



Andy Beshear
GOVERNOR

TRANSPORTATION CABINET

200 Mero Street
Frankfort, Kentucky 40601

Jim Gray
SECRETARY

February 17, 2026

CALL NO. 104
CONTRACT ID NO. 261503
ADDENDUM # 3

Subject: Warren County, STP 7434 (023)
Letting February 19, 2026

- (1) Revised - Proposal Bid Items - Pages 116-121A of 121
- (2) Added - Special Notes - Pages 1-74 of 74
- (3) Revised - Plan Sheet U0A

Proposal revisions are available at <http://transportation.ky.gov/Construction-Procurement/>.

If you have any questions, please contact us at 502-564-3500.

Sincerely,

A handwritten signature in black ink that reads "Rachel Mills".

Rachel Mills, P.E.
Director
Division of Construction Procurement

RM:mr
Enclosures

PROPOSAL BID ITEMS

261503

Report Date 2/17/26

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Section: 0001 - PAVING

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0010	00003		CRUSHED STONE BASE	7,680.00	TON		\$	
0020	00020		TRAFFIC BOUND BASE	16.00	TON		\$	
0030	00078		CRUSHED AGGREGATE SIZE NO 2	10,250.00	TON		\$	
0040	00190		LEVELING & WEDGING PG64-22	1,502.00	TON		\$	
0050	00214		CL3 ASPH BASE 1.00D PG64-22	8,556.00	TON		\$	
0060	02602		FABRIC-GEOTEXTILE CLASS 1	14,855.00	SQYD		\$	
0070	02608		FABRIC-GEOTEXTILE CLASS 4A	14,855.00	SQYD		\$	
0080	22906ES403		CL3 ASPH SURF 0.38A PG64-22	2,992.00	TON		\$	
0090	24970EC		ASPHALT MATERIAL FOR TACK NON-TRACKING	21.00	TON		\$	
0100	26248EC		ELECTRONIC DELIVERY MGMT SYSTEM - AGG	1.00	LS		\$	

Section: 0002 - ROADWAY

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0110	00078		CRUSHED AGGREGATE SIZE NO 2	3,867.00	TON		\$	
0120	01000		PERFORATED PIPE-4 IN	768.00	LF		\$	
0130	01010		NON-PERFORATED PIPE-4 IN	36.00	LF		\$	
0140	01028		PERF PIPE HEADWALL TY 3-4 IN	3.00	EACH		\$	
0150	01740		CORED HOLE DRAINAGE BOX CON-4 IN	57.00	EACH		\$	
0160	01810		STANDARD CURB AND GUTTER (REVISED 2-12-26)	7,276.00	LF		\$	
0170	01875		STANDARD HEADER CURB (REVISED 2-12-26)	408.00	LF		\$	
0180	01885		LIP HEADER CURB (REVISED 2-12-26)	153.00	LF		\$	
0190	01923		STANDARD BARRIER MEDIAN TYPE 5 (REVISED 2-12-26)	924.00	SQYD		\$	
0200	02014		BARRICADE-TYPE III	8.00	EACH		\$	
0210	02091		REMOVE PAVEMENT	470.00	SQYD		\$	
0220	02101		CEM CONC ENT PAVEMENT-8 IN	2,904.00	SQYD		\$	
0230	02159		TEMP DITCH	2,640.00	LF		\$	
0240	02160		CLEAN TEMP DITCH	1,320.00	LF		\$	
0250	02200		ROADWAY EXCAVATION	14,504.00	CUYD		\$	
0260	02223		GRANULAR EMBANKMENT	81.00	CUYD		\$	
0270	02242		WATER	200.00	MGAL		\$	
0280	02429		RIGHT-OF-WAY MONUMENT TYPE 1	60.00	EACH		\$	
0290	02430		RIGHT-OF-WAY MONUMENT TYPE 1A	4.00	EACH		\$	
0300	02432		WITNESS POST	10.00	EACH		\$	
0310	02469		CLEAN SINKHOLE	3.00	EACH		\$	
0320	02483		CHANNEL LINING CLASS II	91.00	TON		\$	
0330	02484		CHANNEL LINING CLASS III	49.00	TON		\$	
0340	02545		CLEARING AND GRUBBING APPROXIMATELY 12 ACRES	1.00	LS		\$	

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0350	02562		TEMPORARY SIGNS	814.00	SQFT		\$	
0360	02603		FABRIC-GEOTEXTILE CLASS 2	2,964.00	SQYD		\$	
0370	02607		FABRIC-GEOTEXTILE CLASS 2 FOR PIPE	11,637.00	SQYD		\$	
0380	02650		MAINTAIN & CONTROL TRAFFIC	1.00	LS		\$	
0390	02671		PORTABLE CHANGEABLE MESSAGE SIGN	3.00	EACH		\$	
0400	02676		MOBILIZATION FOR MILL & TEXT	1.00	LS		\$	
0410	02677		ASPHALT PAVE MILLING & TEXTURING	645.00	TON		\$	
0420	02690		SAFELADING	26.00	CUYD		\$	
0430	02701		TEMP SILT FENCE	2,640.00	LF		\$	
0440	02703		SILT TRAP TYPE A	12.00	EACH		\$	
0450	02704		SILT TRAP TYPE B	12.00	EACH		\$	
0460	02705		SILT TRAP TYPE C	12.00	EACH		\$	
0470	02706		CLEAN SILT TRAP TYPE A	12.00	EACH		\$	
0480	02707		CLEAN SILT TRAP TYPE B	12.00	EACH		\$	
0490	02708		CLEAN SILT TRAP TYPE C	12.00	EACH		\$	
0500	02720		SIDEWALK-4 IN CONCRETE (REVISED 2-12-26)	5,454.00	SQYD		\$	
0510	02726		STAKING	1.00	LS		\$	
0520	05952		TEMP MULCH	36,586.00	SQYD		\$	
0530	05953		TEMP SEEDING AND PROTECTION	27,439.00	SQYD		\$	
0540	05963		INITIAL FERTILIZER	1.40	TON		\$	
0550	05964		MAINTENANCE FERTILIZER	2.30	TON		\$	
0560	05985		SEEDING AND PROTECTION	3,702.00	SQYD		\$	
0570	05990		SODDING	38,940.00	SQYD		\$	
0580	05992		AGRICULTURAL LIMESTONE	2.00	TON		\$	
0590	06406		SBM ALUM SHEET SIGNS .080 IN	71.00	SQFT		\$	
0600	06407		SBM ALUM SHEET SIGNS .125 IN	225.00	SQFT		\$	
0610	06410		STEEL POST TYPE 1	488.00	LF		\$	
0620	06510		PAVE STRIPING-TEMP PAINT-4 IN	52,159.00	LF		\$	
0630	06542		PAVE STRIPING-THERMO-6 IN W	13,502.00	LF		\$	
0640	06543		PAVE STRIPING-THERMO-6 IN Y	11,384.00	LF		\$	
0650	06547		PAVE STRIPING-THERMO-12 IN Y	50.00	LF		\$	
0660	06565		PAVE MARKING-THERMO X-WALK-6 IN	1,228.00	LF		\$	
0670	06566		PAVE MARKING-THERMO X-WALK-12 IN	1,145.00	LF		\$	
0680	06568		PAVE MARKING-THERMO STOP BAR-24IN	323.00	LF		\$	
0690	06569		PAVE MARKING-THERMO CROSS-HATCH	2,965.00	SQFT		\$	
0700	06574		PAVE MARKING-THERMO CURV ARROW	35.00	EACH		\$	
0710	06576		PAVE MARKING-THERMO ONLY	1.00	EACH		\$	
0720	06610		INLAID PAVEMENT MARKER-MW	159.00	EACH		\$	
0730	06611		INLAID PAVEMENT MARKER-MY	22.00	EACH		\$	
0740	06612		INLAID PAVEMENT MARKER-BY	166.00	EACH		\$	
0750	10020NS		FUEL ADJUSTMENT	31,166.00	DOLL		\$	
0760	10030NS		ASPHALT ADJUSTMENT	51,102.00	DOLL		\$	
0770	20000ES724		TREE	12.00	EACH		\$	
0780	20099ES842		PAVE MARK TEMP PAINT STOP BAR	323.00	LF		\$	
0790	20194ED		REMOVE & RESET TRAFFIC SIGN	3.00	EACH		\$	
0800	20208NC		PAVE MARK-PAINT ARROWS	33.00	EACH		\$	
0810	20430ED		SAW CUT	271.00	LF		\$	
0820	21289ED		LONGITUDINAL EDGE KEY	9,930.00	LF		\$	
0830	21373ND		REMOVE SIGN	3.00	EACH		\$	

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0840	23139EN		STRIPING REMOVAL	12,290.00	LF		\$	
0850	23158ES505		DETECTABLE WARNINGS (REVISED 2-12-26)	523.00	SQFT		\$	
0860	24631EC		BARCODE SIGN INVENTORY	42.00	EACH		\$	
0870	24880EC		REMOVE PAVEMENT MARKER	308.00	EACH		\$	

Section: 0003 - DRAINAGE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0880	00440		ENTRANCE PIPE-15 IN	206.00	LF		\$	
0890	00441		ENTRANCE PIPE-18 IN	247.00	LF		\$	
0900	00443		ENTRANCE PIPE-24 IN	131.00	LF		\$	
0910	00462		CULVERT PIPE-18 IN	59.00	LF		\$	
0920	00464		CULVERT PIPE-24 IN	50.00	LF		\$	
0930	00521		STORM SEWER PIPE-15 IN	5,404.00	LF		\$	
0940	00522		STORM SEWER PIPE-18 IN	436.00	LF		\$	
0950	00524		STORM SEWER PIPE-24 IN	797.00	LF		\$	
0960	00528		STORM SEWER PIPE-36 IN	46.00	LF		\$	
0970	01202		PIPE CULVERT HEADWALL-15 IN	1.00	EACH		\$	
0980	01204		PIPE CULVERT HEADWALL-18 IN	5.00	EACH		\$	
0990	01208		PIPE CULVERT HEADWALL-24 IN	6.00	EACH		\$	
1000	01212		PIPE CULVERT HEADWALL-36 IN	1.00	EACH		\$	
1010	01432		SLOPED BOX OUTLET TYPE 1-15 IN	1.00	EACH		\$	
1020	01456		CURB BOX INLET TYPE A	48.00	EACH		\$	
1030	01496		DROP BOX INLET TYPE 3	3.00	EACH		\$	
1040	01559		DROP BOX INLET TYPE 13G	5.00	EACH		\$	
1050	01568		DROP BOX INLET TYPE 13S	1.00	EACH		\$	
1060	01577		DROP BOX INLET TYPE 14	2.00	EACH		\$	
1070	01581		DROP BOX INLET TYPE 16G	2.00	EACH		\$	
1080	01756		MANHOLE TYPE A	1.00	EACH		\$	
1090	01767		MANHOLE TYPE C	1.00	EACH		\$	
1100	01771		FRAME AND LID TY 1	1.00	EACH		\$	
1110	08100		CONCRETE-CLASS A	4.31	CUYD		\$	
1120	21799EN		BORE AND JACK PIPE-24 IN	102.00	LF		\$	
1130	23126EN		BORE AND JACK PIPE-18 IN	47.00	LF		\$	
1140	24814EC		PIPELINE INSPECTION	3,692.00	LF		\$	

Section: 0004 - SEWER

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1150	02690		SAFELOADING	34.60	CUYD		\$	
1160	15155		S CAP EXISTING MAIN CUT AND CAP 10" SEWER (REVISED 2-10-26)	2.00	EACH		\$	
1170	15155		S CAP EXISTING MAIN CUT AND CAP 15" SEWER (REVISED 2-10-26)	2.00	EACH		\$	
1180	15155		S CAP EXISTING MAIN CUT AND CAP 24" SEWER (REVISED 2-10-26)	1.00	EACH		\$	

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1190	15155		S CAP EXISTING MAIN CUT AND CAP 4" SEWER (REVISED 2-10-26)	1.00	EACH		\$	
1200	15155		S CAP EXISTING MAIN CUT AND CAP 6" SEWER (REVISED 2-10-26)	2.00	EACH		\$	
1210	15155		S CAP EXISTING MAIN CUT AND CAP 8" SEWER (REVISED 2-10-26)	2.00	EACH		\$	
1220	14003		W CAP EXISTING MAIN CUT, CAP AND BLOCK EXISTING FORCE MAIN	3.00	EACH		\$	
1230	15022		S ENCASEMENT STEEL OPEN CUT RANGE 3 12" STEEL CASING PIPE OPEN CUT W/ CASING SPACERS (RANGE 3) (REVISED 2-10-26)	25.00	LF		\$	
1240	14089		W TAPPING SLEEVE AND VALVE SIZE 1 SOLID SLEEVE	4.00	EACH		\$	
1250	15016		S ENCASEMENT STEEL BORED RANGE 3 12" STEEL CASING PIPE BORED & JACKED W/ CASING SPACERS (RANGE 3)	67.00	LF		\$	
1260	15017		S ENCASEMENT STEEL BORED RANGE 4 18" STEEL CASING PIPE BORED & JACKED W/ CASING SPACERS (RANGE 4)	55.00	LF		\$	
1270	15018		S ENCASEMENT STEEL BORED RANGE 5 24" STEEL CASING PIPE BORED & JACKED W/ CASING SPACERS (RANGE 5)	260.00	LF		\$	
1280	15060		S FORCE MAIN PVC 06 INCH	132.00	LF		\$	
1290	15063		S FORCE MAIN PVC 12 INCH (REVISED 2-10-26)	426.00	LF		\$	
1300	15074		S FORCE MAIN TIE-IN 06 INCH	1.00	EACH		\$	
1310	15077		S FORCE MAIN TIE-IN 12 INCH 12" FORCE MAIN TIE-IN (REVISED 2-10-26)	1.00	EACH		\$	
1330	15089		S LATERAL SHORT SIDE 04 INCH SANITARY SEWER RECONNECT SHORT SIDE (REVISED 2-17-26)	6.00	EACH		\$	
1340	15092		S MANHOLE 4' DIAMETER PRECAST MANHOLE (0'-6' DEEP)	21.00	EACH		\$	
1350	15093		S MANHOLE ABANDON/REMOVE	14.00	EACH		\$	
1360	15094		S MANHOLE ADJUST TO GRADE	2.00	EACH		\$	
1370	15099		S MANHOLE TAP EXISTING	3.00	EACH		\$	
1380	15112		S PIPE PVC 08 INCH	239.00	LF		\$	
1390	15113		S PIPE PVC 10 INCH	62.00	LF		\$	
1400	15114		S PIPE PVC 12 INCH	283.00	LF		\$	
1410	15117		S PIPE PVC 24 INCH	952.00	LF		\$	
1420	15118		S PIPE SPECIAL 15" PVC SANITARY SEWER	542.00	LF		\$	

Section: 0005 - SIGNALIZATION

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1430	04780		FUSED CONNECTOR KIT	18.00	EACH		\$	
1440	04820		TRENCHING AND BACKFILLING	295.00	LF		\$	
1450	04845		CABLE-NO. 14/7C	3,067.00	LF		\$	
1460	04885		MESSANGER-10800 LB	200.00	LF		\$	
1470	04886		MESSANGER-15400 LB	970.00	LF		\$	

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1480	04932		INSTALL STEEL STRAIN POLE	12.00	EACH		\$	
1490	04953		TEMP RELOCATION OF SIGNAL HEAD	34.00	EACH		\$	
1500	06472		INSTALL SPAN MOUNTED SIGN	3.00	EACH		\$	
1510	20093NS835		INSTALL PEDESTRIAN HEAD-LED	8.00	EACH		\$	
1520	20188NS835		INSTALL LED SIGNAL-3 SECTION	11.00	EACH		\$	
1530	20266ES835		INSTALL LED SIGNAL- 4 SECTION	7.00	EACH		\$	
1540	20457NS835		INSTALL PED DETECTOR-AUDIBLE	8.00	EACH		\$	
1550	23068NN		REMOVE & REINSTALL COORDINATING UNIT	2.00	EACH		\$	
1560	23157EN		TRAFFIC SIGNAL POLE BASE	45.00	CUYD		\$	
1570	23222EC		INSTALL SIGNAL PEDESTAL	6.00	EACH		\$	
1580	24528ED		TETHER WIRE	1,170.00	LF		\$	
1590	24900EC		PVC CONDUIT-1 1/4 IN-SCHEDULE 80	135.00	LF		\$	
1600	24901EC		PVC CONDUIT-2 IN-SCHEDULE 80	160.00	LF		\$	
1610	24908EC		INSTALL SIGNAL CONTROLLER-TY ATC	2.00	EACH		\$	
1620	24955ED		REMOVE SIGNAL EQUIPMENT	4.00	EACH		\$	
1630	26119EC		INSTALL RADAR PRESENCE DETECTOR TYPE A	6.00	EACH		\$	
1640	26246EC		INSTALL SOLAR SCHOOL FLASHER ASSEMBLY	2.00	EACH		\$	

Section: 0006 - WATERLINE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1650	14003		W CAP EXISTING MAIN CUT , CAP AND BLOCK ABANDONED WATER MAIN (REVISED 2-10-26)	22.00	EACH		\$	
1660	02690		SAFELOADING	66.00	CUYD		\$	
1670	02735		SURF RESTORATION DRIVEWAY/ENTRANCE RESTORATION	418.00	SQYD		\$	
1680	14014		W ENCASMENT STEEL OPEN CUT RANGE 3 12" STEEL CASING PIPE OPEN CUT W/ CASING SPACERS (RANGE 3) (REVISED 2-10-26)	20.00	LF		\$	
1690	14009		W ENCASMENT STEEL BORED RANGE 4 16" STEEL CASING PIPE BORED & JACKED W/ CASING SPACERS (RANGE 4)	72.00	LF		\$	
1700	14015		W ENCASMENT STEEL OPEN CUT RANGE 4 16" STEEL CASING PIPE OPEN CUT W/ CASING SPACERS (RANGE 4) (REVISED 2-10-26)	28.00	LF		\$	
1710	14011		W ENCASMENT STEEL BORED RANGE 6 30" STEEL CASING PIPE BORED & JACKED W/ CASING SPACERS (RANGE 6)	80.00	LF		\$	
1720	14017		W ENCASMENT STEEL OPEN CUT RANGE 6 30" STEEL CASING PIPE OPEN CUT W/ CASING SPACERS (RANGE 6) (REVISED 2-10-26)	30.00	LF		\$	
1730	14016		W ENCASMENT STEEL OPEN CUT RANGE 5 20" STEEL CASING PIPE OPEN CUT (RANGE 5) (REVISED 2-10-26)	40.00	LF		\$	

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1740	14016		W ENCASEMENT STEEL OPEN CUT RANGE 5 24" STEEL CASING PIPE OPEN CUT W/ CASING SPACERS (RANGE 5) (REVISED 2-10-26)	235.00	LF		\$	
1750	14019		W FIRE HYDRANT ASSEMBLY 6" FIRE HYDRANT ASSEMBLY W/ GATE VALVE (REVISED 2-10-26)	6.00	EACH		\$	
1760	14021		W FIRE HYDRANT REMOVE REMOVE EXISTING FIRE HYDRANT ASSEMBLY	9.00	EACH		\$	
1770	14030		W METER RELOCATE	27.00	EACH		\$	
1780	14179		W PIPE POLYETHYLENE/PLASTIC 1 INCH 1" DI WATER MAIN (REVISED 2-17-26)	51.00	LF		\$	
1790	14056		W PIPE PVC 02 INCH 2" DI WATER MAIN (REVISED 2-17-26)	14.00	LF		\$	
1800	14036		W PIPE DUCTILE IRON 06 INCH	14.00	LF		\$	
1810	14037		W PIPE DUCTILE IRON 08 INCH	290.00	LF		\$	
1820	14039		W PIPE DUCTILE IRON 12 INCH	4,371.00	LF		\$	
1830	14039		W PIPE DUCTILE IRON 12 INCH WITH NITRILE GASKET	416.00	LF		\$	
1840	14040		W PIPE DUCTILE IRON 16 INCH	324.00	LF		\$	
1850	14080		W SERV PE/PLST LONG SIDE 3/4 IN 3/4" SERVICE RECONNECTION - LONG SIDE	7.00	EACH		\$	
1860	14085		W SERV PE/PLST SHORT SIDE 3/4 IN 3/4" SERVICE RECONNECTION - SHORT SIDE	21.00	EACH		\$	
1870	14177		W VALVE BOX REMOVE (REVISED 2-10-26)	2.00	EACH		\$	
1880	14089		W TAPPING SLEEVE AND VALVE SIZE 1 CONNECT TO EXISTING SYSTEM VIA 1" COMPRESSION COUPLING AND CORP STOP	1.00	EACH		\$	
1890	14089		W TAPPING SLEEVE AND VALVE SIZE 1 CONNECT TO EXISTING SYSTEM VIA 2" TAPPING SLEEVE, 2" VALVE & VALVE BOX (SIZE 1)	2.00	EACH		\$	
1900	14089		W TAPPING SLEEVE AND VALVE SIZE 1 CONNECT TO EXISTING SYSTEM VIA 8" SOLID SLEEVE	2.00	EACH		\$	
1910	14090		W TAPPING SLEEVE AND VALVE SIZE 2 CONN TO EXIST SYSTEM VIA 12" TAPPING SLEEVE, 12" VALVE & VALVE BOX (SIZE 2)	5.00	EACH		\$	
1920	14090		W TAPPING SLEEVE AND VALVE SIZE 2 CONN TO EXIST SYSTEM VIA 16" TAPPING SLEEVE, 16" VALVE & VALVE BOX (SIZE 2)	1.00	EACH		\$	
1930	14089		W TAPPING SLEEVE AND VALVE SIZE 1 CONN TO EXSTNG SYS VIA 6" TAPPING SLEEVE 2" VALVE & VALVE BOX (SZ 1) (R 2-10-26)	1.00	EACH		\$	
1940	14108		W VALVE 12 INCH 12" GATE VALVE & BOX (REVISED 2-10-26)	17.00	EACH		\$	
1950	14109		W VALVE 16 INCH 16" GATE VALVE & BOX (REVISED 2-10-26)	5.00	EACH		\$	
1960	14105		W VALVE 06 INCH 6" GATE VALVE & BOX	1.00	EACH		\$	
1970	14106		W VALVE 08 INCH 8" GATE VALVE & BOX (REVISED 2-10-26)	1.00	EACH		\$	

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Section: 0007 - PLANNING (ADDED 2-10-26)

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1971	04793		CONDUIT-1 1/4 IN (ADDED 2-10-26)	40.00	LF		\$	
1972	04795		CONDUIT-2 IN (ADDED 2-10-26)	15.00	LF		\$	
1973	04820		TRENCHING AND BACKFILLING (ADDED 2-10-26)	50.00	LF		\$	
1974	04829		PIEZOELECTRIC SENSOR (ADDED 2-10-26)	4.00	EACH		\$	
1975	04830		LOOP WIRE (ADDED 2-10-26)	2,100.00	LF		\$	
1976	04895		LOOP SAW SLOT AND FILL (ADDED 2-10-26)	400.00	LF		\$	
1977	04960		REMOVE AND REPLACE SIDEWALK (ADDED 2-10-26)	2.00	SQYD		\$	
1978	20360ES818		WOOD POST (ADDED 2-10-26)	2.00	EACH		\$	
1979	20391NS835		ELECTRICAL JUNCTION BOX TYPE A (ADDED 2-10-26)	1.00	EACH		\$	
1981	20359NN		GALVANIZED STEEL CABINET (ADDED 2-10-26)	1.00	EACH		\$	

Section: 0008 - DEMOBILIZATION &/OR MOBILIZATION

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1980	02568		MOBILIZATION	1.00	LS		\$	
1990	02569		DEMOBILIZATION	1.00	LS		\$	

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This Section includes, but is not limited to, the following:
1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
 2. Maintenance of shoring and bracing.
 3. Removal of shoring and bracing, as required.
- B. Types of shoring and bracing systems include, but are not limited to, the following:
1. Steel H-section (soldier) piles.
 2. Timber lagging.
 3. Steel sheet piles.
 4. Portable Steel Trench Box.
- C. Building excavation is specified in another Section.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Section 013323.

Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified professional engineer. System design and calculations must be acceptable to local authorities having jurisdiction. This submittal is for information only. Engineer's review is not for adequacy design, but to verify that it has been designed by a licensed professional. Design of shoring is part of means and methods of construction and remains solely the responsibility of the contractor.

1.4 QUALITY ASSURANCE

- A. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located, and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.

- B. Supervision: Engage and assign supervision of excavation support system to a qualified professional engineer foundation consultant.
- C. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

1.5 JOB CONDITIONS

- A. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.
- B. Survey adjacent structures and improvements, employing qualified professional engineer, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
- C. During excavation, resurvey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident.

1.6 EXISTING UTILITIES

- A. Protect existing active sewer, water, gas, electricity and other utility services and structures.
- B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.
- B. Structural Steel: ASTM A 36.
- C. Steel Sheet Piles: ASTM A 328.
- D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick, unless otherwise indicated.
- E. Portable Steel Trench Box shall be OSHA approved.

PART 3 - EXECUTION

3.1 SHORING

- A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.
- B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.2 BRACING

- A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.
- B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.
- C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
- D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
- F. Repair or replace, as acceptable to Engineer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION 315000

SECTION 330523 - BORING AND JACKING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to furnish and install all bored and jacked carrier pipes in encasement pipes under railroad and highway crossings as shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 312000
- B. Piping: Division 33

1.3 SUBMITTALS

- A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering.
- B. At the time of submission, the Contractor shall, in writing, call the Engineer’s attention to any deviations that the submittals may have from the requirements of the Contract Drawings and Specifications.
- C. Comply with all requirements of Section 01 33 23.
- D. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Carrier Pipe		X							X			
Casing Pipe		X										
Casing Spacers		X		X								
Casing End Seals		X		X								

1.4 EXISTING CONDITIONS

- A. The existing piping & other utilities shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping or utility depicted. All new piping which ties into existing lines must be made compatible with that piping.
- B. So that piping conflicts may be avoided, Contractor shall locate the utility (vertically & horizontally) well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.
- C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

PART 2 - PRODUCTS

2.1 CARRIER PIPE

- A. Carrier pipe shall be as specified in the applicable Division 33 section unless otherwise noted.

2.2 CASING PIPE

- A. Casing pipe shall be steel, plain end, have a minimum yield point strength of 35,000 psi and conform to ASTM A 252 Grade 2 or ASTM A 139 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be in at least 18 foot lengths.
- B. The diameter of the casing pipe shall be as follows:

Carrier Pipe Nominal Diameter (Inches)															
4	6	8	10	12	14	15	16	18	20	21	24	27	30	33	36
Casing Pipe Nominal Diameter (Inches)															
10	12	16	18	20	24	24	30	30	30	36	36	42	48	50	50

For carrier pipe sizes greater than 36-inches nominal diameter, the casing pipe diameter size shall be determined by the Engineer or as shown on the Contract Drawings.

- C. The wall thickness of the casing pipe shall be as follows:

Casing Pipe Nominal Diameter (Inches)								
Under 20	20 & 22	24	30	36	38	42	48	50
Casing Pipe Nominal Thickness (Inches)								
.250 (1/4")	.281 (9/32")	.312 (5/16")	.406 (13/32")	.469 (15/32")	.500 (1/2")	.562 (9/16")	.625 (10/16")	.656 (21/32")

However, should casing pipe thickness be specified or required on Highway or Railroad permit approval sheets, said permit thickness requirement shall govern. Permit approval sheets will be made available to the Contractor.

2.3 CASING SPACERS

- A. **Stainless Steel Casing Spacers:** Stainless steel casing spacers shall be bolt-on style with a shell made in two (2) sections of heavy T-304 stainless steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090" thick with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of heavy T-304 stainless steel. The supports shall be mig welded to the shell and all welds shall be fully passivated. Stainless steel casing spacers shall be made by Cascade Waterworks Mfg. Co., or equal.
- B. **Solid Polyethylene Casing Spacers (to be used with PVC pipe only):** Solid polyethylene casing spacers shall be bolt-on style with a shell made in two (2) sections. Carrier pipe shall be wrapped with rubber strap inside casing space to prevent slippage. All nuts and bolts are to be 18-8 stainless steel. Solid polyethylene casing spacers shall be made by Calpico Inc., Advance Products & Systems, Inc., or equal.

2.4 CASING END SEALS

- A. **Wrap-around end seals -** Wrap-around end seals shall be made of a waterproof flexible coal tar membrane reinforced with fiberglass, or synthetic rubber. The two exposed edges of the wrap-around seal shall be adhesively bonded forming a watertight seal. The ends of the wrap shall be sealed on the casing and carrier pipe by stainless steel bands. Wrap-around end seals shall be made by Calpico Inc., Advance Products & Systems, Inc., or equal.
- B. Upon approval the by Engineer, in lieu of wrap-around end seals, each end of the casing pipe and the carrier pipe shall be wrapped with two (2) layers of roofing felt.

PART 3 - EXECUTION

3.1 CROSSINGS - GENERAL

- A. Where designated on the drawings, crossings beneath state maintained roads, not to be disturbed shall be accomplished by boring and jacking a casing pipe.
- B. Steel casing pipe for crossings shall be bored and/or jacked (or open cut installed where indicated on the Drawings) into place to the elevations shown on the drawings. All joints between lengths shall be solidly butt-welded with a smooth non-obstructing joint inside. The casing pipe shall be installed without bends. The carrier pipe shall be installed after the casing pipe is in place, and shall extend a minimum of two (2) feet beyond each end of the casing to facilitate making joint connections. The carrier shall be braced and centered with casing spacers within the casing pipe to preclude possible flotation. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe within the casing pipe, within two (2) feet of each side of a pipe joint, and the rest evenly spaced. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least 0.75" from the casing pipe wall at all times. Manufacturer's recommendations may govern these requirements.
- C. At each end of the casing pipe, the carrier pipe shall be sealed with casing end seals. The end seals shall extend a minimum of 12 inches in each direction from the end of the casing pipe.
- D. Wood skids are not an acceptable method of supporting the carrier pipe.

3.2 CROSSING - RAILROAD

- A. All water or sewer line crossings of railroads shall be prominently marked at railroad right-of-way lines, on both sides of the track crossing, by durable, weatherproof signs located over the center of the water line. When possible, signs shall be located so that when standing at one sign, the other marker is visible. Signs shall show the following:
 - 1. Name and address of Owner.
 - 2. Contents of pipe.
 - 3. Pressure in pipe.
 - 4. Pipe depth below grade at point of sign.
 - 5. Emergency telephone number in event of pipe rupture.
- B. Contractor must adhere to all safety requirements of the Railway line involved in the crossing.
 - 1. All operations shall be conducted so as to not interfere with, interrupt, or endanger the operation of trains nor damage, destroy, or endanger the integrity of railroad facilities. The Contractor shall provide written acknowledgment to the Railway line that the Contractor and its employees have received, read, and understood the safety rules. Operations will be subject to inspection at any and all time.
 - 2. All cranes, lifts, or other equipment that will be operated in the vicinity of the railroad's electrification and power transmission facilities shall be electrically grounded in an approved manner.
 - 3. At all times, while work is in progress, a field supervisor with no less than twelve (12) months experience in the operation of the equipment being used shall be present. If

boring equipment or similar machines are being used, the machine operator shall also have a minimum of twelve (12) months experience in the operation of the equipment being used.

4. Whenever equipment or personnel are working closer than fifteen (15) feet from the centerline of an adjacent track, that track shall be considered as being obstructed. Operations closer than fifteen (15) feet from the centerline of the track shall be conducted only with the permission of, and as directed by, a duly qualified railroad employee present at the site of the work.
 5. Crossing the tracks at grade by equipment and personnel is prohibited except by prior arrangement with, and as directed by, the railroad line. A separate permit must be obtained, by the Contractor, for any "at grade" crossing of the tracks.
- C. All railroad costs incurred by the Railway line due to work associated with the crossing (inspection, flagging, track work, etc.) shall be paid by the Owner. However, it is the Contractor's responsibility to coordinate the work with the Railway.
- D. Contractor shall notify the Railway line's area engineer a minimum of 14 working days prior to desired start of construction.

3.3 BORING AND JACKING

- A. The Contractor shall excavate his own pits, as he may deem necessary, and will set his own line and grade stakes which shall be checked by the Engineer. Permits, as required, will be furnished or obtained by the Owner, but shall be in the Contractor's hands before any excavating is commenced.
- B. The boring method shall consist of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.
1. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that there will be no unsupported excavation ahead of the pipe.
 2. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. If the obstruction cannot be removed without excavation in advance of the pipe, the pipe shall be abandoned in place and immediately filled with grout.
 3. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than 2 inch. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately 1 inch, grouting or other approved methods must be used to fill such voids.
 4. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.
 5. Any method which does not have this boring arrangement will not be permitted. Contractor's boring arrangement plans and methods must be submitted to, and approved by, the Engineer.
- C. In the event an obstruction is encountered in boring which cannot be removed and it becomes necessary to withdraw the casing and commence elsewhere, the hole from which the casing is withdrawn shall be completely backfilled with coarse sand rammed in.

- D. Insurance to be furnished by the Contractor to cover this type of work shall be adequate to meet the requirements of the Railroad and/or State or County Highway Departments. Insurance shall consist of comprehensive general liability and automobile liability insurance.
- E. Before award of the contract, the Contractor shall furnish a statement of his experience of such work, or if inexperienced, shall advise the Owner as to whom he will sublet the work and give a statement of the experience of the subcontractor, which shall be satisfactory to the Owner.

3.4 CONTRACTOR'S RESPONSIBILITIES

- A. Obtain a copy of the Highway Encroachment and/or Railroad Permit before beginning construction.
- B. Attend a preconstruction meeting at the construction site with the City Inspector, Railroad Inspector, Highway Inspector Engineer, and Contractor being present.

END OF SECTION 330523.16

SECTION 331113 - WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Valves - Utility Services: Section 331216
- B. Horizontal Directional Drilling: Section 330524

1.3 SUBMITTALS

- A. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications.
- B. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 013323.
- C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Pipe and Fittings		X							X			
Couplings and Adapters		X										
Detectable UG Tape		X		X								
Tracer Wire		X		X								
Trench Baffles		X		X								
PE Tubing		X										
Corp. Stops and Fittings		X		X								

1.4 EXISTING CONDITIONS

- A. The existing piping shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping depicted. All new piping which ties into existing lines must be made compatible with that piping.
- B. So that piping conflicts may be avoided, Contractor shall open up his trench well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.
- C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

1.5 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

- A. All activities involving utility line construction covered under the US Army Corps of Engineers NATIONWIDE PERMIT # 12 shall meet the following conditions:
 - 1. Utility Line Activities. Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project. Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity.
 - 2. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.
 - 3. Notification: The permittee must submit a pre-construction notification to the US Army Corps district engineer prior to commencing the activity if any of the following criteria are met: (1) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1/10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials.

B. All activities involving utility line construction covered under KENTUCKY GENERAL CERTIFICATION of Nationwide Permit # 12 shall meet the following conditions:

The general Water Quality Certification applies to surface waters of the Commonwealth as defined in 401KAR10:001 Chapter 10, Section 1(80): Surface waters means those waters having well-defined banks and beds, either constantly or intermittently flowing, lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface.

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.
2. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.
3. This general water quality certification does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.
4. For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.
5. This general certification shall not apply to nationwide permits issued for individual crossings which are part of a larger utility line project where the total cumulative impacts from a single and complete linear project exceed ½ acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.
6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For the utility line crossing and roads, only one bank length is used in calculation of the totals.
7. Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).
8. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.
9. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.
10. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.
11. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet

may allow construction within the 50 foot buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.

12. Utility line stream crossings shall be constructed by methods that maintain flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the excavation shall not be allowed to enter the flowing portion of the stream.
13. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.
14. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.
15. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:
 - a. Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
 - b. Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.
 - c. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
 - d. Removal of riparian vegetation shall be limited to that necessary for equipment access.
 - e. To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
 - f. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
 - g. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
 - h. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.

- i. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.
16. Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

1.6 CONSTRUCTION IN A FLOODPLAIN

- A. No material shall be placed in the stream or in the flood plain to form construction pads, coffer dams, access roads, etc. unless prior approval has been obtained from the Environmental and Public Protection Cabinet.
- B. The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside the flood plain unless the applicant has received prior approval from the Cabinet to fill within the flood plain.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

- A. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, latest revision, pressure class 350, with push-on joints unless otherwise noted on Drawings.
- B. The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision. Thickness of the lining shall be as set forth in the ANSI/AWWA C104/A21.4 specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.
- C. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.
- D. Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.
- E. Joints for ductile iron pipe and fittings, as described hereinbefore, shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11, latest revision. Joints shall have the same pressure rating as the pipe or fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.

- F. Provide ANSI/AWWA C110/A21.10 mechanical joint plugs and locked or restrained pipe joints where indicated on Drawings. Fittings under structures shall be mechanical joint with retainer glands.

2.2 RESTRAINED JOINT DUCTILE IRON PIPE

- A. Restrained joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, latest revision, pressure class 350, with restrained push-on joints unless otherwise noted on Drawings.
- B. The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision. Thickness of the lining shall be set forth in the aforementioned specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.
- C. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.
- D. Fittings shall be pressure class 350 ductile iron and have restrained push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision with the exception of the manufacturer's proprietary design dimensions. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.
- E. The use of restrained joints utilizing a friction type connection shall not be accepted.
- F. Joints for ductile iron pipe and fittings, as described hereinbefore, shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11, latest revision. Joints shall have the same pressure rating as the pipe of fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.
- G. All pipe in the vicinity of a series of bends shall have restrained push-on joints, with lengths as recommended by the Engineer or pipe manufacturer. Pipe at ends left for future connections shall also have restrained push-on joints. All other tees, bends, and dead-ends shall have concrete thrust blocking.
- H. Restrained joint pipe and fittings shall be FLEX-RING Restrained Joint by American Ductile Iron Pipe, TR FLEX Restrained Joint by U.S. Pipe, SUPER-LOCK Restrained Joint by Clow Water Systems, SNAP-LOCK Restrained Joint by Griffin Pipe, or approved equal.
- I. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.
- J. All restrained joint pipe and fittings shall be fabricated by the same pipe manufacturer.
- K. Where spigot end of restrained joint pipe connect with valves or other items that have mechanical-joint ends, connection shall be made with a restrained mechanical-joint gland. Restrained mechanical-joint connection shall be Mechanical- Joint Coupled-Joint by American Ductile Iron Pipe, MECH-LOK Restrained Joint by Griffin Pipe, or approved equal.

2.3 POLYVINYL CHLORIDE PLASTIC (PVC) PIPE

A. AWWA C-900-16

1. 4-inch through 60-inch PVC plastic pipe shall conform to AWWA C-900-16. PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform with the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe. The allowable axial deflection (in degrees) must be printed on each length of pipe.

B. ASTM D2241 (Outside Diameter compatible with Iron Pipe O.D.)

1. 1-inch through 36-inch - PVC plastic pipe shall conform to ASTM Specification - D2241 (latest edition); Product Standards PS-22-70 NBS; Standard Dimension Ratio SDR 17 (250 psi); Maximum Length - 20 feet; Pressure Rating - 250 psi at 73.4o F. Elastomeric gasket shall conform with the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe.
 - a. Fittings, adaptors or specials shall be furnished, as required, to connect the plastic pipe to the cast or ductile iron mechanical joint valves, fittings, and pipe.
 - b. Joints shall be push-on joints conforming to ASTM D-3139.

C. Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision, and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.

D. The basis of acceptance of PVC plastic water main pipe will be a written, notarized certification, accompanied by a copy of test results, that the pipe and pipe material has been sampled, tested and inspected in accordance with the designated standard specifications. These certifications shall be obtained from the manufacturer and delivered to the Engineer's or Owner's representative on the project site. A sufficient number of tests and certifications shall be made so as to be representative of the complete project. Copies of the test results shall be kept on file by the manufacturer and shall be available for review by the Engineer or Owner upon request.

E. Pipe shall be visually inspected on the project site for proper markings which shall include manufacturer's name or trademark, nominal pipe size, pressure rating for water at 73.4 degrees F., plastic pipe material designation code (e.g. PVC 1120), dimension ratio, AWWA or ASTM designation and pressure class with which the pipe complies, and the National Sanitation Foundation NSF 14 Seal of Approval for drinking water.

2.6 COUPLING AND ADAPTORS

- A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.
- B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.
- C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:
- D. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe -

<u>Dresser</u>	<u>Rockwell</u>
Style 138	411

- E. Transition couplings for joining pipe of different outside diameters-

<u>Dresser</u>	<u>Rockwell</u>
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

- F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

<u>Dresser</u>	<u>Rockwell</u>
Style 127 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" C.I. Pipe)	913 steel (3" and larger)
Style 128 steel (2"-96" steel pipe)	

2.7 DETECTABLE UNDERGROUND UTILITY WARNING TAPES

- A. Detectable underground utility warning tapes which can be located from the surface by a pipe detector shall be installed directly above nonmetallic (PVC, polyethylene, concrete) pipe.

- B. The tape shall consist of a minimum thickness 0.35 mils solid aluminum foil encased in a protective inert plastic jacket that is impervious to all know alkalis, acids, chemical reagents and solvents found in the soil.
- C. The minimum overall thickness of the tape shall be 5.5 mils and the width shall not be less than 2" with a minimum unit weight of 2-1/2 pounds/1" x 1,000'. The tape shall be color coded and imprinted with the legend as follows:

<u>Type of Utility</u>	<u>Color Code</u>	<u>Legend</u>
Water	Blue	Caution Buried Water Line Below

- D. Detectable underground tape shall be "Detect Tape" as manufactured by Allen Systems, or equal.
- E. Installation of detectable tapes shall be per manufacturer's recommendations and shall be as close to the grade as is practical for optimum protection and detectibility. Allow a minimum of 18" between the tape and the line.
- F. Payment for detectable tapes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.8 TRACER WIRE

- A. Tracer wire shall be 12 gauge copper wire with 30-mil polyethylene jacket. Tracer wire shall be installed with all buried piping, "duct" taped to top of pipe.
- B. Split Bolt connectors are required when connecting two (2) pieces of tracer wire. Wire and connector shall be wrapped with electrical tape.
- C. Tracer wire shall be brought up into locator boxes with grounding devices. Locator boxes shall be valve boxes with a polystyrene donut that fits around the box to serve as a termination point for tracer wire. Locator boxes shall be installed at a maximum of 3000 linear feet apart, or where shown on the Drawings.
- D. Payment for tracer wire and boxes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule

2.9 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

- A. Where indicated on the Drawings, required by the Specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed.
- B. Concrete shall be 3000 psi, and reinforcing bars shall be installed as indicated on the details.

2.11 CONNECTION OF NEW WATER MAINS TO EXISTING SYSTEM

- A. The Contractor shall connect the new water main to existing water main where shown on the Drawings or directed by the Engineer, and shall furnish all necessary equipment and materials required to complete the connection.

2.13 CUSTOMER SERVICE RELOCATIONS AND RE-CONNECTIONS

Where water service lines are disturbed, the Contractor shall reconnect the existing service line to the new water main. The Contractor shall furnish and install the necessary piping, couplings, fittings, etc. necessary to complete the service line re-connection.

A. Service Lines Not Crossing a Road

- 1. Unless indicated otherwise on the plans, all service lines shall be of PE tubing.
- 2. Water service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein. Locations of the various sizes shall be as directed by the Engineer and as shown on the Drawings.

B. Service Lines Crossing a County Road or City Streets

- 1. Same as subparagraph A, except that in general all pipe may be jacked beneath certain paved or blacktopped city streets or county roads, unless solid rock prevents using this method in which case, the open trench method will be used. Schedule 40 steel pipe shall be used as casing pipe unless otherwise indicated by the plans. The open trench method generally will be used on all unpaved city streets, county roads and private driveways. In general, blacktopped private driveways shall also be jacked under. In all cases where lines are under traffic, a minimum cover of thirty-six (36) inches shall be provided. All backfill shall be compacted by air tampers in layers no greater than 6-inch depth. Specific instructions as to the type of crossing to be installed will be shown on the plans.

C. Service Lines Crossing a State Highway

- 1. Services shall be jacked or pushed under paving. If solid rock is encountered, trench will be open-cut, pipe placed and backfilled all in accordance with current requirements of the State Highway Department or the crossing will be relocated to permit boring or jacking. Specific details will be shown on the plans. Where required on the plans or by the ENGINEER service pipe shall be encased under highways. Schedule 40 steel pipe shall be used as casing pipe unless otherwise indicated by the plans.

D. Existing Galvanized Iron Services

- 1. All galvanized services are to be replaced in their entirety, including service piping from the main to the meter, corporation stops, water meters, meter setters, meter boxes, and service piping five (5) feet past the meter. Service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein.

2.14 CORPORATION STOPS AND FITTINGS FOR HOUSE SERVICE RECONNECTIONS

- A. Corporation stops, of the size required, shall be tapped directly into the water main for Ductile Iron Pipe or by the use of a tapping saddle for PVC pipe.
- B. Corporation stops shall have AWWA C800-66 C.S. threaded inlet. Outlets shall be suitable for the type of service piping furnished and laid, and the Contractor shall verify compatibility with "iron pipe size" or "copper tubing size" service piping as required before ordering stops.
- C. Corporation stops shall be Ford Meter Box Type F1000, F1001, F1002 (as required); Mueller H-15005, H-15006, H-15008, H-15009 (as required); Hayes Series 5200, or equal.
- D. Fittings shall be brass.

PART 3 - EXECUTION

3.1 EXCAVATION FOR PIPELINE TRENCHES

- A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ANSI/AWWA C600 for ductile iron and Cast Iron O.D. (AWWA) PVC pipe or ASTM F-645 for Iron Pipe O.D. (ASTM) PVC pipe except as modified herein.
- B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.
- C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.
- D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the

actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.

- E. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.
- F. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.
- G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.
- H. Minimum cover of 30" shall be provided for all pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42".

3.2 PIPE BEDDING

- A. All pipe shall be supported on a bed of granular material, unless the trench has been prepared in accordance with Paragraph 3.01B. In no case shall pipe be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from large rock, foreign material, frozen earth, and shall be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel.
- B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.
- C. Where flexible pipe is used, the bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the pipe. Granular bedding shall be Size #9-m or ASTM C 33, Size #7 crushed stone, fine gravel, or sand, and is not a separate pay item.
- D. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.
- E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the

Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.

- F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

3.3 SPECIAL GRANULAR FILL

- A. As noted in Paragraph 3.02E, granular material for "Special Granular Fill" when directed by the Engineer shall be Department of Transportation crushed limestone, Size #57. Payment for "Special Granular Fill" must have approval from the Engineer prior to installation.

3.4 LAYING PIPE

- A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.
- B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.
- C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure that it is clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.
- D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02 "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.
- E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.
- F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.
- G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

3.5 BACKFILLING PIPELINE TRENCHES

A. Backfilling of pipeline trenches shall be accomplished as shown on the Drawings and with details set forth hereinafter. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction. In the event that pavement is not placed immediately following trench backfilling in paved areas, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times. Under pavement, all trench backfill shall be in accordance with Method C as shown on the Detail Drawings. All other trench backfill shall be in accordance with Method A or B.

B. Method "A" - Backfilling in Open Terrain:

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12" above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner approved by the Engineer, and shall be carefully compacted to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
2. The upper portion of the trench above the compacted portion shall be backfilled with material which is free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.

C. Method "B" - Backfilling Under Sidewalks & Unpaved Driveways:

Backfilling of pipeline trenches under sidewalks and unpaved driveways shall be accomplished in the following manner.

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner to avoid displacement of the pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.
2. The middle portion of the trench, from a point 12" above the top of the pipe to a point 6" below the grade line, shall be backfilled with material free from rock and/or acceptable to the Engineer. This material shall be placed and compacted in layers of approximately 6 inches. Water (puddling) may be used as required to obtain maximum compaction.
 - a. Upon approval of the Engineer, the Contractor may backfill the middle portion of the trench with crushed stone, fine gravel, or sand in lieu of materials which require compaction.
3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

D. Method "C" - Backfilling Under Streets, Roads, and Paved Driveways:

Backfilling of pipeline trenches under streets, roads and paved driveways shall be accomplished in the following manner:

1. The lower portion of the trench from the pipe bedding to a point 6" below the bottom of the pavement or concrete sub-slab, shall be backfilled with # 9 crushed stone.
 2. The upper portion of the trench, from a point 6" below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with a base course of dense graded aggregate. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.
- E. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalk and unpaved driveways shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways and driveways shall be backfilled in accordance with Method "C". All methods are shown on the Detail Drawings. When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.
1. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.
 2. In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

3.6 SETTLEMENT OF TRENCHES

- A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these rights-of-way within one (1) year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner.

3.7 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASEMENT

- A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the Specifications, or as directed by the Engineer.
- B. For cradle and encasement, concrete shall be 3000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.
- C. For thrust blocks and anchors, concrete shall be 3000 psi, and shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.
- D. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.

- E. Water mains shall have concrete thrust or “kicker” blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline. All reducers (increasers) shall be anchored.

3.8 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

- A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Prior to trenching, the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.
- C. Backfilling of the trench shall be in accordance with Method "C" as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge Construction of the Department of Transportation, to a depth of six (6) inches in roads and streets and four (4) inches in driveways.
- D. A subslab of reinforced concrete shall be placed for state maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 3000 psi, in accordance with the Details shown on the Drawings.

3.9 UNPAVED DRIVEWAY (CRUSHED STONE) SURFACE REPLACEMENT

- A. The Contractor shall replace those sections of existing driveways and parking areas required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Material for backfilling of the pipeline trench shall be dense-graded aggregate in accordance with Method “B” as described hereinbefore.

3.10 REMOVING AND REPLACING CONCRETE CURB AND GUTTER OR SIDEWALK

- A. The Contractor shall remove the curb and gutter or sidewalk when encountered when required for laying the pipe. Only that portion of the curb and gutter or sidewalk needed to lay the pipe shall be removed.
- B. Where concrete curb and gutter or sidewalk is removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than that which existed prior to the Contractor's operation.

3.11 REPLACEMENT OF EXISTING MAIL BOXES, CULVERTS, CLOTHES LINE POSTS, FENCES AND OTHER SUCH FACILITIES

- A. Existing mail boxes, drainage culverts, clothes line posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.
- B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

3.12 PORTLAND CEMENT CONCRETE DRIVEWAY REPLACEMENT

- A. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.
- B. The existing concrete paving shall be sawed or cut to straight edges 12-inches outside the edges of the trench or broken out to an existing joint, as directed by the Engineer. The concrete pavement shall be equal to the existing pavement thickness but not less than 6-inches in thickness for driveways.
- C. Pavement shall be reinforced with 6 x 6 #10-10 wire mesh and shall be constructed with 3000 psi concrete.

3.13 RIP-RAP STREAM BANK SLOPE PROTECTION

- A. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Engineer. Rip-rap slope protection shall be 12-inches thick and shall meet State D.O.T. Standard Specifications.

3.14 TESTING

- A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test of at least 1.5 times the normal operating pressure of the pipe (at its lowest elevation), but not to exceed the rated working pressure of the pipe or valves. Note: Engineer shall verify test pressure. Loss of pressure during the test shall not exceed 0 psi in a 4 hour period and 5 psi in a 24 hour period. Any test results that do not meet both of these requirements shall constitute a failure of the pressure test.
- B. No water leakage in pipelines, when tested under the hydrostatic test described above, shall be allowed.
- C. Contractor shall furnish a recording gauge and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The

pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-hour clock, and shall be approved by the Engineer.

- D. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.
- E. Duration of test shall be not less than four (4) hours where joints are exposed and not less than 24 hours where joints are covered.
- F. Where leaks are visible at exposed joints, evident on the surface where joints are covered, and/or identified by isolating a section of pipe, the joints shall be repaired and leakage must be minimized, regardless of total leakage as shown by test.
- G. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.
- H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.
- I. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.
- J. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.
- K. The cost of testing of pressure piping is incidental and is to be included in the Contractor's unit Contract Price.

3.15 CLEAN UP

- A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

3.16 DISINFECTION OF POTABLE WATER LINES

- A. The new potable waterlines shall not be placed in service--either temporarily or permanently--until they have been thoroughly disinfected in accordance with AWWA Standard C651 latest edition, and to the satisfaction of the Engineer.
- B. After testing, a solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 50 ppm in the main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 50 ppm has been obtained throughout the pipe. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall be allowed to remain in the pipe for 24 hours, after which a residual of at least 25 ppm shall be obtained. The disinfection shall be repeated until 25 ppm is obtained after which

time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm, and then may be connected to the system. Also, no additional payment will be allowed for providing taps for chlorine injection and/or flushing, if necessary. The Contractor is responsible for the disposal of highly chlorinated water flushed from the main, and shall follow the requirements of AWWA C655, latest edition, for dechlorinating the disinfecting water.

- C. The new water line shall not be put into service until bacteriological samples taken at the points specified herein are examined and shown to be negative after disinfection, following the requirements of "Standard Methods for Examination of Water and Wastewater". Two consecutive sets of acceptable samples, taken at least 24 hours apart shall be collected from the new line. Samples are to be taken and tested at every 1200 feet of new water line, at each branch and at each dead end.
- D. If trench water has entered the pipe, or excessive quantities of dirt or debris have entered the pipe, samples shall be taken at intervals of approximately 200 feet and the locations identified. Samples shall be taken of water that has stood in the new line for at least 16 hours after flushing is completed.
- E. If the initial disinfection does not produce satisfactory bacteriological results, the new line shall be reflashed and resampled. If samples fail, the line shall be rechlorinated by the continuous-feed or slug method until satisfactory results are obtained.
- F. All testing documentation shall be submitted to the Owner.

3.17 ALTERNATE METHOD OF INSTALLATION

- A. In lieu of traditional trenching methods for pipe installation, with the approval of the Engineer, the Contractor may choose to install the pipe utilizing the trenchless technology of horizontal directional drilling (HDD). Horizontal directional drilling shall be as specified in Section 330523.13.

END OF SECTION 331113

SECTION 331216 - VALVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to furnish and install all valves shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.
- B. Piping is specified in Division 33 Specification sections.

1.3 SUBMITTALS

- A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering. Comply with provisions of Section 013323.
- B. At the time of submission, the Contractor shall, in writing, call Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.
- C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Valves	X	X			X							
Valve Boxes		X										
Access Manhole	X	X										
Yard Hydrant	X	X			X							
Tapping Sleeve, Valve	X	X		X	X							

PART 2 - PRODUCTS

2.1 GATE VALVES

- A. Gate valves shall conform with AWWA C-509 or AWWA C-515 standard, and shall be of the resilient seat type, iron body, fully bronze mounted, non-rising stem and have a design working pressure of 250 psi. All assembly bolts shall be stainless steel. Valves shall be of standard manufacturer and of the highest quality both as to materials and workmanship.
- B. All gate valves shall be furnished with mechanical joint connections, unless otherwise shown on the Drawings or specified hereinafter.
- C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.
- D. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.
- E. Gate valves 12" and smaller shall be installed in a vertical position. Gate valves greater than 12" shall have the bonnet mounted in the horizontal position and have a bevel gear actuator. Gate valves shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counter-clockwise). All valve operating nuts shall be set within a cast iron valve box. There shall be a maximum 48" depth of valve operating nut. Contractor must use extension stems, if necessary, to raise operator nut within 48" of final grade.

2.11 YARD HYDRANTS

- A. Yard hydrants shall be installed where described on the Drawings or directed by the Engineer in accordance with the details shown. Hydrants shall be of the frostproof, compression type with all working parts removable without digging up the hydrants. Hydrants shall be equipped with removable handwheel or lever, hose connections (1-1/2" size) and bottom connection for 2-inch water line. Hydrants shall be Model M-200 Murdock Manufacturing and Supply Company, American-Darling, Zurn, or equal.
- B. All hydrants shall be backfilled to the ground surface with crushed stone.
- C. Exposed portions of hydrants shall be factory painted with an enamel finish. Color charts shall be furnished with Shop Drawings for color selection by the Engineer. Below ground portions

shall have two (2) coats of Fed. Spec. TT-V-51F Asphalt Varnish.

2.12 GATE VALVES - BURIED

- A. Gate valves shall conform to the Specifications of Section 331216, Paragraph 2.1, except be designed for buried service, have mechanical joint ends, have all exterior surfaces shop painted with two coats of Fed. Spec. TT-V-51F Asphalt Varnish, with 2-inch square nut operator in a vertical position for use in a valve box.

2.13 VALVE BOXES - BURIED VALVES (EXCEPT AIR RELEASE AND SEWAGE COMBINATION VALVES)

- A. Valve boxes shall be of 5-1/4 inch standard cast iron, two-piece, screw type valve box with drop cover marked "WATER", "SEWER", "DRAIN", as applicable. Valve boxes for gate valves larger than 8 inches shall be three-piece. Valve boxes shall be accurately centered over valve operating nut, and backfill thoroughly tamped about them. Valve boxes shall not rest on the valves but shall be supported on crushed stone fill. They shall be set vertically and properly cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk or road surface, and in grass plots, fields, woods or other open terrain. Valve boxes and covers shall be as manufactured by Tyler Corporation, Opelika Foundry, Bingham & Taylor, or equal.
- B. Wherever valve boxes fall outside of the pavement, the top of the box shall be set in a cast-in-place concrete slab 18" x 18" x 4" thick with the top of the slab and box flush with the top of the ground. This provision shall apply to all new and all existing valve boxes which fall within the limits of the contract, unless otherwise stated on the plans or ordered by the Engineer.

2.14 TAPPING SLEEVES AND VALVES

- A. DI tapping sleeves for use in connections to existing water lines, where indicated on the drawings or as directed by the Engineer, shall be constructed of ductile iron conforming to the requirements of ASTM A-536, and have the body of the tapping sleeve seal around the carrier pipe by use of mechanical joints on each end. Tapping outlet connections shall be flanged with drillings in accordance with ANSI class 125#/150#. Tapping sleeves shall be suitable for working pressures of 250 psi and shall be Mueller No. H-615, American Valve and Hydrant No. 2800-C, or approved equal.
- B. SST tapping sleeves for use in connections to existing water lines, where indicated on the drawings or as directed by the Engineer, shall have the body and neck constructed of ASTM A-240 type 304 stainless steel and shall be compressed to the carrier pipe by use of heavy gauge triangular sidebars running the length of the body. Bolts, nuts and washers shall be constructed of type 304 stainless steel. The gasket between the tapping sleeve and carrier pipe shall be constructed of Buna N rubber and be NSF 61 approved. The gasket shall have a grid pattern to help secure it in place and have seal around the full circumference of the pipe. Tapping outlet connections shall be constructed of ductile iron conforming to ASTM A-536 and have either a mechanical joint connection conforming to AWWA C-111, or a flanged connection with drillings in accordance with ANSI class 125#/150#. Tapping Sleeves shall be suitable for the following working pressures: 4"-12" 250 psi, 14"-24" 200 psi and shall be Mueller No. H-304, Romac Industries SST III, or approved equal.

- C. Tapping valves shall meet the requirements of paragraph 2.01 hereinbefore and shall be coordinated to connect to the tapping sleeve with either a flanged end or a mechanical joint end.
- D. All existing water mains to be tapped under this contract shall be exposed in order to verify line sizes prior to ordering tapping sleeves and valves.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All valves shall be installed in accordance with details on the Contract Drawings and with the manufacturer's recommendations.
- B. All valves shall be anchored in accordance with the details on the Contract Drawings.

END OF SECTION 331216

SECTION 331219 - HYDRANTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for furnishing and installing all hydrants and appurtenances specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 312000
- B. Valves - Utilities Services: Section 331216
- C. Water Distribution Piping: Section 331113

1.3 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 013323 of this specification.
- B. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering.
- C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Hydrants	X	X		X	X							

PART 2 - PRODUCTS

2.1 YARD HYDRANTS

- A. Yard hydrants shall be installed where described on the Drawings or directed by the Engineer in accordance with the details shown. Hydrants shall be of the frostproof, compression type with all working parts removable without digging up the hydrants. Hydrants shall be equipped with removable handwheel or lever, hose connections (1-1/2" size) and bottom connection for 2-inch water line. Hydrants shall be Model M-200 Murdock Manufacturing and Supply Company, American-Darling, Zurn, or equal.
- B. All hydrants shall be backfilled to the ground surface with crushed stone.
- C. Exposed portions of hydrants shall be factory painted with an enamel finish. Color charts shall be furnished with Shop Drawings for color selection by the Engineer. Below ground portions shall have two (2) coats of Fed. Spec. TT-V-51F Asphalt Varnish.

2.2 FIRE HYDRANTS

- A. The Contractor shall furnish and install fire hydrants and auxiliary gate valves where shown on the Drawings or directed by the Engineer. Hydrants shall conform in all respects to the most recent requirements of AWWA C502. Hydrant barrel shall have safety breakage feature above the ground line. All hydrants shall have 6-inch mechanical joint shoe connection, two (2) 2-1/2-inch discharge nozzles, and one (1) 4 1/2-inch pumper nozzle with rubber gasketed caps fitted with cap chains. Cap nuts are to be five (5) sided. Connection threads shall be National Standard Thread. Main valve shall have 5-1/4-inch full opening and be of the compression type opening against water pressure so that valve remains closed should barrel be broken off.
- B. Hydrants shall be fully bronze mounted. Main valve shall have a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust and corrosion.
- C. The operating nut shall be five (5) sided bronze or bronze with a five (5) sided ductile iron cap, and mounted so that a counter clockwise motion will open the valve. There must be cast on top an arrow and the word "Open" indicating the direction of turn to open the hydrant.
- D. Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stop shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.
- E. Hydrants shall be shop tested to 300 psi pressure with main valve both opened and closed. Under test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet.
- F. Type of shoe connection shall be mechanical joint and size shall be six inches (6").

- G. Hydrants shall be given two (2) coats of enamel high visibility paint to be selected by the Owner.
- H. Hydrants shall be Mueller Super Centurion Model A-423, or approved equal.

2.3 FLUSH (BLOW-OFF) HYDRANTS

- A. Flush type fire hydrants shall comply, where applicable, to AWWA Standard C-502, latest revision. Flush type fire hydrants shall be of the compression type, with the main valve opening against the pressure and closing with the pressure. The main valve opening shall be 2-1/4" diameter. Flush type fire hydrants shall be of a dry barrel design.
- B. Flush type fire hydrants shall be rated at 150 psi water working pressure, tested at 300 pounds hydrostatic for structural soundness in the following manner; 300 pound hydrostatic test supplied from the inlet side, first with the main valve closed for the testing of the valve seat; second, with the main valve open for testing of the drain valves and the hydrant barrel.
- C. Hydrants shall be constructed of ASTM A-126 Class B cast iron. The main valve of the hydrant shall be made of rubber.
- D. The bottom stem threads of the main valve rods shall be fitted with a cap nut for sealing the threads away from the water.
- E. Changes in size or shape of the waterway shall be accomplished by means of easy curves. Exclusive of the main valve opening, the net area of the waterway of the barrel and the foot piece at the smallest part shall not be less than 120% of that of the net opening of the main valve, except for hydrants with 2-1/4" valve opening.
- F. Hose and steamer caps shall be individually chained to the hydrant.
- G. The operating threads of the hydrant shall be so designed as to avoid the working of any iron or steel parts against either iron or steel. The operating stem and operating nut threads shall be square or acme type.
- H. Bonnet shall be weatherproof, free draining, and of a type that will maintain the operating mechanism in readiness for use under freezing conditions.
- I. The operating nut shall be provided with a convenient means to afford lubrication to insure ease of operating and the prevention of wear and corrosion. Hydrants shall be of dry barrel type. Hydrant shoe shall have two (2) positive acting non-corrodible drain valves that shall drain the hydrant completely by opening when the main valve is closed, and also to close tightly when the main valve is open.
- J. All like parts of hydrants of the same size and model produced by the same manufacturer shall be interchangeable.
- K. Hydrants shall open by turning to the left.
- L. Threads on hose and steamer nozzles shall be National Standard unless otherwise specified.

- M. Operating nuts and cap nuts shall conform to National Standard unless otherwise specified.
- N. Bury shall be 30" measuring depth from grade line to bottom of connecting pipe.
- O. Auxiliary shut-off (isolation) gate valves shall be of the same manufacturer as the hydrant when required.
- P. Hydrants with a 2", 2-1/4" 2-1/2", or 3" shoe (Style 333) shall be supplied with one 2-1/2" hose outlet. Hydrant assembly shall include a cast iron box and cover for installation flush with grade level.
- Q. The inside of all hydrants shall be coated in accordance with AWWA standards except for bronze and machined surfaces. Exterior on hydrant nozzle section shall be painted fire hydrant red (or as specified).
- R. Hydrant shoe shall have protective, thermosetting epoxy coating applied inside and out before assembly. Prior to application of coating, shoes shall be mechanically and chemically cleaned in compliance with SSPC Standards SP-5 and SP-8. A minimum average dry film thickness of 3 mils shall be applied on interior and exterior surfaces of hydrant shoe. Coating designation to be M&H 0271 epoxy and conform fully to AWWA C550-81, Section 3.
- S. Hydrants shall be marked with name of manufacturer, year of manufacture, and size.

2.4 FLUSH HYDRANT BOX

- A. Hydrant box and cover shall be cast iron with a minimum diameter of 16" and a minimum depth of 10".
- B. The hydrant box shall not be attached to the hydrant at any point thus prohibiting loads from being transferred to the hydrant, standpipe, or connecting pipe. Hydrant box, when properly installed with cover, shall withstand a 25,000 pound load.

PART 3 - EXECUTION

3.1 SETTING OF FIRE HYDRANTS

- A. Location:
 - 1. Hydrants shall be located as shown or as directed so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.
 - 2. When placed behind the curb, the hydrant barrel shall be set so that the pumper or hose nozzle cap will be a minimum of five feet (5') from the back of curb.
 - 3. When set in the lawn space between the curb and the sidewalk or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within six inches (6") of the sidewalk.
- B. Position:

1. All hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone and shall have their nozzles parallel with the roadway, with the pumper nozzle facing toward the roadway. Hydrants shall be set to the established grade, with nozzles at least eighteen inches (18") above the ground, as shown or as directed by the Engineer.

C. Connection to Main:

1. Each hydrant shall be connected to the main with a six-inch (6") restrained joint ductile iron branch controlled by an independent six -inch (6") gate valve, unless otherwise specified.

D. Hydrant Drainage in Pervious Soil:

1. Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing uncrushed course aggregate (AAHSTO M-43) No. 57 from the bottom of the trench to at least six inches (6") above the drain opening in the hydrant and to a distance of one foot (1') around the elbow. No drainage system shall be connected to a sewer.

E. Hydrant Drainage in Impervious Soil:

1. Whenever a hydrant is set in clay or impervious soil, a drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant and filled compactly with uncrushed course aggregate (AASHTO M-43) No. 57 under and around the elbow of the hydrant and to a level of six inches (6") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

3.2 SETTING OF YARD HYDRANTS

A. Location:

1. Hydrants shall be located as shown on the Contract Drawings or as directed by the Owner or Engineer so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

B. Position:

1. All hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone. Hydrants shall be set to the established grade, with nozzles at least thirty-six inches (36") above the ground, as shown on the Details in the Drawings, or as directed by the Owner or Engineer. Hydrants shall be backfilled with crushed stone, which is encased by a section of an 18" diameter concrete pipe. (See Standard Details)

C. Connection to Main:

1. Each hydrant shall be connected to the main with a restrained joint ductile iron branch controlled by an independent two (2) inch gate valve, unless otherwise specified.

D. Hydrant Drainage in Pervious Soil:

1. Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing uncrushed course aggregate (AAHSTO M-43) No. 57 from the bottom of the trench to at least six inches (6") above the drain opening in the hydrant and to a distance of one foot (1') around the elbow. No drainage system shall be connected to a sewer.

E. Hydrant Drainage in Impervious Soil:

1. Whenever a hydrant is set in clay or impervious soil, a drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant and filled compactly with uncrushed course aggregate (AASHTO M-43) No. 57 under and around the elbow of the hydrant and to a level of six inches (6") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

3.3 SETTING OF FLUSH HYDRANTS

A. Location:

1. Hydrants shall be located as shown on the Contract Drawings or as directed by the Owner or Engineer so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

B. Position:

1. Hydrants shall be set plumb and to the established grade.

C. Connection to Main:

1. Hydrants shall be connected to the main by mechanical joint, screwed or flanged shoe. Mechanical joint shoes shall be fitted with strapping lugs.

D. Hydrant Drainage in Pervious Soil:

1. Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing uncrushed course aggregate (AAHSTO M-43) No. 57 from the bottom of the trench to at least six inches (6") above the drain opening in the hydrant and to a distance of one foot (1') around the elbow. No drainage system shall be connected to a sewer.

E. Hydrant Drainage in Impervious Soil:

1. Whenever a hydrant is set in clay or impervious soil, a drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant and filled compactly with uncrushed course aggregate (AASHTO M-43) No. 57 under and around the elbow of the hydrant and to a level of six inches (6") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

F. Hydrant Box:

1. Hydrant box shall be installed at grade and per manufacturer's recommendations. Box shall not be attached to the hydrant at any point.

3.4 ANCHORAGE

- A. The bowl of each hydrant shall be tied to the pipe with suitable anchor couplings, as shown on the Standard Details in the Drawings or as directed by the Owner or Engineer.

3.5 FIRE HYDRANT WRENCHES

- A. One (1) hydrant wrench shall be furnished for each ten (10) hydrants or less. When the number of hydrants furnished and installed exceeds twenty-five (25), one (1) hydrant repair kit shall be supplied at no additional cost to the Owner.

END OF SECTION 331219

SECTION 333113 - GRAVITY SEWER PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances as shown on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 312000
- B. Boring and Jacking: Section 330523.16
- C. Sanitary Sewer Manholes, Frames and Covers: Section 333913
- D. Excavation Support and Protection: Section 315000

1.3 SUBMITTALS

- A. Submit manufacturer's data as specified herein. Comply with all requirements of Section 013323.

1.4 INTERNAL PIPE DIAMETER

- A. All sewer pipe provided shall have a minimum actual internal diameter which is equal to or greater than the diameter indicated on the Contract Drawings.

1.5 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

- A. All activities involving utility line construction covered under the US Army Corps of Engineers NATIONWIDE PERMIT # 12 shall meet the following conditions:
 - 1. Utility Line Activities. Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project. Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity.

2. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.
 3. Notification: The permittee must submit a pre-construction notification to the US Army Corps district engineer prior to commencing the activity if any of the following criteria are met: (1) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1/10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials.
- B. All activities involving utility line construction covered under KENTUCKY GENERAL CERTIFICATION of Nationwide Permit # 12 shall meet the following conditions:

The general Water Quality Certification applies to surface waters of the Commonwealth as defined in 401KAR10:001 Chapter 10, Section 1(80): Surface waters means those waters having well-defined banks and beds, either constantly or intermittently flowing, lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface.

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.
2. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.
3. This general water quality certification does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.
4. For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.
5. This general certification shall not apply to nationwide permits issued for individual crossings which are part of a larger utility line project where the total cumulative impacts from a single and complete linear project exceed ½ acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.

6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For the utility line crossing and roads, only one bank length is used in calculation of the totals.
7. Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).
8. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.
9. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.
10. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.
11. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow construction within the 50 foot buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.
12. Utility line stream crossings shall be constructed by methods that maintain flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the excavation shall not be allowed to enter the flowing portion of the stream.
13. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.
14. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.
15. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:
 - a. Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
 - b. Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or

downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.

- c. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
- d. Removal of riparian vegetation shall be limited to that necessary for equipment access.
- e. To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
- f. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
- g. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
- h. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
- i. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

16. Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

1.6 CONSTRUCTION IN A FLOODPLAIN

- A. No material shall be placed in the stream or in the flood plain to form construction pads, coffer dams, access roads, etc. unless prior approval has been obtained from the Environmental and Public Protection Cabinet.
- B. The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside the flood plain unless the applicant has received prior approval from the Cabinet to fill within the flood plain.

PART 2 - PRODUCTS

2.1 GRAVITY SEWER PIPE

- A. Polyvinyl Chloride (PVC) Pipe and Fittings
 - 1. PVC Pipe shall be installed where indicated on the Contract Drawings. PVC pipe shall not be used in locations where the depth of cut is greater than 16 feet.
 - 2. Pipe must be delivered to job site by means which will adequately support it, and not

subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe shall not be stored outside where subject to sunlight.

3. Jointing of PVC pipe shall be by a natural rubber ring inserted into the belled end of the pipe or double hub joints. Solvent weld joints are not acceptable.
4. The PVC pipe manufacturer shall provide special fittings, acceptable to the Engineer to make watertight connections to manholes.
5. Pipe manufacturer shall furnish notarized certificate of compliance with applicable specifications.
 - a. Gravity Sewer Application (15" and Smaller):
 - 1) PVC pipe used for gravity sewer applications shall meet all requirements of ASTM Specification D-3034, latest revision. Pipe and fittings shall meet the extra strength minimum of SDR-35 of that Specification.
 - 2) All pipe and fittings shall be inspected at the factory and on the job site. Testing of PVC pipe and fittings shall be accomplished in conformance with the latest revision of ASTM D3034, ASTM D2444, ASTM D2412, and ASTM D2152. The manufacturer shall submit five (5) copies of certification of test for each lot of material represented by shipment to the job site.
 - 3) The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be as uniform in color as commercially practical. PVC pipe shall have a ring painted around spigot ends in such a manner as to allow field checking of setting depth of pipe in the socket.
 - b. Large Diameter Gravity Sewer Application (Greater than 15"):
 - 1) Large diameter PVC pipe used for gravity sewer applications shall meet or exceed all performance requirements of Paragraph 2.01.B. of this section, except ASTM F679 shall be referenced instead of ASTM D3034.
6. The cleaning and assembly of pipe and fittings shall be in accordance with the manufacturer's recommendation.
7. PVC Gravity Lateral Service Connection Piping (6").
 - a. PVC gravity lateral service connection pipe (6") shall be ASTM-3034, SDR 35 solid wall PVC pipe.
 - b. For deep sewer house connection laterals (deeper than 10 feet) and for near vertical (within 30 degrees of vertical) lateral risers, install a vertical riser adapter with flange (Plastic Treads Model No. G-986 or equal) between the bottom fitting and the vertical riser section to prevent settlement of the lateral riser and to prevent possible damage to the bottom fitting joint. See detail on Drawing SD-2 for deep sewer house connection laterals.

2.2 PIPE EMBEDMENT & BACKFILL MATERIALS (Per ASTM D2321)

- A. Classes of Embedment and Backfill Materials are defined in ASTM D2321. Embedment

Materials are those used for bedding, haunching and initial backfill.

- B. Class 1A and Class 2 materials are acceptable for Pipe Embedment. Included in this category are #9 and #57 crushed stone.
- C. Class 1, 2, 3 and 4A materials are acceptable for Final Backfill, compacted 85% Standard Proctor Density except that Class 4A material must be compacted to 95% Standard Proctor Density and Class 4A material is not allowed for backfill under pavement or traffic areas or in trenches where water content may cause instability of uncontrolled water content.
 - 1. No rocks larger than 3" shall be incorporated into the Final Backfill materials.
- D. Class 1A Manufactured Aggregates: Open graded clean, angular, crushed stone or rock. These materials compact with little or no mechanical effort.
- E. Class 1B Manufactured, Processed Aggregate: Dense graded clean, angular crushed stone. Compact to 85% Standard Proctor Density with hand tampers or vibratory compaction.
- F. Class 2: Clean, coarse-grained materials, such as gravel, coarse sands, and gravel/sand mixtures (1" maximum size). The materials are classified by the Unified Soil Classification System as GW, GP, SW, SP, and GW-GC or SP-SM. Hand tamping or mechanical vibration is required to provide the necessary 85% Standard Proctor Density.
- G. Class 3: Coarse-grained materials with fines including silty or clayey gravels or sands. Gravel or sand must comprise more than 50% of Class 3 materials (1" maximum size). Soils classified as GM, GC, SM or SC meets these requirements. Hand tamping or mechanical vibration is required to provide the necessary 90% Standard Proctor Density.
- H. Class 4: Fine-grained materials, such as fine sands and soils, containing 50% or more clay or silt. Soils classified as Class 4A (ML or CL) have medium to low plasticity. Soils classified as Class 4B (MH or CH) have high plasticity and are NOT allowed as embedment or backfill materials.

2.3 COMPRESSION COUPLINGS

- A. When joining different types of pipe together or new pipe to existing pipe, the Contractor shall use Fernco Compression Couplings, or equal, that are resistant to corrosion by soil and sewage and that will provide a permanent watertight joint.
- B. The compression coupling shall meet the physical test and joint-leak requirements specified in ASTM C-1173. The bands for attaching pipes shall be stainless steel conforming to ASTM C-1173. Each coupling shall bear the manufacturer's name and an indication of its size.

2.4 CONCRETE PIPE ANCHORS

- A. Where indicated on the Drawings, required by the specifications or as directed by the Engineer, concrete pipe anchors shall be installed. Concrete shall be 2000 psi, and reinforcing bars shall be as indicated on the anchor detail.

PART 3 - EXECUTION

3.1 EXCAVATION FOR PIPELINE TRENCHES

- A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ASTM-D-2321 except as modified herein.
- B. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.
- C. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.
- D. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.
- E. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.
- F. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Engineer, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.
- G. Minimum cover of 30" shall be provided for all pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42".

3.2 PIPE BEDDING

- A. All sewer pipe shall be supported on a bed of granular material. In no case shall pipe be

supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from rock, foreign material, frozen earth, and be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel.

- B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe and insofar as possible where bell and spigot pipe is involved so that none of the load will be carried on the bells.
- C. Where flexible pipe is used, the granular bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the pipe. Granular bedding shall be Size #9 or #57 crushed stone, fine gravel, or sand, and is not a separate pay item. Refer to Paragraph 2.2 for specifications for pipe embedment materials.
- D. Where undercutting and granular bedding are involved the undercutting shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.
- E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.
- F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

3.3 SPECIAL GRANULAR FILL

- A. As noted in Paragraph 3.02E, granular material for "Special Granular Fill" when directed by the Engineer shall be Department of Transportation crushed limestone, Size #57. Payment for "Special Granular Fill" must have approval from the Engineer prior to installation.

3.4 LAYING PIPE

- A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.
- B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.
- C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure its being clean. Each piece of pipe shall be lowered separately unless special permission is given

otherwise by the Engineer. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.

- D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02 "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.
- E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.
- F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.
- G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

3.5 BACKFILLING PIPELINE TRENCHES

- A. Backfilling of pipeline trenches shall be accomplished with the requirements set forth in ASTM D 2321, in accordance with the details as shown on the Drawings, and as described hereinafter. Under pavement, all trench backfill shall be in accordance with Method "C" as shown on Standard Detail Drawing SD-2. All other trench backfill shall be in accordance with Method "A" or "B".

- B. Method "A" - Backfilling in Open Terrain:

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 6" above the top of the pipe, shall be backfilled with Class 1A or Class 2 (Fine Gravel or Sand) such as #9 or #57 crushed stone. This material shall be placed in 6" lifts and shall be carefully compacted to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
2. The upper portion of the trench above the compacted portion shall be backfilled with Class 1, 2, 3, or 4A materials. Incorporation of rock larger than 3" is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.
3. Final grading and seeding or sodding shall be in accordance with Sections 312000 and 329200.

- C. Method "B" - Backfilling Under Sidewalks & Unpaved Gravel Driveways:

Backfilling of pipeline trenches under sidewalks and unpaved driveways shall be accomplished in the following manner.

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with Class 1A or Class 2 (Fine Gravel or Sand) such as #9 or #57 crushed stone. This material shall be placed in 6" lifts to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
2. The middle portion of the trench, from a point 6" above the top of the pipe to a point 6" below the grade line, shall be backfilled with Class 1, 2, 3, material free from rock. This material shall be placed and compacted in layers of approximately 6 inches.
3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

D. Method "C" - Backfilling Under Streets, Roads, and Paved Driveways:

Backfilling of pipeline trenches under streets, roads and paved driveways shall be accomplished in the following manner:

1. The lower portion of the trench from the pipe bedding to a point 6" below the bottom of the pavement or concrete sub-slab, shall be backfilled with Class 1A or Class 2 (Fine Gravel or Sand) such as #9 or #57 crushed stone. This material shall be placed in 6" lifts to avoid displacement of the pipe. Compaction shall be accomplished by hand tamping or approved mechanical methods.
2. The upper portion of the trench, from a point 6" below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with Class 1B Crushed Stone. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

E. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalk and unpaved driveways shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways, driveways and paved areas shall be backfilled in accordance with Method "C". All methods are shown on Sheet SD-2 of the Drawings. When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.

F. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.

G. In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

3.6 SETTLEMENT OF TRENCHES

A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement that occurs within these rights-of-way within one year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner and/or the State Department of

Transportation.

3.7 CONCRETE CRADLE, ANCHORS OR ENCASEMENT

- A. Concrete cradle, anchors or encasement shall be placed where shown on the Drawings, required by the specifications, or as directed by the Engineer.
- B. Concrete shall be 2000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.

3.9 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

- A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Prior to trenching, the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.
- C. Backfilling of the trench shall be in accordance with Method "C" as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of Section 303 of the Standard Specifications for Road and Bridge Construction of the Kentucky Department of Transportation, to a depth of six (6) inches in roads and streets and four (4) inches in driveways.
- D. A subslab of reinforced concrete shall be placed for state maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 3000 psi, in accordance with the Details shown on the Drawings.
- E. Prior to placing the bituminous binder course, the granular base course shall be thoroughly cleaned and broomed and a prime coat of Refined Tar RT-2 shall be uniformly applied at the rate of 0.35 gallons per square yard.
- F. The bituminous base course shall be hot mixed, hot laid, bituminous concrete base, furnished and placed in accordance with Section 402 of the Standard Specifications, and to match the existing depth or to a minimum compacted thickness of 3 inches.
- G. The surface course shall be hot mixed, hot laid, bituminous concrete, furnished and placed in accordance with Section 402 of the Standard Specifications, and to match the existing depth or to a minimum compacted thickness of 1-1/2 inches.

3.10 GRAVITY SEWER CONNECTION OF NEW SANITARY SEWER TO EXISTING MANHOLES

- A. New sanitary sewer shall be extended through the wall of the existing manhole, connector seal installed, sealed and patched with an expansive cement mortar and pipe sealed with a test plug. Test plug shall be a wing nut style as manufactured by Richmond Foundry, Richmond, Virginia, or equal. Apron and invert shall be removed in its entirety where required to allow placement of the new sewer at the specified invert elevation.
- B. Wherever plastic sewer pipe is to be field grouted into manhole openings, pipe-to-manhole connector seal shall be Fernco Concrete Manhole Adapters manufactured by Fernco, Inc., Division, Michigan, or equal. Adapter shall be mounted on pipe and shall be positioned about the center of the manhole wall.
- C. At the time the new sewer is placed into permanent service, as designated by the Owner, the Contractor shall remove the old sewer pipe from the manhole, patch and seal the wall with an expansive cement mortar, construct new apron and invert in accordance with the standard details, and remove plug from the new sewer. All temporary pumping, piping, excavation, etc. as required to maintain or divert the sewage flow shall be included by the Contractor.

3.15 TESTING

On all projects involving installation of sanitary sewer lines, the finished work shall comply with the provisions listed below or similar requirements which will insure equal or better results:

- A. Rod Out: After the collecting and/or outfall lines or system have been brought to completion, and prior to final inspection, the Contractor shall rod out the entire system by pushing through each individual line in the system, from manhole to manhole, appropriate tools for the removal from the lines of any and all dirt, debris and trash.
- B. Inspect Lines: During the final inspection, the Engineer will inspect each individual line, from manhole to manhole, either by use of lights or other means at his disposal to determine whether the completed lines are true to line and grade as laid out or as shown on the plans.
- C. Deflection tests shall be performed on a flexible pipe. The test shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system. No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent, pipe shall be replaced or corrected. The rigid ball cylinder or mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured. The pipe shall be measured in compliance with ASTM D2122 Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings. The test shall be performed without mechanical pull devices.
- D. Replace Defective Lines: All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced at the Contractor's expense.

- E. I & I Limits: The Contractor shall lay sewer lines, including house connections so that the access of ground water or loss of water from the sewer system or other gravity flow piping which does not normally flow full will be limited to 10 gallons per inch diameter per mile per day. This limitation is inclusive of manholes, sewers, house connections, and appurtenances. This requirement may be applied to a portion of the contract work, such as the sewers in a separate drainage area or to a single section of the line between two manholes.
- F. Low Pressure Air Test: To test for leaks, the Engineer will require that all completed piping as specified herein after back filling be tested by low-pressure air test, exfiltration, or infiltration test. Should the low pressure air test results be inconclusive, or at the request of the Engineer, an exfiltration or infiltration test will be required on the low pressure air tested segments. Labor, equipment and supplies required for all tests shall be furnished by the Contractor.
 - 1. The low pressure air test shall consist of meeting a required holding time during a measured pressure drop. The initial test pressure shall be 4.0 psi, with the allowable pressure loss being 1.0 psi during the calculated holding time. Holding time shall be as indicated in the following table:

SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015*											
1 Pipe Dia. (in)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Specified Minimum for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46
42	39:48	57	41.883 L	69:48	104:42	139:37	174:30	209:24	244:19	279:13	314:07
48	45:34	50	54.705 L	91:10	136:45	182:21	227:55	273:31	319:06	364:42	410:17
54	51:02	44	69.236 L	115:24	173:05	230:47	288:29	346:11	403:53	461:34	519:16
60	65:40	40	85.476 L	142:28	213:41	284:55	356:09	427:23	498:37	569:50	641:04

* If there is no leakage (0 psi drop) after one hour of testing, the tested section shall be accepted.

- G. Exfiltration Test: In order to test for infiltration the Engineer may also require exfiltration tests on each section of pipe between manholes after it has been laid but prior to back filling of joints. Exfiltration tests shall be conducted by plugging the lower end of the section of sewer to be tested and filling the sewer with water to a point approximately five feet above the invert at the lower end and at least one foot above the pipe at the upper end, observing for leakage at all joints and measuring the amount of leakage for a given interval of time. Exfiltration shall not exceed 110 percent times the infiltration limits set out hereinbefore. All observed leaks shall be corrected even though exfiltration is within the allowable limits.
- H. Infiltration Test: To test for infiltration, the Engineer may also require that the Contractor plug the open ends of all lines at the manhole so that measurements may be made at each section of

the sewer line. Infiltration tests shall consist of weir measurement to determine quantities of any infiltration. Measurements shall be taken at line locations directed by the Engineer. This infiltration test will not be made until the sewer line is completed, and the Contractor will be required to correct all conditions that are conducive to excessive infiltration and may be required to relay such sections of the line that may not be corrected even though infiltration is within allowable limits.

- I. Smoke testing may be used only to locate leaks and in no case shall be considered conclusive. In all cases the smoke test shall be accompanied by an air test, exfiltration test or infiltration test. Smoke testing may only be performed where ground water is low and smoke is blown into a conduit that is properly sealed. All such leaks or breaks discovered by the smoke tests shall be repaired and/or corrected by the Contractor at his own expense. Equipment and supplies required from smoke tests shall be furnished by the Contractor. The Contractor may also be required to smoke test the first section (manhole-to-manhole) of each size of pipe and type of joint on each construction contract prior to backfilling to establish and check laying and jointing procedures. Other supplementary smoke tests prior to backfilling may be performed by the Contractor at his option; however, any such tests shall not supplant the final tests of the completed work unless such final tests are waived by the Engineer.

3.16 CLEAN UP

- A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

END OF SECTION 333113

SECTION 333413 - SEWAGE FORCE MAINS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 312000
- B. Sewage Pumping Stations: 333210
- C. Valves - Site Utilities: 331216

1.3 SUBMITTALS

- A. Submit manufacturer’s data and shop drawings for all materials and as specified herein. Comply with all requirements of Section 013323.
- B. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 013323.
- C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Pipe	X	X		X					X			
Fittings	X	X		X								
Detectable Tape	X	X		X								
Trench Baffles	X	X		X								

1.4 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

All activities involving utility line construction covered under NATIONWIDE PERMIT # 12 shall meet the following conditions:

- A. The general Water Quality Certification is limited to the crossing of intermittent and perennial streams by utility lines.
- B. The construction of permanent or temporary access roads will impact less than 300 linear feet of intermittent and perennial streams and less than one acre of jurisdictional wetlands.
- C. Utility lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGS 7 ½ minute topographic map except where the utility line alignment crosses the stream. Utility lines that cross streams shall be constructed by methods that maintain normal stream flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the utility line excavation shall not be allowed to enter the flowing portion of the stream.
- D. The activities shall not result in any permanent changes in preconstruction elevation contours in waters or wetlands or stream dimension, pattern or profile.
- E. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.
- F. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
- G. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regarding and reseeding will be accomplished with 14 days after disturbance.
- H. To the maximum extent practicable, all in stream work under this certification shall be performed during low flow.
- I. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such in stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
- J. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.
- K. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.
- L. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of

water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling 800/928-2380.

1.5 CONSTRUCTION IN A FLOODPLAIN

- A. No material shall be placed in the stream or in the flood plain to form construction pads, coffer dams, access roads, etc. unless prior approval has been obtained from the Environmental and Public Protection Cabinet.
- B. The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside the flood plain unless the applicant has received prior approval from the Cabinet to fill within the flood plain.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PLASTIC PRESSURE PIPE

- A. PVC Pressure Piping:
 - 1. PVC mains shall be polyvinyl chloride plastic pipe, Class 200 (SDR-21) pressure rated pipe. PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for ductile-iron fittings. All PVC pipe shall conform to the latest revisions of the following:
 - ASTM D 2241
Standard Dimension Ratio SDR-21 (200 psi)
 - B. Joints for polyvinyl chloride (PVC) mains shall be integral bell and spigot type joints with rubber-o-ring gasket. The cleaning and assembling of the pipe joints shall be in accordance with manufacturer's recommendations.
 - C. Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision, and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.
- OR C. Fittings for the pipe shall be constructed of the same plastic material as is used for the pipe, minimum 200 psi pressure rating, gasketed and shall be of the molded type or machined from extruded stock. All PVC fittings shall conform to the latest revisions of the following:

Materials:	ASTM D 1784
Joints:	ASTM D 3139
Gaskets:	ASTM F 477
Standard Dimension Ratio	SDR-21 (200 psi)

2.5 COUPLING AND ADAPTORS

- A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.
- B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.
- C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Smith-Blair, or equal, per the following, unless otherwise specified and/or noted on the Drawings:
- D. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe -

Dresser	Smith-Blair
Style 138	411

- E. Transition couplings for joining pipe of different outside diameters-

Dresser	Smith-Blair
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")

- F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

Dresser	Smith-Blair
Style 128 steel (3" 48" C.I. Pipe)	912 cast (3"-12")
Style 128 steel (2" 96" steel pipe)	913 steel (3" and larger)

2.6 DETECTABLE UNDERGROUND UTILITY WARNING TAPES

- A. Detectable underground utility warning tapes which can be located from the surface by a pipe detector shall be installed directly above nonmetallic (PVC, polyethylene, concrete) pipe.
- B. The tape shall consist of a minimum thickness 0.35 mils solid aluminum foil encased in a protective inert plastic jacket that is impervious to all know alkalis, acids, chemical reagents and solvents found in the soil.
- C. The minimum overall thickness of the tape shall be 5.5 mils and the width shall not be less than 2" with a minimum unit weight of 2-1/2 pounds/1" x 1,000'. The tape shall be color coded and imprinted with the message as follows:

<u>Type of Utility</u>	<u>Color Code</u>	<u>Legends</u>
Sewer	Safety Green	Caution Buried Sewer Line Below

- D. Detectable underground tape shall be "Detect Tape" as manufactured by Allen Systems, or equal.
- E. Installation of detectable tapes shall be per manufacturer's recommendations and shall be as close to the grade as is practical for optimum protection and detectability. Allow a minimum of 18" between the tape and the line.
- F. Payment for detectable tapes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.7 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

- A. Where indicated on the Drawings, required by the specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed. Concrete shall be 2000 psi, and reinforcing bars shall be as installed as indicated on the details.

PART 3 - EXECUTION

3.1 EXCAVATION FOR PIPELINE TRENCHES

- A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ASTM-D-2321 except as modified herein.
- B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved, bell holes shall be excavated during this latter operation to prevent the bells

from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.

- C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.
- D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.
- E. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.
- F. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.
- G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.
- H. Minimum cover of 30" shall be provided for all pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42".

3.2 PIPE BEDDING

- A. All sewer pipe shall be supported on a bed of granular material unless the trench has been prepared in accordance with Paragraph 3.1B. In no case shall pipe be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from large rock, foreign material, frozen earth, and shall be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel.
- B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on

the bells.

- C. Where flexible pipe is used, the bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the pipe. Granular bedding shall be Size #9-m or ASTM C 33, Size #7 crushed stone, fine gravel, or sand, and is not a separate pay item.
- D. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.
- E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Fill". Removal of poor material is not a separate pay item.
- F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

3.3 SPECIAL GRANULAR FILL

- A. As noted in Paragraph 3.2E, granular material for "Special Granular Fill" when directed by the Engineer shall be Department of Transportation crushed limestone, Size #57. Payment for "Special Granular Fill" must have approval from the Engineer prior to installation.

3.4 LAYING PIPE

- A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.
- B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.
- C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure it's being cleaned. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.
- D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02

"Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.

- E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.
- F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.
- G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

3.5 BACKFILLING PIPELINE TRENCHES

- A. Backfilling of pipeline trenches shall be accomplished with the requirements set forth in "Earthwork" Section 31 20 00 as shown on the Drawings and with details set forth hereinafter.
- B. Method "A" - Backfilling in Open Terrain:

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

- 1. The lower portion of the trench, from the pipe bedding to a point 12" above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner approved by the Engineer, and shall be carefully compacted to avoid displacement of the pipe.
 - a. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
- 2. The upper portion of the trench above the compacted portion shall be backfilled with material which is free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.

- C. Method "B" - Backfilling Under Sidewalks & Unpaved Driveways:

Backfilling of pipeline trenches under sidewalks and unpaved driveways shall be accomplished in the following manner.

- 1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with material free from rock, and acceptable to the Engineer or with crushed stone as specified in "Pipe Bedding". This material shall be placed in a manner to avoid displacement of the pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.
- 2. The middle portion of the trench, from a point 12" above the top of the pipe to a point 6" below the grade line, shall be backfilled with material free from large rock and acceptable to the Engineer. This material shall be placed and compacted in layers of approximately 6 inches. Water (puddling) may be used as required to obtain maximum compaction.

- a. Upon approval of the Engineer, the Contractor may backfill the middle portion of the trench with crushed stone, fine gravel, or sand in lieu of materials which require compaction.
 - 3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.
- D. Method "C" - Backfilling Under Streets, Roads, and Paved Driveways:

Backfilling of pipeline trenches under streets, roads and paved driveways shall be accomplished in the following manner:

- 1. The lower portion of the trench from the pipe bedding to a point 6" below the bottom of the pavement or concrete sub-slab, shall be backfilled with # 9 crushed stone.
 - 2. The upper portion of the trench, from a point 6" below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with a base course of dense graded aggregate. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.
- E. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalk and unpaved driveways shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways and driveways shall be backfilled in accordance with Method "C". All methods are shown on Sheet SD-2 of the Drawings. When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.
- F. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.
- G. In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

3.6 SETTLEMENT OF TRENCHES

- A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these rights-of-way within one year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner and/or the State Department of Transportation.

3.7 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASEMENT

- A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the specifications, or as directed by the Engineer.

- B. For cradle and encasement, concrete shall be 2000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.
- C. For thrust blocks and anchors, concrete shall be 2000 psi, and shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.
- D. When tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.

3.8 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

- A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Prior to trenching, the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.
- C. Backfilling of the trench shall be in accordance with Method "C" as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge Construction of the Department of Transportation, to a depth of six (6) inches in roads and streets and four (4) inches in driveways.
- D. A subslab of reinforced concrete shall be placed for state maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 2500 psi, in accordance with the Details shown on the Drawings.

3.9 REMOVING AND REPLACING CONCRETE CURB AND GUTTER

- A. The Contractor shall remove the curb and gutter when encountered when required for laying the sewer. Only that portion of the curb and gutter needed to lay the sewer line shall be removed. Where concrete curb and gutter removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than which existed prior to the Contractor's operation.

3.10 REPLACEMENT OF EXISTING MAIL BOXES, CULVERTS, CLOTHES LINE POSTS, FENCES AND OTHER SUCH FACILITIES

- A. Existing mail boxes, drainage culverts, clothes line posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing

facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.

- B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

3.11 PORTLAND CEMENT CONCRETE DRIVEWAY REPLACEMENT

- A. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.
- B. The existing concrete paving shall be sawed or cut to straight edges 12-inches outside the edges of the trench or broken out to an existing joint, as directed by the Engineer. The concrete pavement shall be equal to the existing pavement thickness but not less than 6-inches in thickness for driveways.
- C. Pavement shall be reinforced with 6 x 6 #10-10 wire mesh and shall be constructed with 3000 psi concrete.

3.12 RIP-RAP STREAM BANK SLOPE PROTECTION

- A. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Engineer. Rip-rap slope protection shall be 12-inches thick and shall meet State D.O.T. Standard Specifications.

3.13 TESTING

- A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test of at least 1.5 times the normal operating pressure of the pipe (at its lowest elevation), but not to exceed the rated working pressure of the pipe or valves. Note: Engineer shall verify test pressure. Loss of pressure during the test shall not exceed 0 psi in a 4 hour period and 5 psi in a 24 hour period. Any test results that do not meet either of these requirements shall constitute a failure of the pressure test.
- B. No water leakage in pipelines, when tested under the hydrostatic test described above, shall be allowed.
- C. Contractor shall furnish a recording gauge and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-hour clock, and shall be approved by the Engineer.
- D. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.
- E. Duration of test shall be not less than four (4) hours where joints are exposed and not less than 24 hours where joints are covered.

- F. Where leaks are visible at exposed joints, evident on the surface where joints are covered, and/or identified by isolating a section of pipe, the joints shall be repaired and leakage must be minimized, regardless of total leakage as shown by test.
- G. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.
- H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.
- I. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.
- J. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.
- K. The cost of testing of pressure piping is incidental and is to be included in the Contractor's unit Contract Price.

3.14 CLEAN UP

- A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

3.15 ALTERNATE METHOD OF INSTALLATION

- A. In lieu of traditional trenching methods for pipe installation, with the approval of the Engineer, the Contractor may choose to install the pipe utilizing the trenchless technology of horizontal directional drilling (HDD). Horizontal directional drilling shall be as specified in Section 330524.

END OF SECTION 333413

SECTION 333913 - SANITARY SEWER MANHOLES, FRAMES, AND COVERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for furnishing and installing all manholes and appurtenances specified herein and shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 312000
- B. Gravity Sewer Lines: Section 333113

1.3 SUBMITTALS

- A. Submit manufacturer’s data and shop drawings for the materials specified herein. Comply with all requirements of Section 013323.
- C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Manholes	X				X							
Joint Seal	X	X		X								
Steps	X			X								
Frames & Lids	X											
Pipe Connectors	X											
External Rubber Wrap	X	X										
External Rubber Chimney Seal	X	X										

PART 2 - PRODUCTS

2.1 MANHOLES

- A. Manholes of the form and dimensions shown on the Drawings shall be constructed of ASTM C 478 precast reinforced concrete manhole sections erected on 3,000 psi concrete foundation.
- B. Precast concrete manhole bottom sections may be substituted for "cast-in-place" foundations subject to the Owner's review.
- C. The excavation shall be kept free of water while the manhole is being constructed and the manhole shall not be backfilled until inspected by the Engineer.
- D. Standard Manholes:
 - 1. The standard manhole shall be 4' -0" in diameter and not greater than six (6) feet in depth, measured from the top of the cover frame to the invert of the outlet and shall be cone type- top construction as shown on the Drawings.
 - 2. Manholes greater than six (6) feet in depth, measured as above, shall be paid for as a standard six foot manhole, plus the additional vertical depth at the Contract unit price.
- E. Shallow Manholes:
 - 1. The shallow manholes shall be five (5) feet or less in depth, measured from the top of the cover frame to the invert of the outlet and shall be of flat top construction as shown on the Drawings.
- F. Concrete Manhole Sections:
 - 1. Precast concrete manhole sections (risers and grade rings) shall conform to ASTM C 478.
- G. Precast Concrete Eccentric Cones:
 - 1. Precast concrete eccentric cones shall be of the size and shape shown on the Drawings and shall conform to ASTM C 478.
- H. Precast Manhole Section Joints:
 - 1. Precast manhole section joints shall be jointed with one of the following products:
 - ASTM C 443 rubber gaskets
 - AASHTO M-198-75 preformed flexible butyl type joint sealant
 - Hamilton-Kent "Kent-Seal No. 2"
 - K.T. Snyder Co. "Rub'r-Nek"
 - Press Seal Gasket "E-Z stik"
 - Concrete Sealants, Inc. "Conseal"

or equal, or joined with bituminous mastic joint sealing compound. When making joints with mastic compound prime and seal all joints with primer supplied with the joint compound. Manhole section joints shall be watertight. These requirements apply to all

joints, including manhole risers, cones, and grade rings.

I. External Rubber Wrap:

Each manhole barrel joint shall be sealed with an external rubber wrap as manufactured by Sealing Systems, Inc., or equal. The wrap shall be made of a Stretchable, Self-Shrinking, IntraCuring Halogenated Based Rubber with a minimum thickness of 30 mils. The back side of each unit shall be coated with a cross-linked re-enforced butyl adhesive. The butyl adhesive shall be non-hardening sealant, with a minimum thickness of 30 mils. The wrap shall be designed to stretch around the substrate then overlapped creating a cross-link and fused bond between the rubber and butyl adhesive. The application shall form a continuous rubber seal that applies inward pressure on the protected area for the life of the application. The butyl adhesive and the inward pressure exerted on the substrate will prevent the intrusion of water and soil through the joint sections of a manhole.

External Rubber Wrap Specifications

Height	9 inches
Length	16 or 50 foot rolls
Thickness	60 mils
Height tolerances	9 inches +/- .188"
Length tolerances	+/- 3"
Rubber Thickness tolerances	30 mils
Butyl Adhesive Thickness	30 mils

Stretchable, Self-Shrinking, Intra-Curing Halogenated Based Rubber

Physical Properties	ASTM Test Method	Typical Value
Shear Strength	D816	20 lb. PSI min
Tensile, PSI	D412	50 PSI
Elongation %	D412	500 %
Penetration	D217	60/140 MM
Low Temperature	D746	Minus 49° F flexibility
Heat Aging	D573 7 days @ 90 degrees C	
Tensile Strength	minimum, PSI (MPa) > 100 PSI	Pass
Fusion	5/64" (0.2) max	Pass
Elongation %	minimum 300% at break	Pass
Ozone Resistance	no visible signs of cracking	Pass
Aging and Storage	300% elongation applied (10 Years)	Pass
UV Resistance	No visible signs of cracking	Pass

J. Manhole Inverts:

1. Manhole inverts shall be formed with 3,000 psi concrete. Inverts shall be constructed as

shown on the Contract Drawings and shall form a smooth finish. Inverts may be shop fabricated or constructed on site.

K. Manhole Steps:

1. Plastic manhole steps shall be PS1-PF (Press Fit) polypropylene plastic as manufactured by MA Industries, Peachtree City, Georgia or equal. Steps shall be driven into specially sized holes cast into the manhole section. Holes shall be formed in the manhole section using an insert plug that is removed upon curing.
2. Steps shall be aligned vertically above the outlet, in line with the flow through. Step spacing shall be 16”.

L. Manhole Frames and Covers:

1. Manhole castings shall consist of cast iron frames with a minimum clear opening of twenty-two (22) inches. Casting shall have a minimum of four (4) bolt holes for the purpose of anchoring the casting to the manhole cone or grade ring. Manhole frame castings shall be securely anchored to the manhole. Anchoring shall be by means of ½” diameter stainless steel wedge anchor. Wedge anchors shall only be placed in the cone section or flat top slab, with anchor rod passing through grade ring and frame casting.
2. Manhole covers must set neatly in the rings, with contact edges machined for even bearing and tops flush with ring edge. They shall have sufficient corrugations to prevent slipperiness and be marked in large letters, "SANITARY SEWER". The covers shall have two concealed pick holes. Covers on sanitary sewer manholes shall not be perforated.
3. Acceptable manufacturers are J.R. Hoe & Sons, Middlesboro, KY; John Bouchard & Sons Co., Nashville, TN; and Neenah Foundry Company, Neenah, WI., or equal.
 - a. Where indicated on the Drawings or in the Specifications, Traffic Weight Manhole frames and covers shall be provided. These shall weigh a minimum of 325 pounds.
 - b. Non-Traffic Weight: Manhole frame and cover weight to be minimum of 250 pounds.

M. Watertight Manhole Covers:

1. Watertight manhole covers shall consist of cast iron frames with machined bearing surfaces, continuous gasket seal preinstalled into slots with dovetail design and shall be of the self-sealing type as manufactured by Neenah Foundry Company or equal. Watertight manhole covers shall have sufficient corrugations to prevent slipperiness and be marked in large letters "SANITARY SEWER". Weight of manhole covers shall be as specified in Paragraph 2.1.K of this specification.

N. Pipe Connections Into Manholes:

1. Sewer pipe shall be sealed in the manhole section pipe openings with a resilient connector meeting the requirements of ASTM C923. Resilient connector shall be A-Lok or Z-Lok by A-Lok Products, Inc., Cast-A-Seal 12-08 by Press-Seal Gasket Corporation, or equal.
2. Resilient connector shall be cast integrally into the wall of the manhole section at time of manufacture. There shall be no mortar placed around the connector on the outside of the

manhole and no mortar shall be placed around the top half of the connector on the inside of the manhole when completing the invert work.

- 3. Resilient connectors requiring compression clamps or take up clamps will not be approved.
- 4. Wherever plastic sewer pipe is to be field grouted into manhole openings, pipe-to-manhole connector seal shall be Fernco Concrete Manhole Adapters manufactured by Fernco, Inc., Division, Michigan, or equal. Adapter shall be mounted on pipe and shall be positioned about the center of the manhole wall.

O. Precast Concrete Manhole Base Sections:

- 1. Precast concrete manhole base sections, if provided in lieu of cast-in-place foundations, shall be "monolithic", consisting of base slab, and base riser section. Upon review and approval by the Owner and Engineer, precast base sections may include floor invert channel and apron. All precast base sections with pipe openings shall be furnished with ASTM C 923 pipe-to-manhole connector gaskets, as specified hereinbefore. Precast base sections shall be furnished with an integral anti-flotation footing, thickness as specified hereinafter, with 6-inch projection, as shown in the Details. Precast base sections shall be set on a 6-inch deep pad (compacted thickness) of dense graded aggregate, placed to proper elevation and leveled. The Engineer reserves the right to inspect precast manhole base sections at the construction site and to reject the use of such sections if the Engineer determines the products unsuitable for the Owner's installation.
- 2. Precast concrete manhole base slab thickness shall comply with the following schedule:

0' - 10'	Vertical Height - 6" Slab
10.1' - 15'	Vertical Height - 8" Slab
15.1' - 20'	Vertical Height - 10" Slab
20.1' - 25'	Vertical Height - 12" Slab
25.1' - 30'	Vertical Height - 14" Slab

P. Drop Connections into Manholes

- 1. Where indicated on the Drawings, drop connections into manholes shall be installed. Drop connections shall be cast-in-place or precast, and shall conform to the requirements shown on the Details.

Q. External Rubber Chimney Seal:

- 1. This section shall include the complete external rubber chimney seal manhole sealing system. The sealing system shall prevent leakage of water into the manhole through the frame joint area and through the adjustment ring area. All materials required for the installation of the sealing system shall be furnished by the contractor and shall be new, of first grade, and shall be of reputable manufacturers known to the trade.
- 2. The casting shall be sealed to the structure with an external rubber chimney sealing system as manufactured by Sealing Systems, Inc., or approved equal. The seal shall be a continuous seamless band made of high quality EPDM (Ethylene Propylene Diene Monomer) rubber with a minimum thickness of 65 mils. There shall be a preformed L shaped corner molded into the top of the seal. The top section and the side section will extend from the L shaped corner at a generally 90-degree angle to each other. Wherein the seal is pre-formed in substantially the same shape as when attached to the manhole structure. The thickness of the L shaped corner extending 1" into the top section and 1"

down the side section is increased and may be at least twice the thickness of the top section reinforcing the seal at this particular area. There shall be a 2" to 3" wide strip of butyl mastic attached to the underside of top section of the seal. There shall be a 2" wide strip of butyl mastic attached to the inside of the side section at the bottom of the seal. The mastic shall be non-hardening butyl rubber sealant, with a minimum thickness of 1/8", and shall seal to the cone/top of the manhole section and over the flange of the casting frame. An aerosol primer shall be used to enhance the bond strength of the seal to the structure.

2.2 COMPRESSION COUPLINGS

- A. When joining different types of pipe together or new pipe to existing pipe, the Contractor shall use Fernco Compression Couplings, or equal, that are resistant to corrosion by soil and sewage and that will provide a permanent watertight joint. The compression coupling shall meet the physical test and joint-leak requirements specified in ASTM C-594. The bands for attaching pipes shall be stainless steel conforming to ASTM C-594. Each coupling shall bear the manufacturer's name and an indication of its size.

PART 3 - EXECUTION

3.1 EXCAVATION FOR MANHOLE INSTALLATION

- A. Unless otherwise directed by the Engineer, excavation in which manholes are to be installed shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the manhole to be properly bedded.
- B. Excavation may be undercut to a depth below the required invert elevation that will permit installing the manhole on a bed of granular material to provide continuous support for the manhole base. When this method is used, the bedding shall be as set out in Paragraph 3.2 hereinafter.
- C. Excavations shall be of sufficient dimensions to provide free working space on all sides of the manhole and to permit proper backfilling around the manhole. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the excavation.
- D. The excavation shall be straight and uniform so as to permit installation of the manhole to lines and grades given by the Engineer. It shall be kept free of water during the installation of the manhole and until the manhole has been backfilled. Removal of water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by the Owner or the Engineer, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

3.2 MANHOLE BEDDING

- A. All manholes shall be supported on a bed of granular material. In no case shall manhole be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom excavations, as well as rock bottom excavations. Bedding material shall be free from rock, foreign material, frozen earth, and be acceptable to the Engineer. Bedding shall be a minimum of 6" below manhole base.
- B. Granular bedding shall be Size #9-m or ASTM C 33, Size #7 crushed stone, fine gravel, or sand, and is not a separate pay item.
- C. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the manhole will be at least six inches above the bottom of the excavation. Undercutting is not a separate pay item.
- D. In wet, yielding, mucky locations where the manhole is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe and/or manhole might take place during the placing of the backfill, the pipe and/or manhole must be weighted or secured permanently in place by such means as will prove effective. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary excavation depth in order to prepare a proper bed for the manhole. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.

3.4 SPECIAL GRANULAR FILL

- A. As noted in Paragraph 3.2.D, granular material for " Special Granular Fill " when directed by the Engineer shall be Department of Transportation crushed limestone, Size #9. Payment for " Special Granular Fill " must have approval from the Engineer prior to installation.

3.5 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

- A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipelines and manholes under this Contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Prior to excavating, the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed excavation to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the manhole has been installed and prior to placing the new base and pavement.
- C. Backfilling of the excavation shall be in accordance with Method "C" as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge

Construction of the Department of Transportation, to a depth of six (6) inches in roads and streets and four (4) inches in driveways.

- D. A subslab of reinforced concrete shall be placed for state maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 3000 psi, in accordance with the Details shown on the Drawings.
- E. Bituminous Concrete Surface and Bituminous Concrete Base shall conform to the requirements of Sections 402 and 403 of the Standard Specifications for Road and Bridge Construction of the Department of Transportation.

3.8 MANHOLE FRAME INSTALLATION

- A. The manhole frame casting shall be centered over the opening in the cone or grade ring of the manhole, with a bituminous mastic joint sealing compound applied between the concrete and the casting.
- B. The frame shall be bolted to the cone or grade ring with stainless steel wedge anchors.

3.9 EXTERNAL RUBBER CHIMNEY SEAL INSTALLATION

- A. The external rubber chimney seal sealing system shall be installed according to the manufacturer's recommendations. The top section of the seal shall extend 3" attaching to the casting base/flange with the side section covering over the entire grade adjustment ring area and onto the cone section a minimum of 2".

3.10 TESTING

This specification shall govern the vacuum testing of sanitary sewer manholes and structures and shall be used as a method of determining acceptability by the Owner, in accepting maintenance of a sanitary sewer manhole or structure on behalf of the public. Test procedure shall comply with ASTM C1244. Other forms of testing of some manholes may be required, as deemed necessary by the Owner.

- A. Manholes shall be tested after installation with all connections in place.
 - 1. Lift holes, if any, shall be plugged with an approved, non-shrinkable grout prior to testing.
 - 2. Drop connections shall be installed prior to testing.
 - 3. The vacuum test shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings.
 - 4. The manholes shall be backfilled and finished to design grade.
- B. Test Procedure:
 - 1. Temporarily plug, with the plugs being braced to prevent the plugs or pipes from being drawn into the manhole, all pipes entering the manhole at least eight inches into the sewer pipe(s). The plug must be inflated at a location past the manhole/pipe gasket.
 - 2. The test head shall be placed inside the frame at the tope of the manhole and inflated, in

accordance with the manufacturer's recommendations.

3. A vacuum of 10" of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and disconnect the vacuum line.
4. The pressure gauge shall be liquid filled, having a 3.5 inch diameter face with a reading from zero to thirty inches of mercury.
5. The manhole shall be considered to pass the vacuum test if it holds at least 9 inches of mercury for the following time durations:

Manhole Depth	Time (Minutes)		
	4' Diameter	5' Diameter	6' Diameter
20 Feet or Less	1	2	3
20.1 to 30 Feet	2	3	4

6. If a manhole fails the vacuum test, the manhole shall be repaired with a non-shrinkable grout or other suitable material based on the material of which the manhole is constructed and retested, as stated above.
 7. All temporary plugs and braces shall be removed after each test.
- C. Manholes will be accepted as having passed the vacuum test requirements if they meet the criteria stated above.

3.10 CLEAN UP

- A. Upon completion of installation of the manholes and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground around and adjacent to the construction area in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

END OF SECTION 333913

PREPARED BY _____
 CHECKED BY _____
 APPROVED BY _____
 DATE _____
 DATE _____
 DATE _____

USER: \$\$\$USER\$\$\$
 DATE: \$\$\$DATE\$\$\$
 FILE NAME: \$\$\$designFiles\$Specification\$\$\$
 E-SHEET NAME: _____

NOTES:
 1. FITTINGS SHALL BE INCIDENTAL TO PIPE

KYTC Item No.	Description	Unit	Drawings Sheet Numbers									Total Units	
			U1	U2	U3	U4	U5	U6	U7	U8	U9		
Water													
14040	16" DI Water Main	LF	23	301									324
14039	12" DI Water Main	LF	412	290	368	609	618	584	587	618	275		4,371
14039	12" DI Water Main with Nitrile Gasket	LF	345	71									416
14037	8" DI Water Main	LF	80	54	156								290
14036	8" DI Water Main	LF			8								14
14056	W Pipe PVC 02 Inch	LF				14							14
14179	W Pipe Polyethylene/Plastic 1 inch	LF								51			51
14016	20" Steel Casing Pipe Open Cut (Range 5)	LF					20	20					40
14011	30" Steel Casing Pipe Bored & Jacked w/ Casing Spacers (Range 6)	LF		80									80
14017	30" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 6)	LF		30									30
14009	16" Steel Casing Pipe Bored & Jacked w/ Casing Spacers (Range 4)	LF				72							72
14014	12" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 3)	LF								20			20
14015	16" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 4)	LF											28
14016	24" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 5)	LF	55	85	65	28	30						235
14003	Cut, Cap and Block/Abandoned Water Main	EA	2	4	2	1	4	1	1	6	2		22
14019	6" Fire Hydrant Assembly w/ Gate Valve	EA	1	1	1	1	1	1	1	1	1		6
14021	Remove Existing Fire Hydrant Assembly	EA	1	1	1	1	1	1	1	1	1		9
14090	Connect to Existing System via 16" Tapping Sleeve, 16" Valve & Valve Box (Size 2)	EA	1	1						1	1		1
14090	Connect to Existing System via 12" Tapping Sleeve, 12" Valve & Valve Box (Size 2)	EA	1	1						1	1		5
14089	Connect to Existing System via 6" Tapping Sleeve, 2" Valve & Valve Box (Size 1)	EA								1	1		1
14089	Connect to Existing System via 2" Tapping Sleeve, 2" Valve & Valve Box (Size 1)	EA					2						2
14089	Connect to Existing System via 1" Compression Coupling and Corp Stop	EA								1			1
14089	Connect to Existing System via 8" Solid Sleeve	EA		2	3								5
14109	16" Gate Valve & Box	EA	2	2				2	2	3	4		17
14106	12" Gate Valve & Box	EA											1
14106	8" Gate Valve & Box	EA											1
14105	6" Gate Valve & Box	EA											1
		TONS											2.36
14030	Ductile Iron Fittings (Incidental to pipe)	EA	1	3	2	1	2	5	4	5	4		27
14080	Relocate Existing Water Meter	EA		2			1	2	1	1			7
14085	3/4" Service Reconnection - Long Side	EA	1	3			2	1	3	3	4		21
14085	3/4" Service Reconnection - Short Side	EA											4
2735	Driveway/Entrance Restoration	LF	2	56	24	40	74	65	129	30			418
14177	Structure Removal (i.e. Valve Boxes)	EA		2									2
2690	Safeload Existing Water Main Under Roadway	CUYD	6.92	3.344	19.33	19.94	14.28			2.384			66
Sanitary													
15117	24" PVC Sanitary Sewer	LF						241		610	101		952
15118	15" PVC Sanitary Sewer	LF					215	327					542
15114	12" PVC Sanitary Sewer	LF	141	142									283
15113	10" PVC Sanitary Sewer	LF									62		62
15112	8" PVC Sanitary Sewer	LF					201			38			239
15063	12" PVC Force Main	LF	359					67					426
15060	6" PVC Force Main	LF								132			132
15018	24" Steel Casing Pipe Bored & Jacked w/ Casing Spacers (Range 5)	LF	100				80	80					260
15017	18" Steel Casing Pipe Bored & Jacked w/ Casing Spacers (Range 4)	LF									55		55
15016	12" Steel Casing Pipe Bored & Jacked w/ Casing Spacers (Range 3)	LF								67			67
15022	12" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 3)	LF								25			25
15092	4' Diameter Precast Manhole (0'-6" Deep)	EA	1	2			5	4	2	4	3		21
15094	Adjust Manhole to Grade	EA	1	1			1						2
15093	Remove/Abandon Existing Manhole	EA	1	1			1	2	2	5	2		14
15099	Connect to Existing Manhole	EA					1			2			3
14089	Solid Sleeve	EA	2							2			4
15155	Cut, Cap and Block Existing Force Main	EA	1							2			3
		TONS	0.26										0.26
15089	Sanitary Sewer Reconnect Short Side	EA	1	2			2						6
15155	Cut and Cap 24" Sewer	EA								1			1
15155	Cut and Cap 15" Sewer	EA											2
15155	Cut and Cap 10" Sewer	EA							1				2
15155	Cut and Cap 8" Sewer	EA					1						2
15155	Cut and Cap 6" Sewer	EA											2
15155	Cut and Cap 4" Sewer	EA									1		1
15077	1/2 Force Main Tie-In	EA	1										1
15074	6" Force Main Tie-In	EA								1			1
2690	Safeload Existing Sewer Under Roadway	CUYD	6.629	2.035			2.62			21.22	1.89		34.6

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 CHECKED BY _____
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 APPROVED BY _____
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14056	W Pipe PVC 02 inch	LF				14							14
14179	W Pipe Polyethylene/Plastic 1 inch	LF					20	20					51
14016	30" Steel Casing Pipe Open Cut (Range 5)	LF											40
14011	30" Steel Casing Pipe Bored & Jacked w/ Casing Spacers (Range 6)	LF		80									80
14017	30" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 6)	LF		30									30
14009	16" Steel Casing Pipe Bored & Jacked w/ Casing Spacers (Range 4)	LF			72								72
14014	12" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 3)	LF							20				20
14015	16" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 4)	LF			28								28
14016	24" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 5)	LF	55	85	65	30							235
14003	Cut, Cap and Block/Abandoned Water Main	EA	2	4	2	1	4	1	6	2			22
14019	6" Fire Hydrant Assembly w/ Gate Valve	EA	1	1	1	1	1	1	1	1			6
14021	Remove Existing Fire Hydrant Assembly	EA	1	1	1	1	1	1	1	1			6
14090	Connect to Existing System via 16" Tapping Sleeve, 16" Valve & Valve Box (Size 2)	EA	1	1					1	1			1
14090	Connect to Existing System via 12" Tapping Sleeve, 12" Valve & Valve Box (Size 2)	EA	1	1					1	1			5
14089	Connect to Existing System via 6" Tapping Sleeve, 2" Valve & Valve Box (Size 1)	EA							1	1			1
14089	Connect to Existing System via 2" Tapping Sleeve, 2" Valve & Valve Box (Size 1)	EA				2							2
14089	Connect to Existing System via 1" Compression Coupling and Corp Stop	EA				1							1
14089	Connect to Existing System via 8" Solid Sleeve	EA		2	3								5
14109	16" Gate Valve & Box	EA	2	2					2	3	4		17
14106	12" Gate Valve & Box	EA				1							1
14106	8" Gate Valve & Box	EA											1
14105	6" Gate Valve & Box	EA											1
	Ductile Iron Fittings (Incidental to pipe)	TONS											2.36
14030	Relocate Existing Water Meter	EA	1	3	2	1	2	5	4	5	4		27
14080	3/4" Service Reconnection - Long Side	EA		2		1	2	1	1				7
14085	3/4" Service Reconnection - Short Side	EA	1	3		2	1	3	3	4	4		21
2735	Driveway/Entrance Restoration	LF		56	24	40	74	65	129	30			418
14177	Structure Removal (i.e. Valve Boxes)	EA	2										2
2690	Safeload Existing Water Main Under Roadway	CUYD	6.92	3.344	19.33	19.94	14.28		2.384				66
Sanitary													
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15016	12" Steel Casing Pipe Bored & Jacked w/ Casing Spacers (Range 3)	LF							67				67
15022	12" Steel Casing Pipe Open Cut w/ Casing Spacers (Range 3)	LF							25				25
15092	4" Diameter Precast Manhole (0'-6" Deep)	EA	1	2		5	4	2	4	3			21
15094	Adjust Manhole to Grade	EA	1	1		1							2
15093	Remove/Abandon Existing Manhole	EA	1	1		1	2	2	5	2			14
15099	Connect to Existing Manhole	EA				1			2	2			3
14089	Solid Sleeve	EA	2						2				4
15155	Cut, Cap and Block Existing Force Main	EA	1						2				3
	Fittings (Incidental to pipe)	TONS	0.26										0.26
15089	Sanitary Sewer Reconnect Short Side	EA	1	2		2							6
15155	Cut and Cap 24" Sewer	EA											1
15155	Cut and Cap 15" Sewer	EA	1					1					2
15155	Cut and Cap 10" Sewer	EA											2
15155	Cut and Cap 8" Sewer	EA				1							2
15155	Cut and Cap 6" Sewer	EA											2
15155	Cut and Cap 4" Sewer	EA									1		1
15077	1/2" Force Main 11e-in	EA	1										1
15074	6" Force Main 11e-in	EA									1		1
2690	Safeload Existing Sewer Under Roadway	CUYD	6.629	2.035			2.62		21.22	1.89			34.6