SECTION 4200 - STORM SEWER PIPE

4200.1 SCOPE: This section covers the requirements for all labor, equipment and materials for the installation of storm sewers pipes. Trenching guidelines are provided in a separate section.

4200.2 MATERIALS, DEFINITIONS AND EQUIPMENT:

4200.2.1 ***Reinforced Concrete Pipe (RCP)***: Note: All pipe on City of Joplin right-of-way shall be RCP pipe unless approve otherwise by the Director of Public Works. RCP pipe shall conform to ASTM C76 for round pipe, ASTM C506 for arch pipe, and ASTM C507 for elliptical pipe. Unless otherwise specified, Class III, wall B minimum shall be provided. Joints shall be tongue-in-groove with preformed, flexible sealants and shall conform to ASTM C990. End sections shall be flared and shall meet the concrete material, steel area, and workmanship requirements for Class III or A-III pipe. Fittings shall be manufactured from green precast stock, carefully mitered, and shall have reinforcing cages welded together at the joint. RCP is allowed under all driving surfaces. Joints shall not have gaps larger than 1/3 the bell depth.

4200.2.2 ***Reinforced Concrete Boxes (RCB):*** Reinforced concrete box sections shall conform Missouri Department of Transportation Standards or to ASTM 1433. Design tables shall be appropriate for the loading conditions. Designs not taken from the design tables shall be sealed by a registered professional engineer. Joints shall not have gaps larger than 1/3 the bell depth.

4200.2.3 ***Corrugated Metal Pipe (CMP) Aluminized***: Sheet steel for aluminized CMP pipe shall conform to AASHTO M 274. Pipe manufacture shall conform to AASHTO M 36. Wall thickness shall be 0.079 inches, 14 gage, for circular pipe 30 inches diameter and smaller, and 0.109 inches, 12 gage, for circular pipe 54 inches diameter or smaller. Joints shall be made with a bolted aluminized steel band assembly. End sections shall be flared and shall have a rolled top edge. Fittings shall be fabricated from the same material as the pipe. This pipe shall have a minimum of on foot cover with earth or crushed rock in addition to the required bedding. Pipe may also be specified using MoDOT Standards for Corrugated Steel Pipe, latest addition. CMP shall not be allowed under driving surfaces.

4200.2.4 ***High Density Polyethylene Pipe (PE or HDPE):*** HDPE pipe shall conform to AASHTO M 294 Type S (non-perforated circular cross section, with corrugated outer surface and smooth inner surface). Outside diameter shall match the outside diameter of RCP wall B joints. Joint coupling bands shall be of the same material as the pipe and shall, when fastened in place, provide the joint with the same or greater structural properties as the remainder of the pipe. Joint coupling bands shall prevent infiltration of soil. End sections shall be RCP flared end sections, meeting the requirements listed in this Section for

RCP fittings. This pipe shall have a minimum of on foot cover with earth or crushed rock in addition to the required bedding. HDPE shall not be allowed under driving surfaces.

4200.2.5 ***POLYPROPYLENE CULVERT PIPE*:** Acceptance of polypropylene pipe will be based upon the pipe being in accordance with the latest edition of Section 1041 of the Missouri Standard Specifications for Highway Construction. Manufacturers furnishing pipe to city of Joplin projects shall be included on approved list of the Construction and Materials Division of the Missouri Department of Transportation. Polypropylene pipe may be used under driving surfaces when used in compliance with these specifications and standard plans. End sections shall be precast concrete.

4200.2.6 ***Bedding Material:*** Material for bedding for pipes other than flexible pipes shall be limestone base having a gradation as follows:

Sieve Size	Percent Passing
1”	100
½”	60-90
#4	35-60
#30	10-35
#200	0-15

4200.2.7 ***Temporary Plugs*:** Temporary plugs shall be a model recommended by pipe manufacturer; watertight to a static head of 25 feet.

4200.3 CONSTRUCTION DETAILS

4200.3.1 ***Pipe Bedding:*** The sub-grade shall be excavated so as to provide space for at least four (4) inches of bedding material between the sub-grade and the pipe if the sub-grade material is earth, and six (6) inches of bedding material between the sub-grade and the pipe if the sub-grade material is rock. Bedding material shall be placed in the trench and carefully graded and tamped to the proper elevation so that the pipe, when placed, shall conform to the specified line and grade.

4200.3.2 ***Grade and Alignment*:** The Engineer will provide the Contractor with line and grade information. It shall be the Contractor’s responsibility to install the sewer according to plans. Three (3) batter boards, a top line and grade pole or laser beam shall be used for this purpose unless some other method of checking the inner lower grade and line is approved by the Engineer in writing. The Contractor must test the ditch or grade of the top line and

sewer, and will be held responsible for the correct flow of storm sewers. Any apparent inaccuracy in grade stakes shall be called to the Engineer's attention immediately upon discovery. The Contractor shall provide and maintain on the work at all times a laser beam or a gauge rod of sufficient length to reach from the invert of the sewer pipe being laid to the top line strung on the three batter boards. The gauge rod shall be graduated and numbered each foot of its entire length. The gauge rod shall be equipped with either a plumb line or two spirit levels and the utmost care used to insure a truly vertical gauge rod at the time the reading is taken and pipe being set. In the event a laser beam is used to set line and grade for the pipe laying operation, the laser must be checked at the beginning of each day and at least once between structures and at any other time the Engineer deems it necessary to insure the proper line and grade of the pipe.

4200.3.3 **"Pipe Laying (Rigid Pipe)":** Installation of pipe shall proceed from the downstream end of the project with bell ends facing upstream. Alignment and grade shall be uniform between manholes, and a positive system of grade control shall be used for maintaining alignment. Due to difficulty of compacting beneath wide pipes, loose bedding material shall be shaped to receive the full length of the pipe except where required to mate joints. The ends of the installed pipe shall be plugged whenever the work is not in progress. Joint installation shall follow the manufacturer's recommendation.

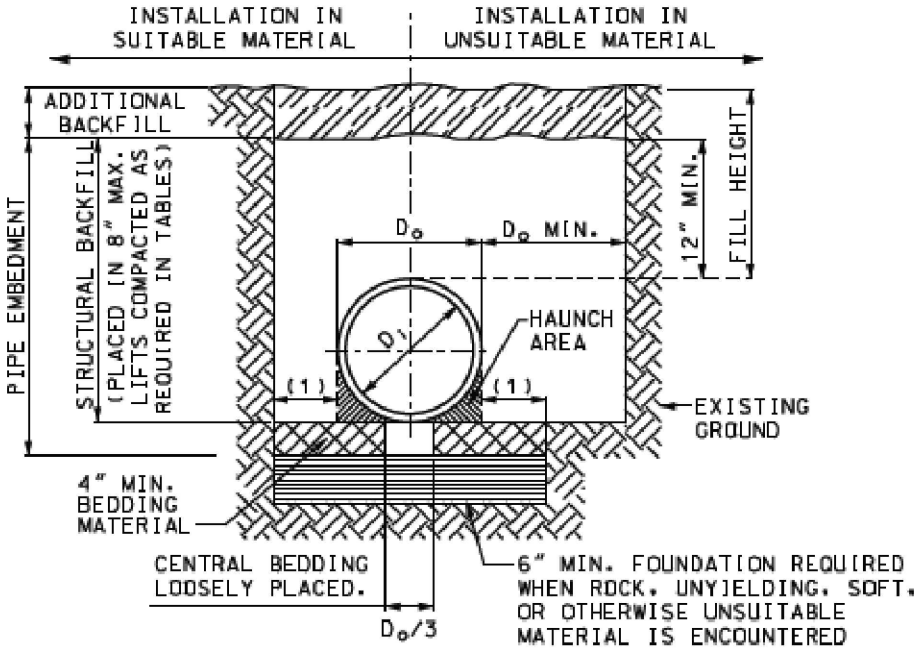
4200.3.4 **Pipe Laying (Flexible Pipe):** Pipes shall be constructed and inspected in accordance with the latest version in effect of Sections 724 and 730 of the Missouri Standard Specifications for Highway Construction. The cover over flexible pipe shall be as shown on the standard plans, but in no case shall be less than 24 inches. Bedding material shall be the following gradation:

1.5"	100% passing
½"	≤25% passing
NO. 4	≤15% passing
No. 200	<12%

4200.4 **MEASUREMENT**: Measurement will be made to determine the number of linear feet of Storm Sewer placed and accepted, for the purpose of making payments.

4200.5 **PAYMENT**: The cost of furnishing all labor, equipment, tools, and materials, and the performance of all work necessary to construct storm sewer pipe, testing, including all incidental work necessary at the locations specified herein, shall be included in the linear foot price listed in the Proposal as

Storm Sewer Pipe	Per L.F.

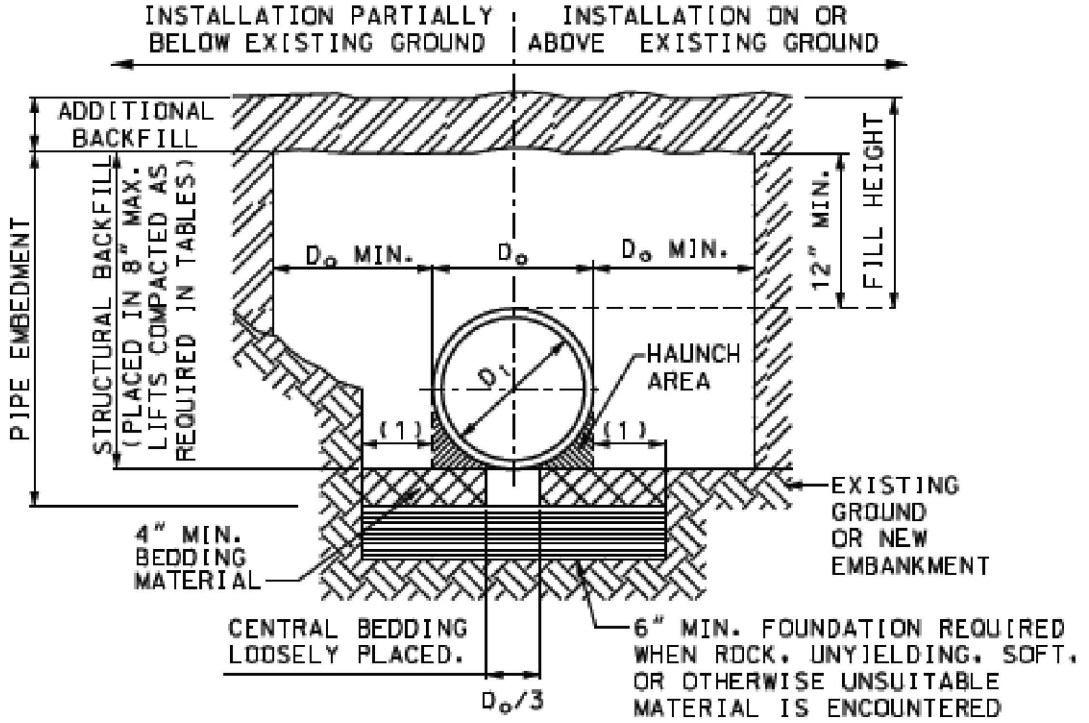


TRENCH INSTALLATION

LEGEND

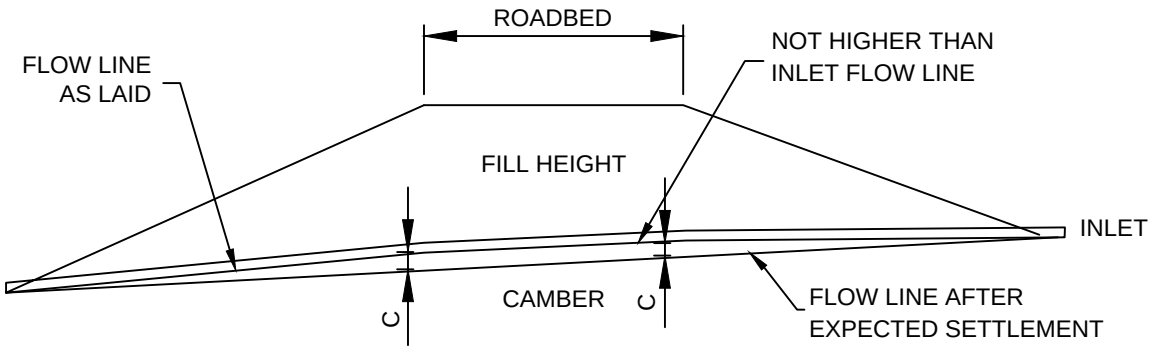
D_i = INSIDE DIAMETER OF PIPE.
D_o = OUTSIDE DIAMETER OF PIPE.
(1) = $(D_o/4)+6"$ (MIN.)

NOTE:
MULTIPLE PIPE SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF $\frac{1}{2}$ D_o OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".



EMBANKMENT INSTALLATION

CITY OF JOPLIN	CITY OF JOPLIN, MO	CKD BY: SALISBURY	POLYPROPYLENE (FLEXIBLE) PIPE INSTALLATION METHODS
	PUBLIC WORKS DEPT	DATE: 10/2015	
	ENGINEERING DIVISION	ENGINEER: HEATHERLY	
	602 S MAIN ST 64801	FILE: POLYPRO1	



NOTE:
ON YIELDING SOIL, PIPE CULVERTS SHALL BE PLACED ON A CAMBERED FLOW LINE. THE AMOUNT OF CAMBER WILL VARY WITH SOIL CONDITION AND WILL BE SPECIFIED ON THE DESIGN PLANS.

TYPICAL CAMBERED FLOW LINE

CONSTRUCTION SEQUENCE:

1. PLACE BEDDING MATERIAL TO GRADE.
2. COMPACT BEDDING OUTSIDE THE MIDDLE THIRD OF THE PIPE.
3. INSTALL PIPE TO GRADE.
4. PLACE AND COMPACT THE HAUNCH AREA UP TO THE SPRINGLINE.
5. COMPLETE BACKFILL ACCORDING TO SPECIFICATIONS.

MINIMUM COVER FOR CONSTRUCTION LOADS				
NOMINAL PIPE DIA. (IN.)	MINIMUM COVER (FT) FOR INDICATED AXLE LOADS (THOUSANDS OF POUNDS)			
	18-50	50-75	75-110	110-150
12-36	2:0	2:5	3:0	3.0
42-60	3:0	3:0	3:5	4.0

MINIMUM COVER LIMITS ARE NOT SUFFICIENT FOR SILTY SAND OR SILTY GRAVEL, STRUCTURAL BACKFILL COMPACTED TO 90% STANDARD PROCTOR DENSITY. THE CONTRACTOR SHALL PROVIDE MINIMUM COVER PLUS ANY ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. IN UNPAVED SITUATIONS, THE SURFACE MUST BE MAINTAINED TO A LEVEL AND NON-RUTTED CONDITION.

CITY OF Joplin

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FILL HEIGHT LIMITS

STRUCTURAL BACKFILL	SPECIFIED NOMINAL DIA OF PIPE (IN.)	DOUBLE WALL POLYPROPYLENE				TRIPLE WALL POLYPROPYLENE			
		COMPACTION 90% SPD		COMPACTION 95% SPD		COMPACTION 90% SPD		COMPACTION 95% SPD	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
GRAVEL (AASHTO M145 SOIL TYPE A1 & A3)	12	2'	21'	2'	29'	--	--	--	--
	15	2'	22'	2'	31'	--	--	--	--
	18	2'	19'	2'	27'	--	--	--	--
	24	2'	16'	2'	22'	--	--	--	--
	30	2'	11'	2'	15'	2'	17'	2'	23'
	36	--	--	--	--	2'	15'	2'	21'
	42	--	--	--	--	2'	19'	2'	27'
	48	--	--	--	--	2'	12'	2'	17'
	60	--	--	--	--	2'	16'	2'	23'
COURSE SAND (AASHTO M145 SOIL TYPE A-1-b)	12	2'	18'	2'	24'	--	--	--	--
	15	2'	22'	2'	31'	--	--	--	--
	18	2'	16'	2'	21'	--	--	--	--
	24	2'	13'	2'	17'	--	--	--	--
	30	2'	7'	2'	10'	2'	17'	2'	23'
	36	--	--	--	--	2'	15'	2'	21'
	42	--	--	--	--	2'	19'	2'	27'
	48	--	--	--	--	2'	12'	2'	17'
	60	--	--	--	--	2'	16'	2'	23'
SILTY SAND OR SILTY GRAVEL (AASHTO M145 SOIL TYPES A-2-4 & A-2-5)	12	2.8'	11'	2'	19'	--	--	--	--
	15	2.8'	11'	2'	23'	--	--	--	--
	18	3'	11'	2'	16'	--	--	--	--
	24	3.3'	10'	2'	13'	--	--	--	--
	30	3.4'	6'	2'	7'	3'	10'	2'	17'
	36	--	--	--	--	3.3'	10'	2'	15'
	42	--	--	--	--	3.2'	11'	2'	20'
	48	--	--	--	--	3.1'	9'	2'	13'
	60	--	--	--	--	2'	10'	2'	17'

NOTES:

1. SPD = STANDARD PROCTOR DENSITY.
2. FILL HEIGHT MEASURED FROM THE TOP OF PIPE TO SURFACE.
3. LIMITS ACCOUNT FOR SHORT-TERM TEMPORARY WATER TABLE DEPTHS OF FIVE FEET ABOVE SPRINGLINE. TABLES ARE NOT APPLICABLE FOR LONG-TERM PERMANENT WATER TABLE DEPTHS ABOVE SPRINGLINE.
4. POLYPROPYLENE PIPE USED FOR STORM SEWERS UNDER THE INFLUENCE OF A PAVEMENT SECTION WHICH HAS 3500 ADT OR GREATER ARE LIMITED TO THE SHADED VALUES.

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