

**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 these specifications and the plans 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:

Select materialsSection 1016
Joint materials Subarticle 1032-9(F)

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 which uniformly distributes the weight of the pipe along its axis or circumference. Repair minor damage to pipe when permitted. Remove pipe from the project which 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 Engineer will determine the amount of camber used.

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 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 on the plans or specifications.

Maintain the pipe foundation in a dry condition.

300-5 INVERT ELEVATIONS.

If invert elevations are shown on the Drainage Summary Sheet, install the proposed pipe culverts at the elevations shown.

The proposed pipe culvert invert elevations shown in 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 one foot (0.3 m), a pay adjustment will be made as follows:

$$\text{Pay Adjustment (per linear foot)} = [(APE - AAE) \pm 1 \text{ foot (0.3 m)}] (0.15 \times \text{CUP})$$

Where: CUP = Contract Unit Price of Pipe Culvert

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

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

When the actual location of a pipe culvert is changed from the location shown on the original plans, the Engineer will make a pay adjustment deemed warranted based upon the relation of the pipe culvert as shown on the original 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 water tight 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 water tight. 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 at the plant all pipe 60 inches (1524 mm) or larger in diameter for proper installation on the project.

300-7 BACKFILLING.

Place fill around the pipe in accordance with the applicable method shown on the plans, in layers not to exceed 6 inches (150 millimeters) 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 on the plans.

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 3 feet (1 meter) of cover [3 feet (1 meter) of cover above the top of loose material over pipe for Type-B 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 which 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 METHOD OF MEASUREMENT.

(A) General:

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

(B) Foundation Conditioning:

(1) Using Local Material:

Undercut excavation is all excavation removed by undercutting below the bottom of the trench as staked. The quantity of undercut excavation to be paid for will be the actual number of cubic yards (cubic meters) of undercut excavation, measured in their original position and computed by the average end area method, which has been removed as called for on the plans or specifications.

Local material used to replace pipe undercut excavation will be measured as provided in Article 225-7 or Article 230-5.

(2) Using Other Than Local Material:

No measurement will be made of undercut excavation. The material used to replace pipe undercut excavation will be classified as foundation conditioning material. The quantity of foundation conditioning material to be paid for will be the actual number of tons (metric tons) of this material weighed in trucks on certified platform scales or other certified weighing devices.

(C) Select Material:

Select material, is classified as material meeting the requirements of Section 1016, other than local material or borrow material. The quantity of select material to be paid for will be the actual number of tons (metric tons) of this material weighed in trucks on

certified platform scales or other certifying weighing devices, which 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 as provided in Article 225-7 or Article 230-5.

300-10 BASIS OF PAYMENT.

(A) Foundation Conditioning:

(1) Using Local Material:

The quantity of undercut excavation, measured as provided in Subarticle 300-8(B)(1), will be paid for at double the contract unit price for "Unclassified Excavation" as provided in Article 225-8.

Local material used for conditioning the foundation will be paid for as provided in Article 225-8 for "Unclassified Excavation" or in Article 230-6 for "Borrow Excavation," depending on the source of the material.

(2) Using Other Than Local Material:

The quantity of foundation conditioning material, measured as provided in Subarticle 300-8(B)(2), will be paid for at the contract unit price per ton (metric ton) for "Foundation Conditioning Material, Minor Structures".

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.

(B) Select Material:

Where local material meeting the requirements for select material as specified in Section 1016 is used for backfilling above the foundation, this material will be paid for as provided in Article 225-8 for "Unclassified Excavation" or in Article 230-6 for "Borrow Excavation", depending on the source of the material.

Where other than local material is used for backfilling above the foundation, the quantity of select material, measured as provided in Subarticle 300-8(C), will be paid for at the contract unit price per ton (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.

(C) Compensation:

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.

(D) Pay Items:

Payment will be made under:

- Foundation Conditioning Material, Minor Structures..... Ton (Metric Ton)
- Select Material, Class _____ Ton (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 plans or provisions. The work includes construction of joints and connections to other pipes, endwalls, and drainage structures.

310-2 MATERIALS

Refer to Division 10:

Plain concrete culvert pipe	Subarticle 1032-9(B)
Reinforced concrete culvert pipe	Subarticle 1032-9(C)
Precast concrete pipe end sections	Subarticle 1032-9(D)
Concrete pipe tees and elbows	Subarticle 1032-9(E)
Corrugated aluminum alloy culvert pipe	Subarticle 1032-2(A)
Prefabricated corrugated aluminum alloy pipe end sections	Subarticle 1032-2(B)
Corrugated aluminum alloy pipe tees and elbows	Subarticle 1032-2(C)
Corrugated steel culvert pipe and pipe arch.....	Subarticle 1032-3(A)
Prefabricated corrugated steel pipe end sections	Subarticle 1032-3(B)
Corrugated steel pipe tees and elbows	Subarticle 1032-3(C)
Corrugated steel eccentric reducers	Subarticle 1032-3(D)
HDPE smooth lined corrugated plastic pipe	Article 1044-7
Bituminous coated corrugated steel culvert pipe	Subarticle 1032-4(A)
Prefabricated bituminous coated corrugated steel pipe end sections...	Subarticle 1032-4(B)
Bituminous coated corrugated steel pipe tees and elbows.....	Subarticle 1032-4(C)
Bituminous coated corrugated steel eccentric reducers	Subarticle 1032-4(D)
Concrete lined corrugated steel culvert pipe.....	Subarticle 1032-4(F)
Concrete lined corrugated steel pipe tees and elbows.....	Subarticle 1032-4(F)
Vitrified clay culvert pipe	Article 1032-7

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

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 to Section 300.

When using HDPE smooth lined corrugated plastic side drain pipe, provide a minimum earth cover of 12 inches (304.8 mm) when placing under asphalt or concrete and a minimum earth cover of 18 inches (457.2 mm) when placing under soil.

Metric pipe sizes shown on the plans, specifications, and estimate are for concrete pipes. Equivalent sizes for alternate material choices are acceptable.

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 reinforced concrete pipe (RCP), corrugated steel pipe, and HDPE smooth lined corrugated plastic pipe.

Metric pipe sizes shown on the plans, specifications, and estimate are for concrete pipes. Equivalent sizes for alternate material choices are acceptable.

310-6 METHOD OF MEASUREMENT.

The quantity of pipe to be paid for will be the actual number of linear feet (linear meters) of pipe which has been incorporated in the completed and accepted work.

Measurement of pipe is made by counting the number of joints used and multiplying by the length of the joint to obtain number of linear feet 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 foot (meter).

The quantity of pipe end sections, tees, elbows, and eccentric reducers to be paid for will be the actual number of each of these items which have been incorporated into the completed and accepted work.

310-7 BASIS OF PAYMENT.

Payment will be made for quantities as measured in Article 310-4, for the pay items listed below.

Payment will be made under:

__" (mm) R.C. Pipe Culverts, Class____.	.....	Linear Foot (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 Foot (Linear Meter)
__" (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 Foot (Linear Meter)
__(mm) x __"(mm) C.S. Pipe Arch Culverts,__(mm) Thick .	.....	Linear Foot (Linear Meter)
__" (mm) x __" (mm) x __" (mm) C.S. Pipe Tees, __" (mm) Thick.....	.....	Each
__" (mm) C.S. Pipe Elbows, __" (mm) Thick .....	.....	Each
__" (mm) C.S. Eccentric Reducers, __" (mm) Thick .....	.....	Each
__" (mm) Bituminous Coated C.S. Pipe Culverts, Type ____, __" (mm) Thick .....	.....	Linear Foot (Linear Meter)
__" (mm) Bituminous Coated C.S. Pipe Culverts, Type ____, __" (mm) Thick, Elongated .....	.....	Linear Foot (Linear Meter)
__" (mm) x __" (mm) Bituminous Coated C.S. Pipe Arch Culverts, Type _____, __" (mm) Thick.....	.....	Linear Foot (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) Concrete Lined C.S. Pipe Culverts, __" (mm) Thick Steel.....	.....	Linear Foot (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 Foot (Linear Meter)
__" (mm) Side Drain Pipe.....	.....	Linear Foot (Linear Meter)
__" (mm) Pipe End Section.....	.....	Each

**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 plans or provisions. The work includes the construction joints and connections to other pipes, endwalls, and other drainage structures.

320-2 MATERIALS.

Refer to Division 10:

Corrugated steel structural plate pipe and pipe arch Article 1032-5
 Corrugated aluminum alloy structural plate pipe and pipe arch Article 1032-6

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

Provide, for review, design and detail drawings for all structural plate elbows, wyes, and tees. All designs and details must meet the requirements of AASHTO Section 12 and be sealed by a North Carolina Registered 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 prices bid for the items involved.

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

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 6 inch (150 millimeters) 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 must 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 pipeline 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 100 foot-pounds (135 Newton meters) and a maximum of 200 foot-pounds (270 Newton meters) 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. The amount of camber used will be determined by the Engineer.

(C) Workmanship:

Provide quality workmanship in 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 manufacturers instructions..

320-4 METHOD OF MEASUREMENT.

The quantity of corrugated steel structural plate pipe or pipe arch to be paid for will be the actual number of linear feet (linear meters) of pipe or pipe arch, measured along the flow line of the pipe or pipe arch, NOT INCLUDING elbows, wyes, and tees, to the nearest foot (meter), which has been completed and accepted.

The quantity of corrugated steel or corrugated aluminum alloy structural steel plate elbows, wyes, and tees to be paid for will be the actual number of these items which have been incorporated into the completed and accepted work.

320-5 BASIS OF PAYMENT.

Payment will be made for quantities as measured in Article 320-4, for the pay items listed below:

Payment will be made under:

- ___" (mm) C.S. Structural Plate Pipe, ___Gage..... Linear Foot (Linear Meter)
- ___" (mm) C.S. Structural Plate Pipe, ___ Gage, Elongated..... Linear Foot (Linear Meter)
- ___" (mm) x ___" (mm) C.S. Structural Plate
Pipe Arch, ___Gage..... Linear Foot (Linear Meter)
- ___" (mm) C.A.A. Structural Plate Pipe, ___" (mm) Thick..... Linear Foot (Linear Meter)
- ___" (mm) C.A.A. Structural Plate Pipe,
___" (mm) Thick Elongated..... Linear Foot (Linear Meter)
- ___" (mm) x ___" (mm), C.A.A. Structural
Plate Pipe Arch, ___" (mm) Thick Linear Foot (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.

Furnish and install welded steel pipe of the size, thickness, and grade called for in the plans or provisions. The work includes the construction joints and connections to other pipes, endwalls, and other drainage structures and all jacking or boring.

330-2 MATERIALS.

Refer to Division 10:

Welded steel pipe Article 1032-8

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

330-3 PIPE INSTALLATION.

Install pipe in accordance with Section 300 except that where the pipe is to be jacked or bored in place install the pipe in accordance with the requirements of the special provisions. When jacking or boring, hold the bore diameter to a minimum to ensure that there will be no settlement of the pipe.

330-4 METHOD OF MEASUREMENT.

The quantity of pipe to be paid for will be the actual number of linear feet (linear meters) of pipe which has been incorporated in the completed and accepted work. Measurement will be made by counting the number of joints used and multiplying by the length of the joint. Where partial joints are used, measurement will be made along the longest length of the partial joint to the nearest 0.1 of a foot (meter).

330-5 BASIS OF PAYMENT.

Payment will be made for quantities as measured in Article 342-4, for the pay items listed below:

Payment will be made under:

__" (mm)Welded Steel Pipe, __" (mm) Thick, Grade ____ Linear Foot(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 disposal of any existing public or private water or sewage pipe or subsurface and shoulder drain pipe.

The work includes but is not limited to removing pipe, hauling pipe, and all excavation and backfill that may be necessary.

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

340-2 MATERIALS

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

- Fine aggregate.....Article 1014-1
(Bottom ash, although not included in Article 1014-1, may also be used with permission of the Engineer.)
- Portland cement.....Article 1024-1
- Type IP blended cement.....Article 1024-1
- Fly ash.....Article 1024-5*
- *Certain requirements of this article and ASTM C618 may be waived with the permission of the Engineer.
- Type 1S blended cement.....Article 1024-1
- Water.....Article 1024-4
- Chemical Admixtures.....Article 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 which has been approved by the N.C. Division of Highways determine mix proportions based on laboratory trial batches meeting the following requirements:

	<u>Excavatable</u>	<u>Non-Excavatable</u>
Compressive Strength	150 psi (1,035 KPa) (max.) @ 56 days	125 psi (862 Kpa) (min.) @ 28 days
Approximate quantities per cubic yard (cubic meter):		
Cement	40-100 lbs. (18 Kg-45 Kg)	100-150 lbs. (45 Kg-68 Kg)
Fly ash	***	***
Fine Agg. (SSD)	***	***
Water (approximate)	As Necessary	As Necessary
Air	0 - 35%	0 - 35%

*** Amounts singly or in combination to make the mix yield one cubic yard (0.8 m³).

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 4" x 8" (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 which 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 special provisions.

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 dictate

340-4 METHOD OF MEASUREMENT.

The quantity of pipe removal measured will be the actual number of linear feet(linear meters) of pipe and flared end sections, measured to the nearest 0.1 foot (meter), which has been removed in accordance with this section. **No measurement will be made for pipe removal when a new pipe is placed back in the same trench.**

The substitution of flowable fill material as an option for leaving pipes in place will be considered the best option for the Contractor. Measurement will be made at the contract unit price for the particular item that flowable fill is substituted for

340-5 BASIS OF PAYMENT.

The quantity of pipe removal, measured as provided for in Article 340-3, will be paid for at the contract unit price per linear foot (linear meter) for "Pipe Removal." **No payment will be allowed for "Pipe Removal" when a new pipe is placed in the same trench.**

Any additional backfill material which is necessary will be paid for at the contract unit price for "Unclassified Excavation" in accordance with the provision of Article 225-8, or at the contract unit price for "Borrow Excavation" in accordance with the provisions of Article 230-6, depending on the source of the material.

Payment for flowable fill will be made at the contract unit price for the particular item that flowable fill is substituted for. In no case will payment for the use of flowable fill as a substitute be made for more than one deleted item of work.

Payment will be made under:

Pipe Removal Linear Foot (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 METHOD OF MEASUREMENT

The quantity of pipe clean out to be paid will be the actual number of existing pipes, structure to structure, which has 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.

350-4 BASIS OF PAYMENT

The quantity of pipe clean out measured in accordance with Article 350-3 will be paid at the contract unit price per each for "Pipe Clean Out". 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:

Pipe Clean Out..... Each

NOTES