a condition that erosion or saturation will not damage the pipe foundation or backfill.

Do not operate heavy equipment over any pipe until it has been properly backfilled with a minimum 1 m of cover, or the same depth above the top of loose material over pipe for Type-B pipe installation. Place, maintain, and finally remove the required cover that is above the proposed finished grade at no cost to the Department. Remove and replace, at no cost to the Department, pipe that becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations.

300-8 MAINTENANCE

Maintain all pipe installations in a condition such that they will function continuously from the time the pipe is installed until the project is accepted.

300-9 MEASUREMENT AND PAYMENT

General

No measurement will be made of any work covered by this section except for the work of undercut excavation, foundation conditioning and providing select material that is not local material. Removal and disposal of existing pavement is a part of the excavation for the new pipe culvert installation. Repair of the pavement will be made in accordance with Section 654.

Foundation Conditioning

Using Local Material

Undercut excavation is all excavation removed by undercutting below the bottom of the trench as staked. *Undercut Excavation* will be measured as the actual number of cubic meters of undercut excavation, measured in its original position and computed by the average end area method, that has been removed as called for in the contract and will be paid for at double the contract unit price for *Unclassified Excavation* as provided in Article 225-7.

Local material used for conditioning the foundation will be measured and paid for as provided in Article 225-7 for *Unclassified Excavation* or in Article 230-5 for *Borrow Excavation* depending on the source of the material.

Local material used to replace pipe undercut excavation will be measured and paid for in accordance with Article 225-7 or Article 230-5.

Using Other Than Local Material

No measurement and payment will be made for *Undercut Excavation*. The material used to replace pipe undercut excavation will be classified as foundation conditioning

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material. *Foundation Conditioning Material, Minor Structures* will be measured and paid for as the actual number of metric tons of this material weighed in trucks on certified platform scales or other certified weighing devices.

No direct payment will be paid for undercut excavation. Payment at the contract unit price for *Foundation Conditioning Material, Minor Structures* will be full compensation for all work of pipe undercut excavation.

Select Material

Select material is classified as material meeting the requirements of Section 1016, other than local material or borrow material. *Select material* will be measured and paid for as the actual number of metric tons of this material weighed in trucks on certified platform scales or other certified weighing devices, that has been used for backfilling above the foundation.

Where local material or borrow material meeting the requirements for select material as specified in Section 1016 is used for backfilling above the foundation, this material will be measured and paid for as provided in Article 225-7 or Article 230-5.

Where other than local material is used for backfilling above the foundation, the quantity of select material, will be measured and paid for at the contract unit price per metric ton for *Select Material, Class _____*, or where there is no unit price in the contract applicable to the class of select material involved, the select material will be paid for as extra work in accordance with Article 104-7.

Payment at the contract prices for the various items covered by Sections 310, 320, 330, 340 and 350 will be full compensation for all work covered by this section except for foundation conditioning, and select material.

Payment will be made under:

Pay Item	Pay Unit
Foundation Conditioning Material, Minor Structures	Metric Ton
Select Material, Class _____	Metric Ton

SECTION 310 PIPE CULVERTS

310-1 DESCRIPTION

Furnish and install concrete pipe, corrugated aluminum alloy pipe, corrugated steel pipe and pipe arch, bituminous coated corrugated steel pipe, concrete lined corrugated steel pipe, bituminous coated corrugated steel pipe arch, vitrified clay pipe and sections of the class, type, and size called for in the contract. The work includes construction of joints and connections to other pipes, endwalls, and drainage structures.

310-2 MATERIALS

Refer to Division 10.

Item	Section
Plain Concrete Pipe Culvert	1032-9(B)
Reinforced Concrete Pipe Culvert	1032-9(C)
Precast Concrete Pipe End Sections	1032-9(D)
Concrete Pipe Tees and Elbows	1032-9(E)
Corrugated Aluminum Alloy Pipe Culvert	1032-2(A)
Corrugated Aluminum Alloy Pipe Tees and Elbows	1032-2(B)
Corrugated Steel Culvert Pipe and Pipe Arch	1032-3(A)
Prefabricated Corrugated Steel Pipe End Sections	1032-3(B)

Corrugated Steel Pipe Tees and Elbows	1032-3(C)
Corrugated Steel Eccentric Reducers	1032-3(D)
HDPE Smooth Lined Corrugated plastic Pipe	1044-7
Bituminous Coated Corrugated Steel Pipe Culvert	1032-4(A)
Prefabricated Bituminous Coated Corrugated Steel Pipe End Sections	1032-4(B)
Bituminous Coated Corrugated Steel Pipe Tees and Elbows	1032-4(C)
Bituminous Coated Corrugated Steel Eccentric Reducers	1032-4(D)
Concrete Lined Corrugated Steel Culvert Pipe	1032-4(F)
Concrete Lined Corrugated Steel Pipe Tees and Elbows	1032-4(F)
Vitrified Clay Culvert Pipe	1032-7

Suppliers that provide metal pipe culverts, fittings, and all other accessories covered by this section shall meet the requirements of the Department's Brand Certification program for metal pipe culverts, and be listed on the Department's pre-approved list for suppliers of metal pipe culvert.

Do not use plain galvanized or aluminized corrugated steel pipe in the following counties:

Beaufort, Bertie, Bladen, Brunswick, Camden, Carteret, Chowan, Columbus, Craven, Currituck, Dare, Gates, Hertford, Hyde, Jones, Martin, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrell, and Washington.

310-3 PIPE INSTALLATION

Install pipe, pipe tees, and elbows according to Section 300.

310-4 SIDE DRAIN PIPE

Install concrete, corrugated steel, or HDPE smooth lined corrugated plastic side drain pipe in accordance with Section 300.

When using HDPE smooth lined corrugated plastic side drain pipe, provide a minimum earth cover of 305 mm when placing under asphalt or concrete and a minimum earth cover of 460 mm when placing under soil.

310-5 PIPE END SECTIONS

Choose which material to use for the required end sections. Both corrugated steel and concrete pipe end sections will work on concrete pipe, corrugated steel pipe, and HDPE smooth lined corrugated plastic pipe.

310-6 MEASUREMENT AND PAYMENT

Pipe will be measured and paid for as the actual number of linear meters of pipe that has been incorporated into the completed and accepted work.

Measurement of pipe will be made by counting the number of joints used and multiplying by the length of the joint to obtain the number of linear meters of pipe installed and accepted. Measurements of partial joints are made along the longest length of the partial joint to the nearest 0.1 of a meter. *Pipe end sections, tees, elbows, and eccentric reducers* will be measured and paid for as the actual number of each of these items that have been incorporated into the completed and accepted work.

Payment will be made under:

Pay Item	Pay Unit
__ mm R.C. Pipe Culverts, Class ____.	Linear Meter
__ mm x __ mm x __ mm R.C. Pipe Tees, Class ____	Each
__ mm R.C. Pipe Elbows, Class ____.	Each
__ mm C.A.A. Pipe Culvert, __ mm Thick	Linear Meter

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__mm x __mm x __mm C.A.A. Pipe Tees, __mm Thick	Each
__mm C.A.A. Pipe Elbows, __mm Thick	Each
__mm C.S. Pipe Culverts, __mm Thick	Linear Meter
__mm x __mm C.S. Pipe Arch Culverts, __mm Thick	Linear Meter
__ x __mm x __mm C.S. Pipe Tees, __mm Thick	Each
__mm C.S. Pipe Elbows, __mm Thick	Each
__mm x __mm C.S. Eccentric Reducers, __mm Thick	Each
__mm Bituminous Coated C.S. Pipe Culverts, Type __, __mm Thick	Linear Meter
__mm Bituminous Coated C.S. Pipe Culverts, Type __, __mm Thick, Elongated	Linear Meter
__mm x __mm Bituminous Coated C.S. Pipe Arch Culverts, Type __, __mm Thick	Linear Meter
__mm x __mm x __mm Bituminous Coated C.S. Pipe Tees, Type __, __mm Thick	Each
__mm Bituminous Coated C.S. Pipe Elbows, Type ____, __mm Thick	Each
__mm x __mm Bituminous Coated C.S. Eccentric Reducers, Type __, __mm Thick	Each
__mm Side Drain Pipe	Linear Meter
__mm Pipe End Section	Each
__mm Concrete Lined C. S. Pipe Culverts, __mm Thick Steel	Linear Meter
__mm x __mm x __mm Concrete Lined C. S. Pipe Tees, __mm Thick Steel	Each
__mm Concrete Lined C. S. Pipe Elbows, __mm Thick Steel	Each
__mm Vitrified Clay Pipe Culverts	Linear Meter

SECTION 320

**CORRUGATED STEEL and ALUMINUM ALLOY
STRUCTURAL PLATE PIPE AND PIPE ARCH**

320-1 DESCRIPTION

Furnish and install corrugated steel and corrugated aluminum alloy structural plate pipe and pipe arch of the size and gage called for on the plans at locations indicated in the contract. The work includes the construction of joints and connections to other pipes, endwalls, and other drainage structures.

320-2 MATERIALS

Refer to Division 10.

Item	Section
Corrugated Structural Plate Pipe and Pipe Arch	1032-5
Corrugated Aluminum Alloy Structural Plate Pipe and Pipe Arch	1032-6

Suppliers that provide metal pipe culverts, fittings, and all other accessories covered by this section shall meet the requirements of the Department’s Brand Certification program for metal pipe culverts, and be listed on the Department’s pre-approved list for suppliers of metal pipe culvert.

Provide for review, design and detail drawings for all structural plate elbows, wyes, and tees. All designs and details shall meet the requirements of AASHTO Section 12 and be sealed by a North Carolina Licensed Professional Engineer. Provide seven copies of the plans and one copy of the design calculations to the Engineer for review and

acceptance prior to beginning fabrication. Include the cost of any required reinforcement (stiffeners, miscellaneous fabricated steel, heavier gage plates, etc.) in the unit bid prices for the items involved.

Provide elbows, wyes, and tees of at least the same gauge as the connecting pipe culvert.

320-3 CONSTRUCTION METHODS

(A) Excavation, Foundation Preparation, and Backfilling

Install the pipe and pipe arch in accordance with Section 300 except place a minimum of 150 mm thickness of foundation conditioning material in accordance with the details shown in the plans.

(B) Erection

Erect in accordance with the manufacturer's assembly diagrams and instruction sheets. All erection procedures and methods shall meet industry standards. Handle structural plate with reasonable care. Do not drag or skid plate. The plate or the assembled pipe or pipe arch will be rejected, if the spelter coating is broken beyond repair prior to acceptance.

Assemble the entire pipe culvert completely before placing any backfill. Erect elongated pipe with the long diameter in a vertical position. Maintain correct position of pipe during assembly, correct for spiraling.

Install all bolts in accordance with the procedures specified by the manufacturer before backfill is placed. Tighten all nuts to a minimum of 135 N_m and a maximum of 270 N_m of torque. Check nut tightness with a properly calibrated torque wrench before, during, and after placing backfill.

Camber the invert grade by an amount sufficient to prevent the development of sag or back slope in the flow line after the backfill is placed. The Contractor shall determine the amount of camber required and submit to the Engineer for approval.

(C) Workmanship

Provide quality workmanship when installing the pipe and pipe arch. Evidence of poor or inadequate workmanship includes but is not limited to the following:

- (1) Uneven laps.
- (2) Improper shaping.
- (3) Variation from a straight center line.
- (4) Ragged edges.
- (5) Loose, unevenly lined or spaced bolts.
- (6) Illegible identification stamp on any plate.
- (7) Bruised, scaled or broken spelter coating.
- (8) Dents or bends in the metal itself.

Poor or inadequate workmanship may constitute sufficient cause for rejection of the completed or partially completed work, or of any materials proposed for use in the work.

(D) Elbows, Wyes, and Tees

Shop fabricate all structural plate elbows, wyes, and tees with the angle between the branch and main line of the lateral as noted on the plans. Provide joint connections in accordance with the manufacturer's instructions.

320-4 MEASUREMENT AND PAYMENT

Corrugated Steel Structural Plate Pipe or Pipe Arch will be measured and paid for as the actual number of linear meters of pipe or pipe arch, measured along the flow line of

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the pipe or pipe arch, not including elbows, wyes, and tees, to the nearest meter, that has been completed and accepted.

Corrugated Steel or Corrugated Aluminum Alloy Structural Steel Plate Elbows, Wyes, and Tees will be measured and paid for as the actual number of these items that have been incorporated into the completed and accepted work.

Payment will be made under:

Pay Item	Pay Unit
__ mm C.S. Structural Plate Pipe, ____ Gauge	Linear Meter
__ mm C.S. Structural Plate Pipe, ____ Gauge, Elongated	Linear Meter
__ mm x __ mm C.S. Structural Plate Pipe Arch, ____ Gauge	Linear Meter
__ mm C.A.A. Structural Plate Pipe, __ mm Thick	Linear Meter
__ mm C.A.A. Structural Plate Pipe, __ mm Thick Elongated	Linear Meter
__ mm x __ mm, C.A.A. Structural Plate Pipe Arch, __ mm Thick	Linear Meter
__ mm C.S. Structural Plate Pipe Elbow, Elongated, ____ Gauge (__ mm x __ mm Corrugation)	Each
__ mm C.S. Structural Plate Pipe Elbow, Elongated, ____ Gauge, with ____ Bolts, mm x __ mm Corrugation	Each
__ mm C.S. Structural Plate Pipe Wye, Elongated, ____ Gauge (__ mm x __ mm Corrugation)	Each
__ mm C.S. Structural Plate Pipe Wye, Elongated, ____ Gauge, With ____ Bolts, __ mm x __ mm Corrugation	Each
__ mm C.S. Structural Plate Pipe Tee, Elongated, ____ Gauge __ mm x __ mm Corrugation	Each
__ mm C.S. Structural Plate Pipe Tee, Elongated, ____ Gauge, With __ Bolts, __ mm x __ mm Corrugation	Each
__ mm C.A.A. Structural Plate Pipe Elbow, Elongated, __ Gauge __ mm x __ mm Corrugation	Each
__ mm C.A.A. Structural Plate Pipe elbow, Elongated, ____ Gauge, With ____ Bolts, __ mm x __ mm Corrugation	Each
__ mm C.A.A. Structural Plate Pipe Wye, Elongated, __ Gauge __ mm x __ mm Corrugation	Each
__ mm C.A.A. Structural Plate Pipe Wye, Elongated, ____ Gauge, With ____ Bolts, __ mm x __ mm Corrugation	Each
__ mm C.A.A. Structural Plate Pipe Tee, Elongated, __ Gauge __ mm x __ mm Corrugation	Each
__ mm C.A.A. Structural Plate Pipe Tee, Elongated, ____ Gauge, With ____ Bolts, __ mm x __ mm Corrugation	Each

**SECTION 330
WELDED STEEL PIPE**

330-1 DESCRIPTION

This work shall consist of furnishing and installing welded steel pipe by trenchless methods as shown in the contract and as directed.

330-2 MATERIALS

Refer to Division 10.

Item	Section
Welded Steel Pipe	1032-8

Suppliers that provide metal pipe culverts, fittings, and all other accessories covered by this section shall meet the requirements of the Department's Brand Certification program for metal pipe culverts and be listed on the Department's pre-approved list for suppliers of metal pipe culvert.

330-3 PIPE INSTALLATION

Install the pipe by trenchless construction, true to line and grade and in a manner such that settlement does not occur. Fill all voids around the pipe. Installations that become damaged or have to be abandoned will be replaced by the Contractor at no cost to the Department as directed by the Engineer.

Conduct a pre-construction meeting in the presence of the Engineer at least 48 hours prior to the beginning of the pipe installation. The meeting shall consist of but not limited to:

- (A) reviewing all installation methods to install the pipe true to the line and grade given
- (B) methods to insure there is no settlement of the pipe or of the completed roadway section
- (C) methods for filling any potential voids around the pipe

330-4 MEASUREMENT AND PAYMENT

___ mm *Welded Steel Pipe In Soil* will be measured and paid for as the actual number of linear meters of pipe measured along the flow line to the nearest meter, which has been installed in soil.

___ mm *Welded Steel Pipe Not In Soil* will be measured and paid for as the actual number of linear meters of pipe measured along the flow line to the nearest meter which has been installed in non-soil, as observed and confirmed by the Engineer. Non-soil is defined as all material other than soil. The Contractor shall request and obtain the Engineer's observation and confirmation of the limits of the installation not in soil prior to and during the installation of the pipe or portion of the pipe not in soil.

Failure of the Contractor to request and obtain the Engineer's observation and confirmation of the limits of the pipe not in soil prior to and during the installation will result in the payment at the unit price for ___ mm *Welded Steel Pipe In Soil*.

Such payment will include, but is not limited to furnishing all labor, tools, equipment, materials and incidentals, miscellaneous grading or excavation necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
___ mm Welded Steel Pipe in Soil	Linear Meter
___ mm Welded Steel Pipe Not in Soil	Linear Meter

**SECTION 340
PIPE REMOVAL**

340-1 DESCRIPTION

Remove and dispose of all existing roadway drainage pipe, including flared end sections, where the removal of the existing pipes is required by the plans or as directed. Unless otherwise indicated on the plans, this work does not include the removal and

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disposal of any existing public or private water or sewage pipe or subsurface and shoulder drain pipe.

The Contractor has the option of leaving pipes in place and filling with flowable fill.

340-2 MATERIALS

If used, flowable fill shall meet the following requirements of Division 10:

Item	Section
Fine Aggregate (Bottom ash, although not included in Article 1014-1, may also be used with permission of the Engineer.)	1014-1
Portland Cement	1024-1
Type IP Blended Cement	1024-1
Fly Ash	*1024-5
*Certain requirements of this article and ASTM C618 may be waived with the permission of the Engineer.	
Type 1S Blended Cement	1024-1
Water	1024-4
Chemical Admixtures	**1024-3

**High-air generators or foaming agents may be used in lieu of conventional concrete air-entraining agents with the permission of the Engineer.

Submit the proposed mix design(s) on M & T Form 312 at least 35 days prior to use. Have a testing laboratory that has been approved by the Department determine mix proportions based on laboratory trial batches meeting the following requirements:

	Excavatable	Non-Excavatable
Compressive Strength	1035 kPa (max.)@ 56 days	862 kPa (min.) @ 28 days
Approximate quantities per 0.8 cubic meter		
Cement	18-45 kg	45-68 kg
Fly Ash	***	***
Fine Aggregate (SSD)	***	***
Water (approximate)	As Necessary	As Necessary
Air	0 - 35%	0 - 35%
*** Add amounts singly or in combination to make the mix yield 0.8 cubic meter.		

To achieve desired placement consistency, flowability may be adjusted by varying the water content, with appropriate quantitative changes in other materials. Less flowable mixes are desirable when it is necessary to put traffic back on a roadway quickly or when less buoyant fill is needed to backfill pipes that could float out of position. Mixes to be pumped will need fly ash.

State on Form 312 the intended use of the material. Accompany Form 312 with a listing of compressive strength of at least three 100 mm x 200 mm cylinders at the age of 28 or 56 days, depending on whether the mix is to be excavated or not. Air cure the cylinders during the entire period before testing. The Engineer will advise the Contractor in writing of the acceptability of the mix design.

340-3 CONSTRUCTION METHODS

Remove existing pipe when so designated on the plans or as directed.

When an existing pipe is encountered that is not shown on the plans, do not remove until the Engineer is notified of its presence and has directed its removal.

Where traffic is to be maintained, remove pipe in sections so that half the width of the roadway will be available to traffic.

Remove existing pipe in such a manner that any nearby facilities will not be damaged.

Backfill the area disturbed by the removal of an existing pipe in accordance with the sections of these Specifications applicable to the adjacent construction.

Salvaged pipe is the property of the Contractor unless otherwise indicated by the contract.

Discharge flowable fill material directly from the truck into the space to be filled, or by other approved methods. The mix may be placed full depth or in lifts as site conditions warrant.

340-4 MEASUREMENT AND PAYMENT

Pipe Removal will be measured and paid for as the actual number of linear meters of pipe and flared end sections, measured to the nearest 0.1 meter that has been removed in accordance with this section. No measurement and payment will be made for pipe removal when a new pipe is placed back in the same trench.

Flowable Fill will be measured and paid for as the item for which it was substituted. In no case will payment for the use of flowable fill as a substitute be made for more than one deleted item of work.

Any additional backfill material that is necessary will be paid for at the contract unit price for Unclassified Excavation in accordance with the requirements of Article 225-7, or at the contract unit price for Borrow Excavation in accordance with the requirements of Article 230-5, depending on the source of the material.

Payment includes but is not limited to removing pipe, hauling pipe, and all excavating and backfilling that may be necessary.

Payment will be made under:

Pay Item	Pay Unit
Pipe Removal	Linear Meter

**SECTION 350
PIPE CLEAN OUT**

350-1 DESCRIPTION

Clean out silt accumulations and other debris from existing drainage pipes at locations shown on the plans and as directed.

350-2 CONSTRUCTION METHODS

Use a pipe clean out method that does not damage the existing pipe.

350-3 MEASUREMENT AND PAYMENT

Pipe Clean Out will be measured and paid for as the actual number of existing pipes, structure to structure, that have been cleaned out and accepted, except where the work of cleaning out the pipe was made necessary by the Contractor's negligence in taking appropriate erosion control measures. Such price and payment will be full compensation for cleaning out existing pipe and disposing of all silt and debris.

Payment will be made under:

Pay Item	Pay Unit
Pipe Clean Out	Each