

**SECTION 430
PIPE CULVERTS AND STORM SEWERS**

430-1 Description.

Furnish and install drainage pipe and mitered end sections at the locations called for. Also, furnish and construct such joints and connections to existing pipes, catch basins, inlets, manholes, walls, etc., as may be required to complete the work.

Construct structural plate pipe culverts, underdrains, or roof drains; under Sections 435, 440, and 445, respectively.

430-2 Materials.

430-2.1 Pipe: Meet the following requirements:

Concrete Pipe	Section 941
Round Rubber Gaskets	Section 942
Corrugated Steel Pipe and Pipe Arch.....	Section 943
Corrugated Aluminum Pipe and Pipe Arch	Section 945
Cast Iron Pipe.....	Section 946
Corrugated Polyethylene Pipe	Section 948
Polyvinyl Chloride (PVC) Pipe	Section 948

Do not use bituminized-fiber pipe.

430-2.2 Joint Materials: Use joint materials as specified in 430-7 through 430-11 for the particular type of pipe and conditions of usage as specified.

430-2.3 Mortar: Use mortar composed of one part portland cement and two parts of clean, sharp sand, for sealing joints in concrete and cast iron pipe, to which mixture the Contractor may add hydrated lime in an amount not to exceed 15% of the cement content. The Contractor need not test the cement, the hydrated lime, or the sand used in the mortar in accordance with Section 346, provided the cement and the hydrated lime are products of the type and quality appropriate for this work as determined by the Engineer, and the sand is a clean commercial sand approved by the Engineer. Use mortar within 30 minutes after its preparation.

430-3 Type of Pipe to Be Used.

The type or types of pipe to be used will be designated in the plans with the following exception:

Use either concrete pipe (at least Class I), corrugated steel pipe, corrugated aluminum pipe, corrugated polyethylene pipe or PVC pipe, for side drains.

430-4 Laying Pipe.

430-4.1 General: Lay all pipe, true to the lines and grades given, with hubs up and tongue end fully entered into the hub. When pipe with quadrant reinforcement, or circular pipe with elliptical reinforcement, is used, install the pipe in a position such that the manufacturer's marks designating "top" and "bottom" of the pipe are not more than five degrees from the vertical plane through the longitudinal axis of the pipe. Take up and relay any pipe that is not in true alignment or which shows any settlement after laying at no additional expense to the Department.

Repair lift holes, if present, by use of a hand-placed, stiff, non-shrink, 1-to-1 mortar of cement and fine sand, after first washing out the hole with water. Completely fill the void created by the lift hole with mortar. Cover the repaired area with a 24 by 24 inch [600 by 600 mm] piece of filter fabric secured to the pipe. Use a Class D filter fabric meeting the requirements shown on Roadway and Traffic Standard Index 199.

Secure the filter fabric to the pipe using a method that holds the fabric in place until the backfill is placed and compacted. Use a grout mixtures, mastics, or strapping devices to secure the fabric to the pipe.

Test plastic and metal pipe larger than 36 inches [900 mm] in diameter to verify that pipe deflection does not exceed 5%. Provide test and testing equipment at no additional expense to the Department. Obtain the Engineer's approval for all testing devices and test methods. The Engineer will supervise the test.

The following minimum joint performance standards apply:

Pipe Application	Minimum Standard
Cross Drains	Soil-tight
Storm Drains	Soil-tight
Gutter Drain	Water-tight
Side Drains	Soil-tight

430-4.2 Trench Excavation: Excavate the trench for pipe culverts and storm sewers as specified in Section 125.

430-4.3 Foundation: Provide a suitable foundation, where the foundation material is of inadequate supporting value, as determined by the Engineer. Remove the unsuitable material and replace it with suitable material, as specified in 125-8. Where in the Engineer's opinion, the removal and replacement of unsuitable material is not practicable, he may direct alternates in the design of the pipe line, as required to provide adequate support. Minor changes in the grade or alignment will not be considered as an adequate basis for extra compensation.

Do not lay pipe on blocks or timbers, or on other unyielding material, except where the use of such devices is called for in the plans.

430-4.4 Backfilling: Backfill around the pipe as specified in 125-8 unless specific backfilling procedures are described in the Contract Documents.

430-4.5 Plugging Pipe: When shown in the plans, seal the ends of the pipe culverts with a masonry plug a minimum of 8 inches [200 mm] in thickness, or by an approved prefabricated pipe plug listed on the Qualified Products List. Install the prefabricated pipe plug in accordance with the manufacturer's instructions.

430-4.6 End Treatment: Place an end treatment at each cross drain, side drain, or storm sewer pipe end as shown in the plans. Refer to the Design Standards for types of end treatment details.

As an exception to the above, when concrete mitered end sections are permitted, the Contractor may use reinforced concrete U-endwalls, if shop drawings are submitted to the Engineer for approval prior to use.

Provide end treatments for corrugated polyethylene pipe and PVC pipe as specified in 948-1.7 and 948-2.3, respectively, or as detailed in the plans.

430-4.7 Metal Pipe Protection: Apply a bituminous coating to the surface area of the pipe within and 12 inches [300 mm] beyond the concrete or mortar seal prior to sealing, to protect corrugated steel or aluminum pipe embedded in a concrete structure, such as an inlet, manhole, junction box, endwall, or concrete jacket.

Ensure that the surface preparation, application methods (dry film thickness and conditions during application), and equipment used are in accordance with the coating manufacturers' published specifications.

Obtain the Engineer's approval of the coating products used.

430-5 Removing and Relaying Existing Pipe.

430-5.1 Removal: If the plans indicate that existing pipe is to remain the property of the Department, collect and stack along the right-of-way all existing pipe or pipe arch so indicated in the plans to be removed, or that does not conform to the lines and grades of the proposed work and that is not

to be relaid, as directed by the Engineer. Take care to prevent damage to salvageable pipe during removal and stacking operations.

430-5.2 Relaying: Where so shown in the plans, collect and clean existing culvert pipe, then relay it in the same manner as specified for new culvert pipe. Where necessary, straighten existing metal pipe or pipe arch before it is relaid.

430-6 Placing Pipe Under Railroad.

430-6.1 General: Construct pipe culverts under railroad tracks in accordance with the requirements of the railroad company.

Perform all the shoring under the tracks, and sheeting and bracing of the trench, required by the railroad company or deemed necessary by the Engineer in order to ensure safe and uninterrupted movement of the railroad equipment, at no expense to the Department.

430-6.2 Requirements of the Railroad Company: Install pipe using methods required by the railroad company and shown in the Contract Documents.

When the general method of installation required by the railroad company is indicated in the plans, do not alter such method, or any other specific details of the installation which might be indicated in the plans, without receiving approval or direction from the railroad, followed by written approval from the Engineer.

430-6.3 Notification to Railroad Company: Notify the railroad company and the Engineer at least ten days prior to the date on which pipe is to be placed under the railroad tracks.

430-6.4 Placing Pipe by Jacking: Obtain the Engineer's and the railroad company's approval of the details of the jacking method to be used, when placing pipe through the railroad embankment, before the work is started.

430-6.5 Use of Tunnel Liner: When the railroad company requires that a tunnel liner be used for placing the pipe in lieu of the jacking method, the Department will pay for the tunnel liner material separately in cases where the Contract Documents do not require the use of a tunnel liner. For these cases the Department will reimburse the Contractor for the actual cost of the liner, delivered at the site. The Department will base such cost on a liner having the minimum gage acceptable to the railroad.

430-7 Specific Requirements for Concrete Pipe.

430-7.1 Sealing Joints:

430-7.1.1 Round Concrete Pipe Other than Side Drain: Seal the pipe joints with round rubber or profile gaskets. When round rubber gaskets are used, meet the requirements of 941-1.5. Ensure that the gasket and the surface of the pipe joint, including the gasket recess, are clean and free from grit, dirt and other foreign matter, at the time the joints are made. In order to facilitate closure of the joint, application of an approved vegetable soap lubricant immediately prior to closing of the joint will be permitted. Prelubricated gaskets may be used in lieu of a vegetable soap lubricant when the lubricating material is certified to be inert with respect to the rubber material.

Seal pipe joints with a profile rubber gasket meeting the requirements of 942-4 for joints designed in accordance with the requirements of 941-1.6.

Furnish and install a filter fabric jacket around the first joint of all round concrete pipe entering or leaving a drainage structure.

Use a filter fabric jacket consisting of a piece of woven or non-woven filter fabric which provides an Apparent Opening Size (AOS) of a No. 70 to No. 100 sieve [150 to 212 μm], 24 inches [600 mm] in width and a length sufficient to provide a minimum overlap of 24 inches [600 mm]. Secure the filter fabric jacket against the outside of the pipe by steel or plastic strapping or by other methods approved by the Engineer.

430-7.1.2 Side Drain Pipe: For all concrete pipe which does not have rubber-gasket joints, thoroughly wet the joints before the inside mortar is placed. Before succeeding sections of the pipe are laid, fill the lower half of the joint portion of the pipe in place on the inside with cement mortar, and

wipe the upper half of the tongue portion of the next joint with cement mortar, both in sufficient thickness to bring the inner surface of the abutting pipe flush and even, when the pipe is laid. After the pipe is laid, wipe and finish smooth the inside of the joint. Form a mortar bead not less than 3/4 inch [20 mm] thick completely around the outside of the joint.

430-7.2 Laying Requirements for Concrete Pipe with Rubber Gasket Joints: Lay the pipe to the line and grade shown in the plans within the following tolerances. Do not allow departure from and return to plan alignment and grade to exceed 1/16 inch per foot [5 mm per meter] of nominal pipe length, with a total of not more than 1 inch [25 mm] departure from theoretical line and grade. In addition, do not allow the gap between sections of pipe to exceed 5/8 inch for pipe diameters of 12 inches through 18 inches [16 mm for pipe diameters of 300 through 450 mm], 7/8 inch for pipe diameters of 24 through 66 inches [25 mm for pipe diameters of 600 mm through 1.7 m], and 1 inch for pipe diameters 72 inches and larger [25 mm for pipe diameters 1.8 m and larger]. Where minor imperfections in the manufacture of the pipe create an apparent gap in excess of the tabulated gap, the Engineer will accept the joint provided that the imperfection does not exceed 1/3 the circumference of the pipe, and the rubber gasket is 1/4 inch [6 mm] or more past the pipe joint entrance taper. Where concrete pipes are outside of these tolerances, replace them at no expense to the Department. Do not apply mortar, joint compound, or other filler to the gap which would restrict the flexibility of the joint.

Place and compact backfill material consisting of crushed stone/gravel or soils required in 125-8.

430-7.3 Field Joints for Elliptical Concrete Pipe: Use either a preformed plastic gasket material or a profile rubber gasket to make a field joint.

430-7.3.1 Plastic Gasket: Meet the following requirements when field joints are made from preformed plastic gasket material:

430-7.3.1.1 General: Install field joints in accordance with the manufacturer's instructions and the following:

430-7.3.1.2 Material: Meet the requirements of 942-2.

430-7.3.1.3 Joint Design: Ensure that the pipe manufacturer furnishes the Engineer with details regarding configuration of the joint and the amount of gasket material required to effect a satisfactory seal. Do not brush or wipe joint surfaces which are to be in contact with the gasket material with a cement slurry. Fill minor voids with cement slurry.

430-7.3.1.4 Primer: Apply a primer of the type recommended by the manufacturer of the gasket material to all joint surfaces which are to be in contact with the gasket material, prior to application of the gasket material. Thoroughly clean and dry the surface to be primed.

430-7.3.1.5 Application of Gasket: Apply gasket material to form a continuous gasket around the entire circumference of the leading edge of the tongue and the groove joint, in accordance with the detail shown on the Design Standards, Index No. 280. Do not remove the paper wrapper on the exterior surface of the gasket material until immediately prior to joining of sections. Apply plastic gasket material only to surfaces which are dry. When the atmospheric temperature is below 60° F [15°C], either store plastic joint seal gaskets in an area above 70°F [20°C], or artificially warm the gaskets to 70°F [20°C] in a manner satisfactory to the Engineer.

430-7.3.1.6 Installation of Pipe: Remove and reposition or replace any displaced or contaminated gasket as directed by the Engineer. Install the pipe in a dry trench. Carefully shape the bottom of the trench to minimize the need for realignment of sections of pipe after they are placed in the trench. Hold to a minimum any realignment of a joint after the gaskets come into contact. Prior to joining the pipes, fill the entire joint with gasket material and ensure that when the pipes are joined there is evidence of squeeze-out of gasket material for the entire internal and external circumference of the joint. Trim excess material on the interior of the pipe to provide a smooth interior surface. If a joint is defective, remove the leading section of pipe and reseal the joint.

430-7.3.1.7 Filter Fabric: Completely wrap the outside of each joint with either a woven or non-woven filter fabric which provides an AOS of a No. 70 to No. 100 sieve [150 to 212 µm],

a minimum of 24 inches [600 mm] in width and a length sufficient to provide a minimum overlap of 24 inches [600 mm]. Secure filter fabric against the outside of the pipe by steel or plastic strapping or by other methods approved by the Engineer.

430-7.3.2 Rubber Gasket: Meet the following requirements when field joints are made with profile rubber gaskets:

430-7.3.2.1 General: Install field joints in accordance with the manufacturer's instructions and the following:

430-7.3.2.2 Material: Meet the requirements of 942-4.

430-7.3.2.3 Joint Design: Ensure that the pipe manufacturer furnishes the Engineer with details regarding configuration of the joint and gasket required to effect a satisfactory seal. Do not apply mortar, joint compound, or other filler which would restrict the flexibility of the gasket joint.

430-7.3.2.4 Filter Fabric: Meet the requirements of 430-7.3.1.7.

430-7.4 Requirements for Concrete Radius Pipe:

430-7.4.1 Design: Construct concrete radius pipe in segments not longer than 4 feet [1.2 m] (along the pipe centerline), except where another length is called for in the Contract Documents. Join each segment using round rubber gaskets. Ensure that the pipe manufacturer submits details of the proposed joint, segment length and shape for approval by the Engineer, prior to manufacture.

430-7.4.2 Pre-Assembly: Ensure that the manufacturer pre-assembles the entire radius section in his yard, in the presence of the Engineer, to ensure a proper fit for all parts. At the option of the manufacturer, the Contractor may assemble the pipe without gaskets. Consecutively number the joints on both the interior and exterior surfaces of each joint, and make match marks showing proper position of joints. Install the pipe at the project site in the same order as pre-assembly.

430-8 Specific Requirements for Corrugated Steel Pipe.

430-8.1 Field Joints:

430-8.1.1 General: Make a field joint with locking bands, as specified in Article 9 of AASHTO M 36.

When existing pipe to be extended is helically fabricated, make a field joint between the existing pipe and the new pipe using one of the following methods:

(1) Cut the new pipe to remove one of the re-rolled annular end sections required in 943-1, or fabricate the pipe so that the re-rolled annular section is fabricated only on one end. Use either a spiral (helical) band with a gasket or a flat band with gaskets as required by 430-8.1.2 (2) to join the pipe sections. Omit the gasket when a helical band is used on side drains.

(2) The Contractor may construct a concrete jacket as shown on the Design Standards, Index No. 280, provided that the minimum cover required by the Design Standards, Index No. 205 can be obtained.

430-8.1.2 Cross Drain, Storm Sewer, and Gutter Drains: Where corrugated steel pipe is used as cross drain, storm sewer, or gutter drain, for the above specified banded joints, use a rubber or neoprene gasket of a design shown to secure the joint performance specified.

Use a gasket of one of the following dimensions:

(1) For annular joints with 1/2 inch [13 mm] depth corrugation: either a single gasket a minimum of 7 inches by 3/8 inch [175 by 9.5 mm] or two gaskets a minimum of 3 1/2 inches by 3/8 inch [90 by 9.5 mm]; and for annular joints with 1 inch [25 mm] depth corrugations: either a single gasket a minimum of 7 inches by 7/8 inch [175 by 25 mm] or two gaskets a minimum of 3 1/2 inches by 7/8 inch [90 by 25 mm].

(2) For helical joints with 1/2 inch [13 mm] depth corrugation: either a single gasket a minimum of 5 inches by 1 inch [125 by 25 mm] or two gaskets a minimum of 3 1/2 inches by 1 inch [90 by 25 mm]; and for helical joints with 1 inch [25 mm] depth corrugations: either a single

gasket a minimum of 5 inches by 1 1/2 inches [125 by 40 mm] or two gaskets a minimum of 3 1/2 inches by 1 1/2 inches [90 by 40 mm].

(3) Such other gasket designs as may be approved by the Engineer.

If, in lieu of a single gasket spanning the joint, two gaskets are used, place these individual gaskets approximately 2 inches [50 mm] from each pipe end at the joint. When two gaskets are used, seal the overlapping area on the coupling band between the gaskets consistent with the joint performance specified. The Contractor may tuck a strip of preformed gasket material over the bottom lip of the band for this purpose. Use coupling bands that provide a minimum circumferential overlap of 3 inches [75 mm]. As the end connections on the coupling band are tightened, ensure that there is no local bending of the band or the connection. Use precurved coupling bands on pipe diameters of 24 inches [600 mm] or less.

Use flat gaskets meeting the requirements of ASTM D 1056, designation 2C2 or 2B3. In placing flat gaskets on pipe prior to placing the coupling band, do not stretch the gasket more than 15% of its original circumference. Use circular gaskets meeting the requirements of ASTM C 361 [ASTM C 361M]. Do not stretch the circular gasket more than 20% of its original circumference in placing the gasket on pipe. Use preformed plastic gasket material meeting the composition requirements of 942-2.2.

Apply an approved vegetable soap lubricant, as specified for concrete pipe in 430-7.1.1.

The minimum joint performance standards specified in 430-4.1 apply.

430-8.1.3 Alternate Joint: In lieu of the above-specified combination of locking bands and flat gaskets, the Contractor may make field joints for these pipe installations by the following combinations:

(a) Use the metal bands as specified in Article 9 of AASHTO M 36M that are at least 10 1/2 inches [265 mm] wide and consist of a flat central section with a corrugated section near each end, designed to match the annular corrugation in the pipe with which they are to be used. Connect the bands in a manner approved by the Engineer, with a suitable fastening device such as the use of two galvanized 1/2 inch [M12] diameter bolts through a galvanized bar and galvanized strap, suitably welded to the band. Use a strap that is the same gage as the band.

Where helically corrugated pipe is to be jointed by this alternate combination, ensure that at least the last two corrugations of each pipe section are annular, and designed such that the band will engage each pipe end with the next-to-outside annular corrugation.

(b) For these bands, use a rubber gasket with a circular cross-section of the "O-ring" type conforming to ASTM C 361 [ASTM C 361M]. Use gaskets having the following cross-sectional diameter for the given size of pipe:

Non-SI Units	
Pipe Size	Gasket Diameter
12 inches through 36 inches (with 1/2 inch depth corrugations)	1 3/16 inch
42 inches through 96 inches (with 1/2 inch depth corrugations)	7/8 inch
36 inches through 120 inches (with 1 inch depth corrugations)	1 3/8 inches

SI Units	
Pipe Size	Gasket Diameter
300 through 900 mm (with 13 mm depth corrugations)	20 mm
1,000 through 2,400 mm (with 13 mm depth corrugations)	22 mm
900 through 3,000 mm (with 25 mm depth corrugations)	35 mm

Use preformed gasket material to seal the overlapping area on the coupling band between gaskets.

(c) Use channel band couplers in helical pipe with ends which have been reformed and flanged specifically to receive these bands. Use channel band couplers that are of a two piece design, are fabricated from galvanized steel stock conforming to AASHTO M 36, have 2 by 2 by 3/16 inch [51 by 51 by 4.8 mm] angles fastened to the band ends to allow for proper tightening, and meet the following:

Non SI Units	
Band Thickness	Pipe Wall Thickness
0.079 inch	0.109 inch or lighter
0.109 inch	0.138 inch or heavier
3/4 inch wide	0.109 inch or lighter
1 inch wide	0.138 inch or heavier
SI Units	
Band Thickness	Pipe Wall Thickness
2.01 mm	2.77 mm or lighter
2.77 mm	3.51 mm or heavier
19 mm	2.77 mm or lighter
25 mm	3.51 mm or heavier

Furnish two 1/2 inch [M12] diameter connection bolts with each band, that conform to ASTM A 307, Grade A and are electroplated in accordance with ASTM B 633.

Use a gasket with the joint that is a hydrocarbon blend of butyl rubber meeting the chemical composition and physical properties of 942-2.2. Use a 3/8 by 3/4 inch [9.5 by 19 mm] gasket for pipe fabricated from 0.109 inch [2.77 mm] or lighter material and a 3/8 by 1 inch [9.5 by 25 mm] gasket for pipe fabricated from 0.138 inch [3.51 mm] and heavier material.

The Contractor may use a flange band coupler without the gasket for all applications other than cross drain, storm sewer and gutter drain.

Do not use the flange band coupler to join dissimilar types of pipe.

The Contractor may join reformed flanged helical pipe to existing annular or reformed pipe having annular ends. On non-gasketed installations, use either an annular band or an alternate joint described in 430-8.1.3. On gasketed installations, use an annular band, minimum of five corrugations in width, in conjunction with two O-ring gaskets as specified in 430-8.1.3. Use mastic material to seal the area of band overlap.

430-8.2 Laying and Shape Requirements for Corrugated Steel Pipe: Install pipe using either a trench or open ditch procedure. Place and compact backfill material consisting of crushed stone/gravel or soils as required in 125-8.

Upon completion of the project, and just prior to acceptance by the Department, clean coated corrugated steel pipe and inspect it for breaks, corrosion or other damage to the coating or to the

pipe itself, and make necessary repairs. When the pipe is laid, ensure that the interior is reasonably uniform and as near circular as is practical.

Ensure that the vertical diameter is not less than 100%, or more than 105%, of the nominal diameter, and the horizontal diameter is not less than 95%, or more than 100%, of the nominal diameter.

Make all measurements for the above dimensions at the surface of the coating, at the point of smallest diameter on the corrugations.

430-9 Field Joints for Aluminum Pipe.

430-9.1 General: Make a field joint with bands fabricated of the same alloy as the culvert sheeting and meet the requirements of AASHTO M 196M.

430-9.2 Aluminum Cross Drains, Storm Sewers, and Gutter Drains: For aluminum pipe (for circular and helical corrugations), meet the requirements as specified above for corrugated steel pipe, except for the material in the bands and band connections for the alternate combination of joint materials, use the same alloy as the culvert sheeting.

430-10 Joints for Cast Iron Pipe.

Meet the requirements of 430-7.1.2 for mortaring and wetting inside the joints, as specified for concrete side drain pipe without rubber gaskets.

430-11 Specific Requirements for Corrugated Polyethylene Pipe and Polyvinyl Chloride (PVC) Pipe.

430-11.1 Field Joints: Ensure that split couplings, twist couplings or gasketed joints are used to seal side drain. Use gasketed joints, wrapped with filter fabric meeting the requirements of a Type D-3 fabric as specified on Roadway and Traffic Standard Index 199, to seal cross drain and storm drain. Use gaskets meeting the requirements of 941-1.5. Ensure that the pipe manufacturer provides a joint design approved by the Engineer prior to use.

430-11.2 Installation Requirements Including Trenching, Foundation and Backfilling Operations: Do not use any corrugated polyethylene or PVC pipe when fill heights exceed 10 feet [3 m], when minimum cover is less than that shown on the Design Standards, Index No. 205, or when extra base is required as shown on Design Standards, Index No. 205.

When pipe is laid, ensure that the interior is reasonably uniform and as nearly circular as practical. Check structure shape regularly during backfilling to verify acceptability of the construction method used. Do not allow pipe to deflect more than 5% in any direction.

Place and compact backfill material as required in 125-8 under, around and a minimum of 12 inches [300 mm] above the pipe.

430-12 Method of Measurement.

430-12.1 New Pipe: The quantities of storm drain pipe, storm drain trench, and cross drain pipe to be paid for will be plan quantity, in place and accepted. The plan quantity will be measured from the inside wall of the structure as shown on the plans, along the centerline of the pipe.

The quantities of side drain pipe and gutter drain pipe to be paid for will be the net length of pipe measured in place, completed and accepted.

430-12.2 Relaid Pipe: The quantity to be paid for (including relaid pipe arch) will be the net length of pipe, measured in place after relaying, completed and accepted.

430-12.3 Mitered End Section: The quantity to be paid for will be the number completed and accepted.

430-13 Basis of Payment.

430-13.1 General: Prices and payments will be full compensation for all work specified in this Section, including all excavation except the volume included in the items for the grading work on the project, and except for other items specified for separate payment in Section 125; all backfilling material and compaction; disposal of surplus material; and all clearing and grubbing outside of the required limits of clearing and grubbing as shown in the plans.

430-13.2 New Pipe: Price and payment will be full compensation for all work and materials for constructing pipe culvert of the kinds and sizes shown in the proposal, including the optional kinds specified as being permissible under the items of Cross Drain Pipe, Side Drain Pipe and Storm Drain Pipe Culvert.

430-13.3 Relaid Pipe: Price and payment will be full compensation for all work, including hauling the pipe to the new location as necessary, any cleaning necessary and, for metal pipe, any straightening, etc., which might be required.

430-13.4 Removing Existing Pipe: When existing pipe is removed and replaced with new pipe approximately at the same location, and clearing and grubbing is not designated to be paid for in the particular area, the cost of excavating and removing the old pipe and of its disposal will be included in the Contract unit price for the new pipe in place.

430-13.5 Replacing Pavement: The cost of restoring pavement, curb, sidewalk, etc., removed only for the purpose of constructing pipe culvert, as specified in 125-9, will be included in the Contract unit price for the pipe culvert, unless designated specifically to be paid for under other items.

430-13.6 Plugging Pipes: The cost of plugging pipes, where so shown in the plans, will be included in the Contract unit price for the pipe culvert.

430-13.7 Flared End Sections: Price and payment will be full compensation for all work and materials required.

430-13.8 Mitered End Sections: Price and payment will be full compensation for all pipe, grates when required, fasteners, reinforcing, connectors, anchors, concrete, sealants, jackets and coupling bands, and all work required.

430-13.9 Railroad Requirements: Where pipe culvert is constructed under railroad tracks, the Contract unit price for the pipe culvert will include the costs of any jacking operations and the operation of placing the pipe by use of a tunnel liner, (except as specified for unanticipated tunnel liner, in 430-6.5, where reimbursement is to be made for such unanticipated liner), and all other work necessary to meet the requirements of the railroad company, excluding the costs of watchman or flagman services provided by the railroad company, except as provided below.

The Department will reimburse the Contractor for the actual costs of any trestle bridge work which is performed by the railroad's forces, as billed to him by the railroad, less the value of any salvage materials derived therefrom, whether such salvage materials are retained by the railroad company or by the Contractor. When the work of shoring and bracing is to be performed by the railroad, such fact will be stipulated in the Contract Documents and the Contractor will be required to pay to the railroad the amount of such costs, which amount will be reimbursed to him by the Department. The Contract unit price for the pipe culvert shall include the costs of all other work of shoring and bracing.

430-13.10 Payment Items: Payment will be made under:

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| Item No. 430- 1- | Concrete Pipe Culvert - per foot. |
| Item No. 2430- 1- | Concrete Pipe Culvert - per meter. |
| Item No. 430- 2- | Corrugated Steel Pipe Culvert - per foot. |
| Item No. 2430- 2- | Corrugated Steel Pipe Culvert - per meter. |
| Item No. 430- 3- | Bituminous Coated Corrugated Steel Pipe Culvert - per foot. |
| Item No. 2430- 3- | Bituminous Coated Corrugated Steel Pipe Culvert - per meter. |
| Item No. 430- 4- | Bituminous Coated and Paved Corrugated Steel Pipe Culvert - per foot. |
| Item No. 2430- 4- | Bituminous Coated and Paved Corrugated Steel Pipe Culvert - per meter. |

Item No. 430- 5-	Corrugated Steel Pipe Arch Culvert - per foot.
Item No. 2430- 5-	Corrugated Steel Pipe Arch Culvert - per meter.
Item No. 430- 6-	Bituminous Coated Steel Pipe Arch Culvert - per foot.
Item No. 2430- 6-	Bituminous Coated Steel Pipe Arch Culvert - per meter.
Item No. 430- 7-	Bituminous Coated and Paved Steel Pipe Arch Culvert - per foot.
Item No. 2430- 7-	Bituminous Coated and Paved Steel Pipe Arch Culvert - per meter.
Item No. 430- 8-	Corrugated Aluminum Pipe Culvert - per foot.
Item No. 2430- 8-	Corrugated Aluminum Pipe Culvert - per meter.
Item No. 430- 9-	Bituminous Coated Corrugated Aluminum Pipe Culvert - per foot.
Item No. 2430- 9-	Bituminous Coated Corrugated Aluminum Pipe Culvert - per meter.
Item No. 430-10-	Bituminous Coated and Paved Corrugated Aluminum Pipe Culvert - per foot.
Item No. 2430-10-	Bituminous Coated and Paved Corrugated Aluminum Pipe Culvert - per meter.
Item No. 430-11-	Corrugated Aluminum Pipe Arch Culvert - per foot.
Item No. 2430-11-	Corrugated Aluminum Pipe Arch Culvert - per meter.
Item No. 430-12-	Aluminized Corrugated Steel Pipe Culvert - per foot.
Item No. 2430-12-	Aluminized Corrugated Steel Pipe Culvert - per meter.
Item No. 430-14-	Elliptical Concrete Pipe Culvert - per foot.
Item No. 2430-14-	Elliptical Concrete Pipe Culvert - per meter.
Item No. 430-17-	Pipe Culvert Optional Material - per foot.
Item No. 2430-17-	Pipe Culvert Optional Material - per meter.
Item No. 430-96-	Polyvinyl Chloride Pipe Culvert - per foot.
Item No. 2430-96-	Polyvinyl Chloride Pipe Culvert - per meter.
Item No. 430-98-	Mitered End Section - each.
Item No. 2430-98-	Mitered End Section - each.
Item No. 430-99-	Polyethylene Pipe Culvert - per foot.
Item No. 2430-99-	Polyethylene Pipe Culvert - per meter.
Item No. 430-150-	Cast Iron Pipe Culvert - per foot.
Item No. 2430-150-	Cast Iron Pipe Culvert - per meter.
Item No. 430-190-	Relay Existing Pipe - per foot.
Item No. 2430-190-	Relay Existing Pipe - per meter.
Item No. 430-200-	Flared End Sections - each.
Item No. 2430-200-	Flared End Sections - each.
Item No. 430-610-	U-Endwall With Grate - each.
Item No. 2430-610-	U-Endwall With Grate - each.