Andy Beshear
GOVERNOR

TRANSPORTATION CABINET
200 Mero Street
Frankfort, Kentucky 40601

Jim Gray
SECRETARY

December 6, 2024

CALL NO. 105
CONTRACT ID NO. 241113
ADDENDUM # 2

Subject: Pulaski County, RRS 5178(002)
Letting December 12, 2024

(1) Revised – Proposal Pages 135-139 of 139
(2) Added – Special Notes – Pages 1-64 of 64

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

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

Sincerely,

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

RM:mr
Enclosures

241113

PROPOSAL BID ITEMS

Report Date 12/6/24

Section: 0001 - PAVING

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0010	00003		CRUSHED STONE BASE	7,509.00	TON		$	
0020	00013		LIME STABILIZED ROADBED	7,992.00	SQYD		$	
0030	00014		LIME	143.00	TON		$	
0040	00020		TRAFFIC BOUND BASE	416.00	TON		$	
0050	00078		CRUSHED AGGREGATE SIZE NO 2	1,808.00	TON		$	
0060	00100		ASPHALT SEAL AGGREGATE	67.00	TON		$	
0070	00103		ASPHALT SEAL COAT	8.10	TON		$	
0080	00190		LEVELING & WEDGING PG64-22	18.00	TON		$	
0090	00212		CL2 ASPH BASE 1.00D PG64-22	5,478.00	TON		$	
0100	00301		CL2 ASPH SURF 0.38D PG64-22	1,509.00	TON		$	
0110	00356		ASPHALT MATERIAL FOR TACK	13.00	TON		$	
0120	00358		ASPHALT CURING SEAL	8.00	TON		$	
0130	02101		CEM CONC ENT PAVEMENT-8 IN	227.00	SQYD		$	
0140	02585		EDGE KEY	134.00	LF		$	
0150	02602		FABRIC-GEOTEXTILE CLASS 1	4,810.00	SQYD		$	
0160	02676		MOBILIZATION FOR MILL & TEXT	1.00	LS		$	
0170	02677		ASPHALT PAVE MILLING & TEXTURING	57.00	TON		$	
0180	02702		SAND FOR BLOTTER	20.00	TON		$	
0190	20071EC		JOINT ADHESIVE	14,979.00	LF		$	
0200	21289ED		LONGITUDINAL EDGE KEY	284.00	LF		$	

Section: 0002 - ROADWAY

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0210	01000		PERFORATED PIPE-4 IN	184.00	LF		$	
0220	01010		NON-PERFORATED PIPE-4 IN	40.00	LF		$	
0230	01020		PERF PIPE HEADWALL TY 1-4 IN	1.00	EACH		$	
0240	01028		PERF PIPE HEADWALL TY 3-4 IN	3.00	EACH		$	
0250	01310		REMOVE PIPE	134.00	LF		$	
0260	01585		REMOVE DROP BOX INLET	1.00	EACH		$	
0270	01691		FLUME INLET TYPE 2	2.00	EACH		$	
0280	01810		STANDARD CURB AND GUTTER	1,754.00	LF		$	
0290	01875		STANDARD HEADER CURB	364.00	LF		$	
0300	01987		DELINEATOR FOR GUARDRAIL BI DIRECTIONAL WHITE	70.00	EACH		$	
0310	01990		DELINEATOR FOR BARRIER WALL-B/W	6.00	EACH		$	
0320	02014		BARRICADE-TYPE III	23.00	EACH		$	
0330	02091		REMOVE PAVEMENT	1,457.00	SQYD		$	
0340	02159		TEMP DITCH	2,295.00	LF		$	
0350	02160		CLEAN TEMP DITCH	1,147.00	LF		$	
0360	02223		GRANULAR EMBANKMENT	2,472.00	CUYD		$	
0370	02230		EMBANKMENT IN PLACE	118,045.00	CUYD		$	
0380	02242		WATER	57.00	MGAL		$	
0390	02351		GUARDRAIL-STEEL W BEAM-S FACE	3,859.50	LF		$	
0400	02360		GUARDRAIL TERMINAL SECTION NO 1	11.00	EACH		$	
0410	02367		GUARDRAIL END TREATMENT TYPE 1	5.00	EACH		$	

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0420	02371		GUARDRAIL END TREATMENT TYPE 7	2.00	EACH		$	
0430	02429		RIGHT-OF-WAY MONUMENT TYPE 1	43.00	EACH		$	
0440	02432		WITNESS POST	6.00	EACH		$	
0450	02483		CHANNEL LINING CLASS II	54.00	TON		$	
0460	02484		CHANNEL LINING CLASS III	236.00	TON		$	
0470	02545		CLEARING AND GRUBBING 15 ACRES	1.00	LS		$	
0480	02551		CONCRETE-CLASS A FOR STEPS	.80	CUYD		$	
0490	02562		TEMPORARY SIGNS	444.00	SQFT		$	
0500	02602		FABRIC-GEOTEXTILE CLASS 1 DITCHES	410.00	SQYD		$	
0510	02603		FABRIC-GEOTEXTILE CLASS 2	3,687.00	SQYD		$	
0520	02650		MAINTAIN & CONTROL TRAFFIC	1.00	LS		$	
0530	02651		DIVERSIONS (BY-PASS DETOURS) KY 635	1.00	LS		$	
0540	02651		DIVERSIONS (BY-PASS DETOURS) TROY GODBY LN	1.00	LS		$	
0550	02690		SAFELOADING	4.60	CUYD		$	
0560	02701		TEMP SILT FENCE	4,170.00	LF		$	
0570	02703		SILT TRAP TYPE A	15.00	EACH		$	
0580	02704		SILT TRAP TYPE B	15.00	EACH		$	
0590	02705		SILT TRAP TYPE C	15.00	EACH		$	
0600	02706		CLEAN SILT TRAP TYPE A	15.00	EACH		$	
0610	02707		CLEAN SILT TRAP TYPE B	15.00	EACH		$	
0620	02708		CLEAN SILT TRAP TYPE C	15.00	EACH		$	
0630	02720		SIDEWALK-4 IN CONCRETE	683.00	SQYD		$	
0640	02726		STAKING	1.00	LS		$	
0650	05950		EROSION CONTROL BLANKET	2,869.00	SQYD		$	
0660	05952		TEMP MULCH	49,855.00	SQYD		$	
0670	05953		TEMP SEEDING AND PROTECTION	37,389.00	SQYD		$	
0680	05963		INITIAL FERTILIZER	2.80	TON		$	
0690	05964		MAINTENANCE FERTILIZER	1.70	TON		$	
0700	05985		SEEDING AND PROTECTION	47,011.00	SQYD		$	
0710	05990		SODDING	1,163.00	SQYD		$	
0720	05992		AGRICULTURAL LIMESTONE	33.00	TON		$	
0730	06510		PAVE STRIPING-TEMP PAINT-4 IN	14,450.00	LF		$	
0740	06514		PAVE STRIPING-PERM PAINT-4 IN	2,254.00	LF		$	
0750	06542		PAVE STRIPING-THERMO-6 IN W	5,752.00	LF		$	
0760	06543		PAVE STRIPING-THERMO-6 IN Y	5,532.00	LF		$	
0770	06556		PAVE STRIPING-DUR TY 1-6 IN W	298.00	LF		$	
0780	06557		PAVE STRIPING-DUR TY 1-6 IN Y	298.00	LF		$	
0790	06565		PAVE MARKING-THERMO X-WALK-6 IN	75.00	LF		$	
0800	06568		PAVE MARKING-THERMO STOP BAR-24IN	128.00	LF		$	
0810	10020NS		FUEL ADJUSTMENT	34,795.00	DOLL	$1.00	$	$34,795.00
0820	10030NS		ASPHALT ADJUSTMENT	27,387.00	DOLL	$1.00	$	$27,387.00
0830	20191ED		OBJECT MARKER TY 3	5.00	EACH		$	
0840	23010EN		PAVE MARK TEMP PAINT STOP BAR-24 IN	100.00	LF		$	
0850	23055N		REMOVE REMOVE RR CROSSING PAVEMENT MARKINGS	1.00	LS		$	
0860	23158ES505		DETECTABLE WARNINGS	52.00	SQFT		$	

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0870	23274EN11F		TURF REINFORCEMENT MAT 1	1,263.00	SQYD		$	
0880	24540		R/W MONUMENT TYPE 3	11.00	EACH		$	
0890	24541		R/W MONUMENT TYPE 3A	3.00	EACH		$	
0900	24665EX		RAILROAD COORDINATION	1.00	LS		$	
0910	25079ED		THRIE BEAM GUARDRAIL TRANSITION TL-2	4.00	EACH		$	

Section: 0003 - DRAINAGE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
0920	00440		ENTRANCE PIPE-15 IN	412.00	LF		$	
0930	00441		ENTRANCE PIPE-18 IN	31.00	LF		$	
0940	00462		CULVERT PIPE-18 IN	134.00	LF		$	
0950	00464		CULVERT PIPE-24 IN	85.00	LF		$	
0960	00490		CULVERT PIPE-15 IN EQUIV	34.00	LF		$	
0970	00521		STORM SEWER PIPE-15 IN	56.00	LF		$	
0980	00522		STORM SEWER PIPE-18 IN	223.00	LF		$	
0990	00524		STORM SEWER PIPE-24 IN	60.00	LF		$	
1000	01202		PIPE CULVERT HEADWALL-15 IN	2.00	EACH		$	
1010	01204		PIPE CULVERT HEADWALL-18 IN	2.00	EACH		$	
1020	01370		METAL END SECTION TY 1-15 IN	2.00	EACH		$	
1030	01371		METAL END SECTION TY 1-18 IN	1.00	EACH		$	
1040	01390		METAL END SECTION TY 3-15 IN	8.00	EACH		$	
1050	01391		METAL END SECTION TY 3-18 IN	6.00	EACH		$	
1060	01440		SLOPED BOX INLET-OUTLET TYPE 1	2.00	EACH		$	
1070	01451		S & F BOX INLET-OUTLET-24 IN	4.00	EACH		$	
1080	01456		CURB BOX INLET TYPE A	3.00	EACH		$	
1090	01642		JUNCTION BOX-18 IN	1.00	EACH		$	
1100	01761		MANHOLE TYPE B	1.00	EACH		$	
1110	02607		FABRIC-GEOTEXTILE CLASS 2 FOR PIPE	671.00	SQYD	$2.00	$	$1,342.00
1120	24814EC		PIPELINE INSPECTION	835.00	LF		$	

Section: 0004 - RCBC

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1130	08002		STRUCTURE EXCAV-SOLID ROCK	47.00	CUYD		$	
1140	08003		FOUNDATION PREPARATION	1.00	LS		$	
1150	08100		CONCRETE-CLASS A	142.60	CUYD		$	
1160	08150		STEEL REINFORCEMENT	15,734.00	LB		$	

Section: 0005 - BRIDGE

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1170	00021		DRAINAGE BLANKET-EMBANKMENT	657.00	CUYD		$	
1180	01643		JUNCTION BOX-24 IN	4.00	EACH		$	
1190	02231		STRUCTURE GRANULAR BACKFILL	1,118.00	CUYD		$	
1200	02603		FABRIC-GEOTEXTILE CLASS 2	3,296.00	SQYD		$	

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LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1210	02692		SETTLEMENT PLATFORM	1.00	EACH		$	
1220	03299		ARMORED EDGE FOR CONCRETE	70.00	LF		$	
1230	03340		STEEL PIPE-2 1/2 IN	31.50	LF		$	
1240	03343		STEEL PIPE-4 IN (REVISED 12-6-24)	30.00	LF		$	
1250	04797		CONDUIT-3 IN	178.00	LF		$	
1260	04799		CONDUIT-4 IN	178.00	LF		$	
1270	08003		FOUNDATION PREPARATION	1.00	LS		$	
1280	08020		CRUSHED AGGREGATE SLOPE PROT	5,421.00	TON		$	
1290	08033		TEST PILES	101.00	LF		$	
1300	08039		PRE-DRILLING FOR PILES	911.00	LF		$	
1310	08052		PILES-STEEL HP14X117	985.00	LF		$	
1320	08100		CONCRETE-CLASS A	176.70	CUYD		$	
1330	08104		CONCRETE-CLASS AA	316.40	CUYD		$	
1340	08151		STEEL REINFORCEMENT-EPOXY COATED	90,760.00	LB		$	
1350	08160		STRUCTURAL STEEL 225,468 LBS	1.00	LS		$	
1360	08170		SHEAR CONNECTORS	1.00	LS		$	
1370	08709		BRIDGE CHAIN LINK FENCE-7 FT	281.00	LF		$	
1380	20391NS835		ELECTRICAL JUNCTION BOX TYPE A	4.00	EACH		$	
1390	23378EC		CONCRETE SEALING	11,973.00	SQFT		$	
1400	25028ED		RAIL SYSTEM SINGLE SLOPE - 40 IN	148.00	LF		$	

Section: 0006 - UTILITY

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1410	02556		CONCRETE CAP	1.00	CUYD		$	
1420	14003		W CAP EXISTING MAIN	12.00	EACH		$	
1430	14005		W ENCASEMENT CONCRETE	20.00	LF		$	
1440	14014		W ENCASEMENT STEEL OPEN CUT RANGE 3	177.00	LF		$	
1450	14015		W ENCASEMENT STEEL OPEN CUT RANGE 4	529.00	LF		$	
1460	14019		W FIRE HYDRANT ASSEMBLY	5.00	EACH		$	
1470	14025		W METER 1 INCH	9.00	EACH		$	
1480	14058		W PIPE PVC 04 INCH	552.00	LF		$	
1490	14059		W PIPE PVC 06 INCH	1,712.00	LF		$	
1500	14077		W SERV PE/PLST LONG SIDE 1 IN	3.00	EACH		$	
1510	14082		W SERV PE/PLST SHORT SIDE 1 IN	6.00	EACH		$	
1520	14092		W TIE-IN 03 INCH	1.00	EACH		$	
1530	14094		W TIE-IN 06 INCH	9.00	EACH		$	
1540	14104		W VALVE 04 INCH	4.00	EACH		$	
1550	14105		W VALVE 06 INCH	11.00	EACH		$	
1560	15000		S BYPASS PUMPING	1.00	EACH		$	
1570	15025		S ENCASEMENT STEEL OPEN CUT RANGE 6	414.00	LF		$	
1580	15087		S LATERAL LONG SIDE 04 INCH	3.00	EACH		$	
1590	15089		S LATERAL SHORT SIDE 04 INCH	4.00	EACH		$	
1600	15092		S MANHOLE	8.00	EACH		$	
1610	15093		S MANHOLE ABANDON/REMOVE	2.00	EACH		$	
1620	15101		S MANHOLE WITH DROP	1.00	EACH		$	
1630	15112		S PIPE PVC 08 INCH	1,016.00	LF		$	

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PROPOSAL BID ITEMS

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Section: 0007 - SIGNING

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1640	06406		SBM ALUM SHEET SIGNS .080 IN	477.81	SQFT		$	
1650	06407		SBM ALUM SHEET SIGNS .125 IN	73.00	SQFT		$	
1660	06410		STEEL POST TYPE 1	963.00	LF		$	
1670	06490		CLASS A CONCRETE FOR SIGNS	1.25	CUYD		$	
1680	21373ND		REMOVE SIGN	18.00	EACH		$	
1690	21596ND		GMSS TYPE D	5.00	EACH		$	
1700	24631EC		BARCODE SIGN INVENTORY	97.00	EACH		$	
1710	24805ED		OBJECT MARKER TYPE 4	12.00	EACH		$	

Section: 0008 - DEMOBILIZATION/MOBILIZATION

LINE	BID CODE	ALT	DESCRIPTION	QUANTITY	UNIT	UNIT PRIC	FP	AMOUNT
1720	02568		MOBILIZATION	1.00	LS		$	
1730	02569		DEMOBILIZATION	1.00	LS		$	

SECTION 02 41 00

DEMOLITION

PART 1–GENERAL

1.01 SUMMARY

A. Work Included: All demolition, removal, and salvage work as shown on the drawings or specified herein to include, but not necessarily limited to the following:
   1. Existing Water Mains.
   2. Existing Sanitary Sewers.

B. Related Sections and Divisions: Applicable provisions of the Contract Documents shall govern work in this section.

1.02 SUBMITTALS

A. CONTRACTOR shall submit permits and notices, if required, authorizing building demolition.

1.03 QUALITY ASSURANCE

A. CONTRACTOR shall perform demolition, removal, and salvage in conformity with applicable federal, state, and local safety practices and code requirements.

B. CONTRACTOR shall contact all public utilities and shall shut off, cut and cap all utility services in accordance with utility requirements, codes, rules and regulations.

C. Obtain and pay for all necessary permits, licenses and certificates required.

1.04 SEQUENCE

A. No demolition, removal, or salvage work shall commence until approval to proceed has been granted by OWNER. Such work shall be completed in accordance with the construction sequence included in the Contract Documents of these specifications and in accordance with the construction phases of this project and work to be done by other contractors.

PART 2–PRODUCTS

2.01 GENERAL

A. Compacted fill shall meet the requirements of Section 31 23 00–Excavation, Fill, Backfill, and Grading.

B. Pipe fittings and materials shall meet the requirements of Section 33 00 10–Buried Piping and Appurtenances.

PART 3–EXECUTION

3.01 BREAKING DOWN AND REMOVING STRUCTURES

A. General:
1. All existing structures, with all attached parts and connections, shown on the drawings or specified to be removed or that interfere with the new construction, shall be entirely removed within the limits shown or specified, unless otherwise provided.
2. When a portion of any existing structure is to be retained, CONTRACTOR shall take care during construction operations so as not to impair the value of the retained portion.
   a. Complete all operations necessary for the removal of any existing structure which might endanger the new construction prior to the construction of the new work.
   b. Do not use any equipment or devices which might damage structures, facilities, or property which are to be preserved and retained.
3. When existing reinforcing is exposed at the surface of removal areas, CONTRACTOR shall burn back the reinforcing bars 2 inches and patch with nonshrink grout, unless noted otherwise.

B. Pavement, Curb, Gutter, Sidewalk, Driveways, Crosswalk, and Similar Structures:
1. Where portions of the existing structure are to be left in the surface of the finished work, CONTRACTOR shall remove the structure to an existing joint, or saw and chip the structure to a true line.
2. Sufficient removal shall be made to provide for proper grades and connections in the new work.

C. Walls, Piers, Surface Drains, Foundations, and Similar Masonry Structures:
1. Remove entirely or break down to an elevation at least 2 feet below the earth subgrade within the areas of a road bed and elsewhere to 2 feet below the finished slopes or natural ground, as the case may be.
2. Remove existing construction as required to clear new construction.

3.02 ABANDONING STRUCTURES

A. Tanks, Manholes, Catch Basins, and Inlets:
1. CONTRACTOR shall thoroughly clean structures to be abandoned.
2. CONTRACTOR shall plug existing pipe connections with brick or concrete block masonry or with any grade of concrete having a 28-day compressive strength in excess of 2,000 psi.
3. CONTRACTOR shall remove the walls of the structures to an elevation at least 2 feet below the finished grade line, or to such elevation that may be designated on the drawings or as necessary to clear new construction.

3.03 ABANDONING AND REMOVING UTILITIES AND UNDERGROUND PROCESS PIPING

A. CONTRACTOR shall be responsible for the turning off or unhooking of all utilities and process piping before starting the demolition work. Remove all utility lines, including electrical services and process piping that are shown or specified to be removed. Remove utility lines that are to be abandoned as needed to clear new construction.

B. The ends of utility lines and process piping shown or specified to be abandoned that are exposed by excavation shall be plugged with concrete to prevent soil infiltration into the pipes.

3.04 BACKFILL

A. CONTRACTOR shall fill all abandoned structures and excavations resulting from removal of structures and utilities with compacted fill. See Section 31 23 00–Excavation, Fill, Backfill, and Grading for required degree of compaction.

B. Prior to filling, CONTRACTOR shall break one opening in the floor or wall near the base of each compartment to allow groundwater to freely migrate through the structure.

END OF SECTION

SECTION 31 10 00

CLEARING AND GRUBBING

PART 1–GENERAL

1.01 SUMMARY

A. Work Included:
   1. Cutting and disposing of trees, brush, windfalls, logs, and other vegetation.
   2. Removing and disposing of roots, stumps, stubs, logs, and other timber.

B. Related Sections and Divisions: Applicable provisions in the Contract Documents shall govern work in this section.

C. Payment: Payment for clearing and grubbing will be at the Unit Price Bid. Tree protection shall be incidental to area work.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

3.01 PREPARATION

A. CONTRACTOR shall identify existing plant life to remain and shall tag accordingly.

3.02 PROTECTION

A. CONTRACTOR shall protect from damage utilities and structures that are to remain.

B. CONTRACTOR shall protect trees, plant growth, and features designated to remain as final landscaping.

C. See the Contract Documents for protection of survey monumentation.

3.03 CLEARING AND GRUBBING

A. Clearing and grubbing shall consist of cutting and disposing of trees, brush, windfalls, logs, and other vegetation, and the removing and disposing of roots, stumps, stubs, grubs, logs, and other timber from within the clearing limits as defined on the Drawings, designated to be removed on the Drawings or in the Specifications, or fall within the excavation, embankment, or improved areas of the site.

B. All roots and stumps shall be removed to a depth of not less than 12 inches below the original ground surface in embankment areas. In cut areas, such material shall be removed to a depth of not less than 12 inches below the subgrade.

C. Disposal by burning or burying clearing and grubbing items within the project limits is not allowed.

3.04 TREE PROTECTION

A. Trees shall be protected when construction activities affect the root zones and limbs.

B. Minimize storage and use of heavy equipment and materials within Critical Root Zone (CRZ), which is considered 1 to 1 1/2 times the diameter (in) at breast height of tree. For example, a 10-inch-diameter tree would require a 10- to 15-foot diameter of protection.

C. Any exposed fine roots shall be kept damp. Any damaged roots above 1-inch diameter shall be cut clean.

D. Tree branches damaged as a result of construction activity shall be cut clean. CONTRACTOR shall make a good faith effort to follow and implement the tree protection plan.

END OF SECTION

SECTION 31 23 00

EXCAVATION, FILL, BACKFILL, AND GRADING

PART 1–GENERAL

1.01 SUMMARY

A. Work Included: Excavating, filling, backfilling, and grading for this work includes, but is not necessarily limited to:
   1. Excavating for footings, foundations, roads, utilities, sidewalks, driveways, parking lots, restoration, and miscellaneous areas.
   2. Furnishing and placing all fill and backfill.
   3. Provide compaction of all fill and backfill.
   4. Furnishing and placing vapor barrier and granular cushion below interior slabs on grade.
   5. Furnishing and placing of crushed stone mat below tank slabs and manhole/vault slabs, basement floors, or other structures where required.
   6. Rough and finish grading prior to paving, seeding, etc.

B. Related Sections and Divisions: Applicable provisions in the Contract Documents shall govern work in this section.

C. Payment: Common excavation shall include all excavation specified, undercutting, fill, backfill and grading, including rock excavation but not including unsuitable foundation material, as hereinafter described.

1.02 REFERENCED STANDARDS

A. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Kentucky, Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction, current edition, including all issued supplemental specifications. Unless specifically stated otherwise, the Measurement and Payment sections of the Standard Specifications shall not apply. Measurement and payment will be made in accordance with terms of the Contract Documents.

B. ASTM C33–Standard Specification for Concrete Aggregates.

C. ASTM D698–Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

D. ASTM D1557–Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

1.03 SUBMITTALS

A. Submit sources and gradations for materials proposed for use as compacted fill, utility trench backfill, trench bedding and cover material, crushed stone mat, and granular cushion.

B. Submit samples of materials proposed for use in Paragraph 1.03.A to a soils testing laboratory for analysis of its suitability and for recommendations on moisture content during compaction, compaction methods, or other appropriate information.

C. Submit sufficient samples of each different type or classification of soil to obtain representative values.

1.04 JOB CONDITIONS

A. The elevations shown for existing work and ground are reasonably correct, but are not guaranteed to be absolutely accurate. No extras will be allowed because of variations between drawings and actual grades.

B. Soil borings were made and the soils information is included in an appendix to these Specifications. The information contained is not guaranteed to be indicative of conditions to be encountered during construction. It is CONTRACTOR's responsibility to make its own investigations to determine physical conditions at the site, which may affect the work.

PART 2–PRODUCTS

2.01 COMPACTED FILL

A. All fill and backfill material designated to be compacted fill shall be granular with no stones larger than 4 inches and shall be reasonably well-graded throughout the particle size range. A minimum 65% of the material shall pass the 3/4-inch sieve, and the material shall be capable of being compaction tested in accordance with ASTM D698, as determined by the Project Soils Engineer. Of that portion of the material passing the No. 4 sieve, not more than 25% shall pass the No. 200 sieve, and material shall have less than 5% clay content. When placing fill during wet weather or in wet areas, this requirement shall be modified to not more than 5% passing the No. 200 sieve. Adequately dewatered areas are not defined as wet areas.

2.02 FLOWABLE FILL

A. Flowable fill shall be a self-compacting, self-leveling, material consisting of a mixture of fine aggregate and filler (as needed), water, and cementitious materials (Portland cement, fly ash, granulated blast furnace slag) that is in a flowable state at the time of placement meeting the requirements of the National Ready Mixed Concrete Association Guide Specification for Controlled Low Strength Materials (CLSM). The flowable fill shall be proportioned by the ready mixed concrete supplier on the basis of field experience and/or laboratory trial mixtures to produce a cohesive and nonsegregating mixture which has the following properties:
   1. Minimum compressive strength: 50 psi.
   2. Maximum compressive strength: 150 psi.

B. CONTRACTOR shall submit the following information well in advance of fill placement to avoid any delay in construction:
   1. Gradation of fine aggregate.
   2. Design mix.
   3. Previous test results with 7- and 28-day compressive strengths.
   4. Certified mill test results for cement identifying brand, type, and chemistry of cement to be used.
   5. Brand, type, principle ingredient, and amount of each admixture if used.

2.03 TRENCH BEDDING MATERIAL

A. Bedding material shall be hard and durable and shall be made by crushing sound limestone or dolomite ledge rock, or crushed gravel aggregate. Bedding material shall conform to the requirements of ASTM C33 and shall conform to gradations shown in the following table. No native soil shall be used for bedding material.

PERCENTAGE BY WEIGHT PASSING INDICATED SIEVE

Size	2 1/2 IN	2 IN	1 1/2 IN	1 IN	3/4 IN	1/2 IN	3/8 IN	No. 4	No. 8	No. 16	No. 30	No. 100	No. 200
57			100	95-100		25-60		0-10	0-5				
67				100	90-100		20-50	0-10	0-5				
8						100	85-100	10-30	0-10	0-5			
9							100	85-100	10-40	0-10	0-5		
10							100	85-100				10-30	

B. All rigid sanitary sewer pipe and related appurtenances shall be bedded and covered in accordance with the Class B bedding detail as shown on Drawing 01-975-43A. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.

C. Concrete and other rigid pipe used in nonsanitary sewer applications may be bedded using the Class C bedding detail as shown on Drawing 01-975-43A. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.

D. Ductile and cast iron pipe shall be bedded in accordance with Class C bedding detail as shown on Drawing 01-975-43A, or the Type 4 laying condition of AWWA C600. Bedding material shall conform to Size No. 57, No. 8, or No. 9. Where ductile iron pipe is polyethylene encased, bedding material shall conform to Size No. 8 or No. 9.

E. Thermoplastic sanitary sewer pipe and related appurtenances shall be bedded and covered in accordance with the Thermoplastic Pipe Bedding Detail on Drawing 01-975-43A. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.

F. All other sanitary sewer pipe and related appurtenances shall be bedded and covered in accordance with the Class B bedding detail as shown on Drawing 01-975-43A. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.

G. PVC water main or force main shall be bedded and covered in accordance with the Thermoplastic Pipe Bedding Detail on Drawing 01-975-43A or in accordance with the Type 4 laying condition of AWWA C605. HDPE water main or force main shall be bedded and covered in accordance with the Thermoplastic Pipe Bedding Detail on Drawing 01-975-43A or in accordance with ASTM D2774. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used. No native materials may be used.

H. Bedding material for copper water services shall conform to Size No. 9 or No. 10**.**

2.04 TRENCH COVER MATERIAL

A. Material which is to be placed from the bedding material to 1 foot above the top of the pipe shall be termed cover material. All trenches shall be backfilled by hand to 1 foot above the top of the pipe with cover material. Cover material shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously in 6-inch layers and shall be compacted using hand tamping bars and/or mechanical tampers. Use special care in placing cover material to avoid injury to or movement of the pipe. Cover material shall consist of durable granular particles ranging in size from fine to a maximum size of 3/4 inch. Unwashed bank run sand and crushed bank run gravel will be considered generally acceptable cover material. Cover material shall generally conform to the following gradation specifications:

COVER MATERIAL GRADATION

Sieve Size	Percentage by Weight Passing
1 inch	100
3/4 inch	85 to 100
3/8 inch	50 to 80
No. 4	35 to 65
No. 30	--
No. 40	15 to 30
No. 200	5 to 15

B. All bedding materials may be substituted for cover material when requested by CONTRACTOR except where polyethylene encasement is used. In such case, only those bedding materials specifically noted for polyethylene encasement may be used.

2.05 TRENCH BACKFILL MATERIAL

A. Backfill shall be that material placed between the top of cover material up to subgrade for placement of restoration materials. Backfill for storm inlets shall be bedding material.

B. When the type of backfill material is not otherwise specified or shown on the Drawings, CONTRACTOR may backfill with the excavated material, provided that such material consists of loam clay, sand, gravel, or other materials which, in the opinion of Project Soils Engineer, are suitable for backfilling.

C. All backfill material shall exceed a temperature of 35°F and be free from frost, cinders, ashes, refuse, vegetable or organic matter, boulders, rocks, or stone, frozen lumps, or other material which in the opinion of Project Soils Engineer is unsuitable. From 1 foot above the top of the pipe to the trench subgrade, well-graded material containing stones up to 8 inches in their greatest dimension may be used, unless otherwise specified. Care should be taken in backfilling so as not to damage the installed pipe.

D. In refilling the trench, if there is not sufficient material excavated therefrom suitable for refilling, CONTRACTOR shall, without extra compensation, furnish the deficiency. Where indicated on the Drawings, fill shall be provided over projecting conduits. Such fill shall be free of large boulders, and the top 6 inches shall be of suitable material to fit the adjoining ground.

E. When called for on the Drawings, in the specifications, or requested by ENGINEER, backfill material shall be granular and shall consist of durable particles ranging in size from fine to coarse in a substantially uniform combination. Sufficient fine material shall be present to fill all the voids in the coarse material. No stones over 3 inches or clay lumps shall be present. Unless otherwise allowed by ENGINEER, granular backfill shall generally conform to the following gradation specification:

GRANULAR BACKFILL

Sieve Size	Percentage by Weight Passing
3 inches	100
2 inches	95 to 100
No. 4	35 to 60
No. 200	5 to 10

PART 3–EXECUTION

3.01 GENERAL

A. Prior to all excavating, CONTRACTOR shall become thoroughly familiar with the site and site conditions.

3.02 PROTECTION

A. CONTRACTOR shall provide all necessary sheeting, shoring, or other soil retention systems including all labor, material, equipment, and tools required, or as necessary to maintain the excavation in a condition to provide safe working conditions, to permit the safe and efficient installation of all items of Contract work, and to protect adjacent property. CONTRACTOR shall be held liable for any damage which may result to property from excavation or construction operations. Sheeting, shoring, and other soil retainage systems shall be withdrawn or removed in a manner so as to prevent subsequent settlement of structures, utilities, and other improvements.

B. Design of sheet piling and other soil retaining systems shall be the sole responsibility of CONTRACTOR. Where such systems are shown on the Drawings, no parameters such as embedment depth, section profile, presence or lack of whalers, etc., nor system type or suitability shall be inferred. CONTRACTOR is responsible for designing and providing a fully functional system compatible with construction and site requirements.

C. Nothing in this specification shall be deemed to allow the use of protective systems less effective than those required by the Occupational Safety and Health Administration (OSHA) and other applicable code requirements.

3.03 FINISH ELEVATIONS AND LINES

A. CONTRACTOR is responsible for establishing finish elevations and lines.

B. Where lasers are used, CONTRACTOR shall check the Work against intermediate grade stakes. Prior to initial use of the laser, CONTRACTOR shall set up laser on ground surface and check line and gradient controls. Lasers not functioning properly shall be immediately removed.

C. If existing property stakes, not within the limits of the trench or street slope limits, are removed or damaged by CONTRACTOR, CONTRACTOR shall bear the cost of replacement. Replacement shall be made by a legal survey performed by a licensed Land Surveyor hired by OWNER. Cost for survey shall be deducted from the Contract Price.

3.04 COMMON EXCAVATION

A. After the site has been cleared and stripped, the site shall be cut and filled to the indicated subgrade as shown or specified.

B. All excavated material that does not meet the specification for compacted fill or embankment fill or meets the specification but is not required for backfill or fill shall be classified as excess material and shall be removed from the site and disposed of at CONTRACTOR's expense.

C. All material other than suitable bearing soil or bedrock, as determined by the Project Soils Engineer, shall be removed from under concrete to be poured on ground.

D. Excavation for all footings, foundation walls, pits, etc., shall be large enough to provide adequate clearance for the proper execution for the work within them.

E. Excavations scheduled to extend below groundwater shall not be started until the area has been dewatered. See Section 31 23 19–Dewatering.

F. When excavations reach subgrade elevations as shown on the Drawings or as specified herein, the Project Soils Engineer will observe the bottom material. Where, in the opinion of the Project Soils Engineer, unsuitable foundation material is found at the level of the subgrade, unsuitable foundation material shall be removed and replaced with material and placing methods as specified under compacted fill and backfill.

G. Excavations that are undercut beneath the foundation shall extend beyond the perimeter of the foundation 1 foot plus a distance at least equal to the depth of undercut below footing grade.

H. CONTRACTOR shall backfill and compact all overexcavated areas.

I. All street excavation shall be performed as called for in Section 205 of the Standard Specifications and as herein modified.

J. The following items of Work shall be included in common excavation:
   1. The excavation to subgrade elevations as detailed in the Drawings including road bed areas, terraces, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.
   2. Removal (and stockpiling, if the use of salvaged topsoil is required) of topsoil from all cut areas and fill areas within a 1:1 slope of finished street, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.
   3. The preparation, grading, compaction, and proof-rolling of subgrade areas for roadbed, sidewalks, bike paths, driveways, and other miscellaneous surface improvements to the elevations detailed on the Drawings.
   4. Excavation and grading required to realign and/or create ditch lines and drainage ways to route drainage to or from storm facilities as shown on the Drawings, or as necessary to maintain positive drainage.
   5. Removal of temporary backfill placed in new utility trenches above the subgrade.

6. The removal and disposal of all undesirable and surplus materials.

K. Common excavation may be completed as part of utility construction prior to initiating general street excavation activities.

L. All subgrade areas in streets and parking lots, including utility trench restoration areas, shall be proof-rolled with a heavily loaded triaxle dump truck or other similar equipment requested by ENGINEER prior to the placement of any fill materials or base course. ENGINEER must be present during proof-rolling to review the Work necessary for the stabilization of any unstable areas identified. Base course placed on unstable or yielding foundation or subgrade shall be removed and then replaced at CONTRACTOR's expense following excavation below subgrade of the affected area.

M. Saw cuts shall be made in existing pavement, driveways, curb and gutter, and sidewalks to allow restoration to neat straight lines. Saw cuts damaged during construction shall be recut prior to beginning restoration.

N. CONTRACTOR shall salvage suitable materials from utility and street construction activities to provide fill for street construction. Where sufficient quantities of materials suitable for street construction are not available from areas of the site, CONTRACTOR shall perform borrow excavation to make up the deficit in accordance with Section 208 of the Standard Specifications.

O. CONTRACTOR shall be responsible for making its own determination of the common excavation quantity when compiling the lump sum bid.

3.05 UTILITY TRENCH EXCAVATIONS

A. Caution In Excavation; CONTRACTOR shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures may be determined and shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on its part.

B. Subsurface Exploration: When determined that it is necessary to explore and excavate to determine the location of existing underground facilities, CONTRACTOR shall make explorations and excavations for such purposes. If CONTRACTOR is asked to perform additional Work in making the explorations and excavations, extra compensation will be allowed as specified In the General Conditions.

C. The trench shall be dug so that the utilities can be laid to the alignment and depth specified. Unless otherwise allowed by ENGINEER, trenches shall not be excavated more than 100 feet in advance of pipe laying. Common excavation shall include all excavation except rock. Included in common excavation shall be removal of street paving of all types, existing structures, existing improvements and trees smaller than 4 inches in diameter measured 4 feet above the ground, all as necessary to complete the pipe installation.

D. The trench shall be finished to the depth necessary to provide a uniform and continuous bearing and support for the pipe on the bedding material provided at every point between bell holes. Any part of the bottom of trench excavated below the specified grade shall be corrected with bedding material, thoroughly compacted in place. The bedding shall be shaped and finished with hand tools to fit the bottom quadrant to the pipe.

E. If unstable soil conditions are encountered at subgrade, CONTRACTOR shall replace the unstable soil with special bedding. CONTRACTOR shall be allowed extra compensation for the special bedding, unless the unstable soil conditions are caused by CONTRACTOR's failure to adequately dewater the trench, in which case CONTRACTOR shall bear the entire cost.

F. All excavated material shall be piled in a manner that will not endanger the Work. Stockpiles not for immediate backfilling shall have silt fences placed around their perimeter for erosion control. The Work shall be conducted in such a manner that pedestrian and motor traffic is not unnecessarily disrupted. Fire hydrants, valve boxes and manholes shall be left unobstructed. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed.

G. Excavated material designated by ENGINEER as being undesirable for backfilling and all surplus excavated material shall be immediately removed as excavation progresses. All such material shall be disposed of in an environmentally safe manner in accordance with local, state, and federal regulations. No such materials shall be disposed of in wetlands, floodplains, or other environmentally sensitive areas. Disposal sites are also subject to approval of OWNER. All undesirable and surplus material disposed of must be leveled off and graded to rough elevations as determined by OWNER. Appropriate erosion control measures shall be provided and maintained at disposal sites until disposal is complete and the disposal site is permanently stabilized.

H. CONTRACTOR shall remove bituminous pavement and road surface as a part of the trench excavation. The width of pavement removed shall be the minimum possible, and acceptable, for convenient and safe installation of utilities and appurtenances.

I. All bituminous pavement shall be cut on neat, straight lines and shall not be damaged beyond the limits of the trench.

J. Where it is necessary to trench through concrete pavement, a strip shall be sawed and removed in such a manner as not to disturb the remainder of the pavement. Paving and undermining of existing concrete pavement shall be prevented by CONTRACTOR. If CONTRACTOR unnecessarily removes or damages pavement or surfaces beyond limits acceptable to ENGINEER, such pavement and surfaces shall be replaced or repaired at the expense of CONTRACTOR.

K. All trees, shrubs, and improved areas outside the excavation shall be protected from damage.

L. Pipe shall be placed only on dry foundations.

M. Excavation shall include all necessary incidental work such as tunneling, sheet piling, shoring, underpinning, pumping, bailing, transportation, and all fill and backfilling.

N. CONTRACTOR shall excavate whatever materials, are encountered as required to place at the elevations shown, all pipe, manholes, and other work as required to complete the project as shown.

O. The excavation at the crossing of all underground utility services in place shall be as narrow as practicable. All underground services shall be protected from damage and maintained in service at their original location and grade during the process of the work. Any damage to underground services shall be replaced or repaired at no cost to OWNER or to the owner of

the service. The present underground services shown on the Drawings are located in accordance with available data. Encountering these services at a different location or encountering services not shown shall not release CONTRACTOR from the above-stated conditions.

P. Any water, drainage, gas sewer, or electric lines encountered in the excavation that are not to be disturbed shall be properly underpinned and supported. Any service connections encountered that are to be removed shall be cut off at limits of the excavation and capped in accordance within the requirements of or permits governing such removals. Any permits required for this work will be obtained by OWNER upon request of CONTRACTOR.

Q. CONTRACTOR shall be responsible for determining and providing the minimum width necessary to provide a safe trench in accordance with current OSHA standards and all other applicable standards. The top width of trench excavation shall be kept as narrow as is reasonably possible and acceptable to minimize pavement damage. Pay items related to maximum trench widths shall not limit CONTRACTOR's responsibility to provide safe trench conditions.

R. Width of Trench–Rigid Pipe: The width of trench below the outside top of the pipe shall be as shown in the following table for the sizes listed. A minimum clearance of 8 inches between the outside of the pipe barrel and the trench wall at the pipe spring line shall be maintained to allow for bedding and haunching. If sheeting is used and is going to remain in place, the trench width shall be measured as the clear distance between inside faces of the sheeting. Otherwise, the trench width shall be based on the width between stable trench walls after sheeting is removed.

MAXIMUM WIDTH OF TRENCH BELOW TOP OF PIPE

Nominal Pipe Diameter (Inches)	Trench Width (Inches)
4	30
6	30
8	36
10	36
12	36
15	36
18 and larger	Pipe O.D. Plus 16 (Minimum 36)

S. Where the width of trench below the outside top of the pipe barrel cannot be otherwise maintained within the limits shown above, CONTRACTOR, at its own expense, shall furnish an adequate pipe installation for the actual trench width which will meet design conditions. This may be accomplished by furnishing higher class bedding, a stronger pipe, concrete cradle, cap or envelope or by driving sheeting prior to excavation to subgrade. Removal of sheeting below the top of the pipe, if allowed by ENGINEER, shall be gradual during backfilling.

T. If the maximum trench width is exceeded for any reason other than by request of ENGINEER, the concrete cradle, cap, sheeting, bedding or the stronger pipe shall be placed by CONTRACTOR at its own expense. Where the maximum trench width is exceeded at the written request of ENGINEER, the concrete cradle, cap, sheeting, bedding or stronger pipe will be paid for on the basis of the price bid.

U. Width of Trench–Thermoplastic and Ductile Iron Pipe: The trench width for flexible pipe shall be minimum three times the pipe outside diameter or the maximum trench width specified for rigid pipe, whichever is greater. A minimum clearance of 8 inches between the outside of the pipe barrel and the trench wall at the pipe spring line shall be maintained to allow for bedding and haunching.

V. Special bedding shall consist of stone material and filter fabric as described herein. Where the bottom of the trench at subgrade is found to be unstable or of unsuitable material, which should be removed, CONTRACTOR shall excavate and remove such unstable or unsuitable material to the trench width and to a depth of 2 feet. The excavated area shall be lined with filter fabric, Mirafi 140 N, US Fabrics US 120NW, Propex Geotex 401, or equal, and backfilled with bedding material in maximum 12-inch layers. At subgrade the filter fabric shall be wrapped over the special bedding with an 18-inch overlap. Bedding material shall then be placed over the special bedding to support the piping. See Dewatering and Excavation to Subgrade sections for additional conditions.

W. If soil conditions or the Drawings require it, concrete cradle or encasement shall be placed around the pipe as shown on Drawing 01-975-43A. Excavation shall be carried 1 foot below the grade line to a depth requested by ENGINEER and concrete cradle or encasement placed. Before the concrete is placed, the pipe shall be laid to line and grade, blocked and braced, and the joint made. The cradle shall then be placed, taking care not to disturb the pipe. Concrete shall have a minimum 28-day compressive strength of 4,000 psi. Concrete cradle shall not be used for thermoplastic piping. See Trench Width section for additional conditions.

X. Open-cut trenches shall be sheeted and braced as required by any governing federal regulations including OSHA, state laws, and municipal ordinances; and as may be necessary to protect life, property, improvements or the Work. Underground or aboveground improvements to be left in place shall be protected and, if damaged, shall be repaired or replaced at the expense of CONTRACTOR.

Y. Sheeting and bracing which is to be left in place must be removed for a distance of 4 feet below the present or proposed final grade of the street, road, or land, whichever is lower. Trench bracing, except that which shall be left in place, may be removed after backfilling has been completed or has been brought up to such an elevation as to permit its safe removal.

Z. Portable Trench Box: Whenever a portable trench box or shield is used, special precautions shall be taken so as not to pull already jointed pipe apart or leave voids around the pipe wall. Whenever possible, the bottom edge of the box shall be kept at a level approximately even with the top of pipe. Cover material shall be placed to at least the top of pipe before moving the box ahead.

AA. All trenches shall be backfilled using specified material so that excessive lengths of trench are not left open. In general, the backfilling operation shall proceed so that no more than 100 feet of trench is open behind the pipe laying operation.

BB. Backfill shall be left below the original surface to allow for placement of restoration materials including pavement, base course, concrete, topsoil, sod, plus any pavement replacement specified in accordance with the Asphaltic Paving section herein. When settlement occurs, CONTRACTOR shall restore the surface improvements at its expense to maintain the finished surface.

3.06 PREPARATION OF SUBGRADE

A. After the site has been cleared, stripped, and excavated to subgrade, thoroughly compact subgrade to the requirements specified for compacted fill below. Scarify and moisture condition the subgrade as recommended by the Project Soils Engineer.

B. Remove all ruts, hummocks, and other uneven surfaces by surface grading prior to placement of fill.

C. All slab-on-grade and road subgrades shall be proofrolled with a heavy rubber-tired construction vehicle (such as a fully loaded tandem-axle dump truck) in the presence of the Project Soils Engineer.

D. ENGINEER may request the excavation of unsuitable materials in areas of unstable subgrade. The excavation of such materials, except in areas where CONTRACTOR has completed utility construction or placed street fill, shall be measured by ENGINEER for payment.

E. The excavation and replacement of unstable utility trench backfill and/or street fill placed by CONTRACTOR shall be at CONTRACTOR's expense.

F. Base course placed on unstable foundation shall be removed and replaced at CONTRACTOR's cost following excavation of the affected area.

G. Where requested by ENGINEER in the field, excavation below subgrade areas shall be lined with geotextile material as specified in Section 31 23 19–Dewatering and backfilled with 3-inch crushed stone dense graded base as specified herein.

H. Geotextile shall be placed where requested by ENGINEER to stabilize street subgrade areas. Fabric shall be as specified in Section 31 23 19–Dewatering. Vibratory compaction shall not be used in the compaction of base course in areas where geotextile fabrics are used.

3.07 COMPACTED FILL AND BACKFILL

A. All fill and backfill, except as otherwise specified, shall be compacted fill placed to within 4 inches of the bottom of the topsoil or to the bottom of the structure or other improvement.

B. Unless otherwise noted, structures with a top slab shall not be backfilled until the slab is in place and has reached its specified 28-day strength.

C. In fill areas above existing grade around structures, compacted fill shall be placed within a minimum of 10 feet from the structure.

D. No fill shall be placed under water or over unsuitable subgrade conditions.

E. All fill and backfill, except embankment fill and clay fill, shall be compacted as follows:
   1. Class 1 Compaction: This class of compaction shall apply to all fill areas under buildings, structures, piping, bituminous roadway and parking areas, curb and gutter, and backfill within 10 feet of structure walls. All compacted material shall be placed in uniform layers not exceeding 8 inches in loose thickness prior to compaction. Each layer shall be uniformly compacted to a dry density at least 95% of the maximum dry density as determined by a laboratory compaction test at the optimum moisture content

(ASTM Test Designation D698). Compaction shall be obtained by compaction equipment appropriate for the conditions.

2. Class 2 Compaction: This class of compaction shall be used in excavated areas beyond 10 feet of structures without any piping or adjacent foundations. Material for backfill shall be granular material as specified above. The material shall be deposited, spread, and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer of the fill shall be compacted to at least 90% of the maximum dry density (testing same as Class 1). Compaction shall be obtained by compaction equipment appropriate for the conditions.

F. No frozen material shall be placed nor shall any material be placed on frozen ground.

G. Four inches of clay fill shall be placed and compacted to at least a firm consistency in areas to be seeded or sodded prior to placement of topsoil.

3.08 EMBANKMENT FILL

A. Embankment fill may be placed in fill areas to be seeded or sodded if no piping exists in the fill and the areas are at least 10 feet from any structure.

B. Embankment fill shall be deposited, spread, and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer shall be compacted to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment. The required compaction shall be obtained for each layer before any material for a succeeding layer is placed thereon. Compaction shall be obtained using the hauling and leveling equipment, and in addition, tamping rollers, pneumatic-tired rollers, vibratory rollers, or other types of equipment required to produce the desired results.

3.09 CONCRETE FILL

A. In areas where there is inadequate room for compaction equipment and in other areas as shown or specified, flowable fill shall be used as fill material.

3.10 PIPE BEDDING AND COVER

A. Immediately prior to placing the pipe, the trench bottom shall be shaped by hand to fit the entire bottom quadrant of the pipe. If pipe is of the bell and spigot type; bell holes shall be provided to prevent the bell from supporting the backfill load. Bell holes shall be large enough to permit proper making of the joint, but not larger than necessary to make the joint. All adjustments to line and grade must be done by scraping away or filling in bedding material under the body of the pipe. Any fill used must be bedding material. If necessary to obtain uniform contact of the pipe with the subgrade, a template shall be used to shape the bedding material. All pipe shall be placed on bedding material at least 4 inches thick. See Drawing 01-975-43A. Bedding material shall then be placed and tamped into place up alongside the pipe in maximum 6-inch layers shovel slicing the bedding material under the haunches to provide firm contact with the pipe. CONTRACTOR shall perform all necessary excavation and shall furnish all necessary material to provide this bedding.

B. Trenches shall be kept water-free and dry during bedding, laying, and jointing. CONTRACTOR shall provide, operate, and maintain all pumps or other equipment necessary to drain and keep all excavation pits and trenches and the entire subgrade area free from water under any and all circumstances that may arise.

3.11 TRENCH BACKFILL CONSOLIDATION

A. All trenches shall be consolidated as specified in this section for the entire depth and width of the trench.

B. Consolidation shall be achieved by use of smooth surface vibratory compactors or backhoe operated hydraulic compactors for granular materials and rotating sheepsfoot type mechanisms for loam/clay soils. The lift height shall not exceed 8 inches for walk behind, hand operated, vibratory compactors and sheepsfoot. Lift height shall not exceed 24 inches for self-propelled vibratory drum or backhoe operated hydraulic compactors. Smaller lift heights shall be provided as necessary to achieve the degree of compaction specified.

C. Unless specified otherwise, backfill material beneath paved areas or future paved areas and within 5 feet of paved areas or future paved areas shall be consolidated as follows: Within 3 feet of the surface 95% of maximum dry density, below 3 feet from the surface to 1 foot above the pipe 90% of maximum dry density, as determined by the modified Proctor Test (ASTM D1557).

D. Unless otherwise specified, backfill material placed in all other areas shall be compacted to the point where no additional consolidation can be observed from the compaction and backfill equipment being used.

E. Backfill material not meeting the compaction specification shall be recompacted by CONTRACTOR at no cost to OWNER. Cost for additional testing on recompacted material shall be at CONTRACTOR's expense.

3.12 GRADING

A. CONTRACTOR shall perform all rough and finish grading required to attain the elevations shown on the Drawings.

B. Grading Tolerances:
   1. Rough Grade: Buildings, parking areas, and sidewalks–±0.1 feet.
   2. Finish Grade: Granular cushion or crushed stone mat under concrete slabs–±0.03 feet.
   3. Lawn areas away from buildings, parking areas, and sidewalks–±0.25 feet.

3.13 MAINTENANCE OF SURFACE

A. CONTRACTOR shall maintain all backfilling, resurfacing, repaving, and other surface improvements constructed under this Contract. CONTRACTOR shall, upon proper notice from OWNER, make all repairs in surfaces of trenches and excavations. All expenses incurred by OWNER and/or CONTRACTOR in making repairs and all expenses in maintaining trench and excavation surfaces shall be at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. OWNER reserves the right to make all emergency repairs necessary to make safe all streets and walks at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. A maintenance guarantee fund, if specified, will be withheld from the final amount due CONTRACTOR for a period of 6 months, after acceptance of the Work, to provide such maintenance.

B. CONTRACTOR shall be responsible for controlling dust dispersion during utility and street construction. Remedial actions required as a result of inadequate dust control shall be

CONTRACTOR's responsibility. To control dust, CONTRACTOR shall apply calcium chloride or ammonium lignin sulfonate in 12 to 14% solution or other dust control palliative acceptable to OWNER. Prior to application of dust palliative, the street shall be graded smooth.

3.14 COMPACTION TESTING

A. Compaction tests shall be done by the Project Soils Engineer. Location and frequency of the tests shall be as recommended by the Project Soils Engineer and paid for by OWNER.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1–GENERAL

1.01 SUMMARY

A. Work Included:
   1. Removal of groundwater to allow belowgrade construction.
   2. Site grading to prevent surface water from entering the excavation.

B. Related Sections and Divisions: Applicable provisions in the Contract Documents shall govern work in this section.

C. Payment:
   1. The expense for making all extra excavations necessary to prevent water from interfering with the proper construction of the work and for forming all dams or diversions, digging of sumps or pump wells, bailing, and installation and pumping of wells shall be borne by CONTRACTOR.
   2. The cost for removal of groundwater and surface water shall be included in the prices bid for the work. No separate payment will be made for dewatering whether accomplished by use of sumps and pumps, well point systems, deep wells, or any other method.
   3. Any permits necessary for the dewatering operations shall be obtained and paid for by CONTRACTOR.

1.02 REFERENCES

A. See Contract Documents for permit requirements and water, erosion, and sediment control.

1.03 SYSTEM REQUIREMENTS

A. CONTRACTOR shall, at its own expense, keep the excavation clear of water while structures, mains, and appurtenances are being built, utilities are being installed, and fill and backfill are being compacted. Under no conditions shall the work be laid in or under water. Unless otherwise approved, no water shall flow over the work until the joints are complete or the concrete has set.

B. Wherever necessary, CONTRACTOR shall excavate in advance of the completed work, lead the water into sumps or pump wells, and provide erosion control measures to prevent water or sediment damage.

C. CONTRACTOR’s dewatering system shall perform so that the soils within the trench will not be destabilized by hydrostatic uplift pressures from adjacent groundwater. If conditions warrant, CONTRACTOR shall furnish and install well point systems or deep wells.

D. Dewatering shall be sufficient to lower the piezometric level to at least 2 feet below the bottom of the excavation. Additional lowering shall be provided as necessary to create a stable subgrade.

E. In areas where rock is encountered, the water level shall be kept at or below top of rock but at least 6 inches below bottom of concrete. Additional rock shall be removed as needed to provide clearances.

F. The control of groundwater shall be such that softening or heaving of the bottom of excavations or formation of “quick” conditions or “boils” shall be prevented.

G. Dewatering systems shall be designed and operated so as to prevent the migration or removal of soils.

1.04 QUALITY ASSURANCE

A. All dewatering shall be done in accordance with applicable federal, state, and local code requirements.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

3.01 DEWATERING

A. Dewatering shall be started, and the water level shall be lowered as specified herein prior to beginning excavation and shall be continued until structure, main, or appurtenance has been completed and fill has been placed and compacted to final grade.

B. CONTRACTOR shall provide at least two groundwater observation wells near each area to be excavated to aid CONTRACTOR in determining whether the minimum specified requirements have been met prior to excavation. The observation well shall be a minimum 2-inch-diameter slotted PVC pipe. The observation well shall be installed and backfilled in such a way as to allow an accurate determination of actual groundwater levels. The observation well shall be properly abandoned after use unless specified otherwise.

C. CONTRACTOR shall provide all necessary materials and equipment to keep the excavation free from water during construction. CONTRACTOR shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outages and shall have available at all times competent workers for the operation of the pumping equipment. The dewatering systems shall not be shut down between shifts, on holidays or weekends, or during the work stoppages.

D. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted fill or backfill, and prevent floatation or movement of all structures and pipelines.

3.02 PROTECTION

A. CONTRACTOR shall take all necessary precautions during the dewatering operation to protect adjacent structures against subsidence, flooding, or other damage. The dewatering system shall be installed and operated so that the groundwater level outside the excavation

is not reduced to the extent that would damage or endanger adjacent structures or property. Any such facilities and structures damaged shall be repaired or replaced to the satisfaction of their owner.

END OF SECTION

SECTION 31 25 00

SLOPE PROTECTION AND EROSION CONTROL

PART 1–GENERAL

1.01 SUMMARY

A. Work Included: Erosion control devices.

B. Related Sections and Divisions: Applicable provisions in the Contract Documents shall govern work in this section.

1.02 PAYMENT

A. All costs associated with slope protection and erosion control shall be included in CONTRACTOR's Bid. This work shall include, but is not limited to, erecting fence, excavation, placing posts, backfilling, attaching woven wire and geotextile fabric; placing ditch checks; installing sediment traps; for removing the fence at completion of project; for cleaning and repairing; for removing or spreading accumulated sediment to form a surface suitable for seeding; for replacing silt fence and damages caused by overloading of sediment material or ponding of water adjacent to silt fence; and for furnishing labor, tools, equipment, and incidentals necessary to complete the work in accordance with the Contract.

1.03 REFERENCES

A. Kentucky Best Management Practices for Construction Activity (Ky BMP).

1.04 REGULATORY REQUIREMENTS

A. CONTRACTOR is required to obtain any necessary federal, state, or local permits for erosion control. The permit requirements are CONTRACTOR's responsibility and shall be included in the prices Bid.

B. Comply with laws prohibiting pollution of any lake, stream, river, or wetland.

1.05 QUALITY CONTROL

A. Construct and maintain erosion sediment control measures in accordance with Ky BMP.

B. Check facilities weekly and after any rainfall event and make needed repairs within 24 hours.

PART 2–PRODUCTS

2.01 EROSION MATS

A. Uniform web of interlocking wood excelsior fibers with a net backing on one side. The wood from which the blanket is produced shall have been properly cured to achieve adequately curled and barbed fibers. The blanket shall be of uniform thickness with the wood fibers evenly distributed over the entire area of the blanket. The blanket shall be furnished in rolled

strips. The width of the strips shall be 48 inches ±1 inch. Weight of blanket measured under average atmospheric conditions shall be 78 pounds per 80 square yards ±10%. Net backing shall have mesh size not exceeding 1 1/2 by 3 inches and may be woven from twisted paper, cotton cord, a biodegradable plastic, or other alternate method. The blanket shall be nontoxic to vegetation.

2.02 SILT FENCE

A. Conform to Kentucky BMP as supplemented herein.

B. Use geotextile fabric consisting of either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride with the following requirements. Fabric shall have the minimum strength values in the weakest principal direction. Nonwoven fabric may be needle-punched, heat-bonded, resin-bonded, or combination thereof.

VALUE MINIMUM REQUIREMENTS (1)

Test	Method	Silty Soils(4)	Sandy Soils(5)
Grab Tensile-Strength/ Strip-Breaking Force	ASTM D-5034, D5035(2)	100	100
Mullen Burst Strength (psi)	ASTM D-3786	200	200
Equivalent Opening Size	CW-02215-77	50-140	20-50
U.S. Standard Sieve	Corps of Engineers		
Water Flow Rate (gal/min/ft.^{2}) at 50 mm Constant Head	ASTM D-4491(3)	10	10
Ultraviolet Radiation Stability (percent)	ASTM D-4355	90	90

(1) All numerical values represent minimum average roll values (i.e., the average of test results on any roll in a lot should meet or exceed the minimum values in the table).
(2) ASTM D-5034 Grab Test and ASTM D-5035 Breakout Force and Elongation Strip Method, Method 16, using a 4-inch by 8-inch sample, 3-inch gauge length clamped in 1-inch by 2-inch long grip, tested at a strain rate of 12 inches/min.
(3) Water Flow Rate in gal/min/ft shall be determined by multiplying Permittivity in sec. as determined by ASTM D-4491 by a conversion factor of 74.
(4) Silty Soil: More than 15% by weight passing No. 200 sieve.
(5) Sandy Soil: Less than 15% by weight passing No. 200 sieve.

C. Furnish geotextile fabric in a wrapping which will protect the fabric from ultraviolet radiation and from abrasion because of shipping and handling. Keep geotextile dry until installed.

D. Provide posts, stakes, and wire reinforcement per Kentucky BMP standards.

2.03 GEOTEXTILE FABRIC–TYPE R

A. For subgrade reinforcement under riprap: Either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinlidene chloride. Fabric shall have the minimum strength values in the weakest principle direction. Nonwoven fabric may be needle-punched, heat-bonded, resin-bonded, or combination thereof.

B. Insect, rodent, mildew, and rot resistant.

C. Furnish in a wrapping which will protect fabric from ultraviolet radiation and from abrasion because of shipping and hauling. Keep geotextile dry until installed.

D. Clearly mark fabric rolls showing fabric type.

E. If sewn seams are used, furnish a field-sewn seam sample produced from the geotextile fabric and thread and with the equipment to be used on the project prior to installation.

F. Comply with the following physical properties:

Test	Method	Value
Grab Tensile Strength (lbs) Puncture Strength (lbs) using 5/16-inch Flat-tipped Rod	ASTM D-4632 Modified ASTM D-3787	200 min. 80 min.
Mullen Burst (lbs/in^2)	ASTM D-3786	250 min.
Elongation at Required Strength (percent)	ASTM D-4632	20 min.
Equivalent Opening Size (U.S. Standard Sieve)	ASTM D-4751	30-140
Water Flow Rate (gal/min/ft^2) at 50 mm Constant Head	ASTM D-4491	10 min.

2.04 STRAW BALE BARRIERS

A. Provide per Kentucky BMP standards.

PART 3–EXECUTION

3.01 GENERAL

A. Install devices before construction activities begin.

B. Proceed carefully with construction adjacent to stream channels to avoid washing, sloughing, or deposition of materials into the stream. If possible, the work area should be diked off and the volume and velocity of water that crosses disturbed areas be reduced by means of planned engineering works (diversion, detention basins, berms).

C. Unless noted on Drawings, do not remove trees and surface vegetation.

D. Expose the smallest practical area of soil at any given time through construction scheduling. Make the duration of such exposure before application of temporary erosion control measures or final revegetation as short as practicable.

3.02 EROSION MAT INSTALLATION

A. Place erosion mat immediately after seeding or sodding operations have been completed. Before mat placement, remove all material or clods over 1 1/2 inches in diameter and all organic material or other foreign material which interfere with the mat bearing completely on the soil or sod.

B. Any small stones or clods which prevent contact of the mats with the soil shall be pressed in the soil with a small lawn-type roller or by other effective means. The mat shall have its lateral edge so impressed in the soil as to permit runoff water to flow over it.

C. The matting strips shall be rolled on or laid in direction of flow. Spread mat evenly, smoothly, in a natural position without stretching and with all parts bearing on soil and place blanket with netting on top. Overlap adjacent strips at least 4 inches. Overlap strip ends at least 10 inches. Make overlaps with the upgrade section on top.

D. Bury upgrade end of each strip of fabric or blanket at least 6 inches in a vertical slot cut in the soil and press soil firmly against the embedded fabric or blanket.

E. Anchor mats in place with vertically driven staples driven until their tops are flush with the soil. Space staples at 3-foot centers along mat edges and stagger space at 3-foot centers through the center. Place staples at 10-inch centers at end or junction slots.

F. Reseed areas damaged or destroyed during erosion mat placing operations as specified for original seeding.

G. Dispose of surplus excavated materials, and all stones, clods or other foreign material removed in the preparation of the seeded soil or sodded surface before placing mat.

H. Following mat placement, uniformly apply water to the area to moisten seedbed to 2-inch depth and in a manner to avoid erosion.

I. Maintain erosion mat and make satisfactory repairs of damage from erosion, traffic, fires or other causes until work acceptance.

3.03 GEOTEXTILE FABRIC–TYPE R

A. Before placing fabric, grade area smooth and remove stones, organic matter, or other foreign material which would interfere with fabric being completely in contact with soil.

B. Place fabric loosely and lay parallel to direction of water movement. Pinning or stapling is acceptable to hold geotextile in place. Overlap or sew together separate pieces of fabric. Overlap joints a minimum 24 inches in the flow direction. After placement, do not expose fabric more than 48 hours before covering.

C. Cover damaged areas with a patch of fabric using a 3-foot overlap in all directions.

3.04 SILT FENCE INSTALLATION

A. Erect silt fence before starting construction operations which might cause sedimentation or siltation at site of proposed silt fence.

B. Construct silt fence in an arc or horseshoe shape with ends pointing up slope. Construct silt fence to the dimensions and details shown on Drawings. Remove silt fences after slopes and ditches have been stabilized and turf developed to the extent that future erosion is unlikely. Dispose of materials remaining after removal.

C. Inspect all silt fences immediately after each rainfall and at least daily. Correct deficiencies immediately. Where construction activity changes the earth contour and drainage runoff,

make a daily review so that silt fences are properly located for effectiveness. Where deficiencies exist, install additional silt fences.

D. Remove and dispose of sediment deposits. Sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade and the area topsoiled, fertilized, and seeded as required.

3.05 STRAW BALE BARRIERS

A. Provide as shown on the Drawings and as necessary on ditch lines and other drainageways to minimize construction sediment laden runoff to downstream ditches and channels and into streams.

B. Inspect all barriers immediately after each rainfall and at least daily. Correct deficiencies immediately. Where construction activity changes the earth contour and drainage runoff, make a daily review so that barriers are properly located for effectiveness. Where deficiencies exist, install additional straw bales.

C. Remove and dispose of sediment deposits. Sediment deposits remaining in place after the barrier is no longer required shall be dressed to conform with the existing grade and the area topsoiled, fertilized, and seeded as required.

END OF SECTION

SECTION 32 16 13

CONCRETE CURB AND GUTTER, SIDEWALKS, AND DRIVEWAY APRONS

PART 1–GENERAL

1.01 SUMMARY

A. Work includes concrete curb and gutter, sidewalks, and base course foundation for sidewalks, driveways, and driveway aprons as shown on the Drawings.

B. Related Sections and Divisions: Applicable provisions in the Contract Documents shall govern work in this section.

1.02 MEASUREMENT AND PAYMENT

A. The Work provided, including base course foundation for sidewalks, driveways, and driveway aprons, shall be measured and paid for at the Unit Price Bid. The Unit Price Bid shall include all labor, equipment, materials, and miscellaneous items for the Work.

1.03 REFERENCES

A. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Kentucky Department of Highways, Standard Specifications for Road and Bridge Construction, current edition, including all issued supplemental specifications. Unless specifically stated otherwise, the Measurement and Payment sections of the Standard Specifications shall not apply. Measurement and payment will be made in accordance with terms of the Contract Documents.

B. AASHTO M148 Standard Specifications for Liquid Membrane–Forming Compounds for Curing Concrete.

1.04 QUALITY ASSURANCE

A. Unless otherwise specified, all curb and gutter, sidewalks, and driveway apron construction shall meet the requirements of the Standard Specifications.

PART 2–PRODUCTS

2.01 CONCRETE

A. Concrete for curb and gutter shall be Class A conforming to Section 601 of the Standard Specifications.

2.02 CURING COMPOUND

A. Liquid curing compounds shall conform to the requirements for Liquid Membrane-Forming Compounds for Curing Concrete, AASHTO Designation M148, Type 2, White Pigmented.

PART 3–EXECUTION

3.01 BASE PREPARATION–CURB AND GUTTER

A. The base course beneath the curb and gutter shall be trimmed or filled as necessary to provide a full depth of curb and gutter as detailed in Drawing 01-975-82A. Prior to placement of concrete, the base shall be thoroughly compacted and moistened.

3.02 BASE PREPARATION–SIDEWALKS AND DRIVEWAYS

A. The subgrade shall be thoroughly compacted and finished to a trim, firm surface. All soft or unsuitable material shall be removed and replaced with suitable material.

B. A minimum 4-inch-thick layer of sand, sand and gravel, or base course shall be placed under all sidewalks. This material shall be thoroughly moistened and compacted before the concrete is placed.

3.03 FORMS

A. Forms shall be of metal and of sufficient strength to resist distortion or displacement. Metal forms shall be used to construct a curb and gutter cross section as shown on Drawing 01-975-82A. Forms shall be full depth of the required work. Facing boards, if used, shall be built so as to obtain the cross section called for on the Drawings. Forms shall be securely staked and held firmly to line and grade. Forms shall be cleaned thoroughly and oiled before reuse.

B. All curved curb and gutter shall form smooth curves and shall not be a series of chords. Radius forms shall be used for all curved curb and gutter where the radius of curvature is 100 linear feet or less.

3.04 PLACING AND FINISHING CONCRETE

A. Unless otherwise specified, concrete shall be placed in accordance with the Standard Specifications.

B. Concrete shall be thoroughly tamped to remove all voids. The exposed surfaces of the curb and gutter shall be thoroughly troweled and finished with a brush at right angles to the line of the curb and gutter. The back edge of the curb, the edge of the gutter adjacent to the pavements, and edges adjacent to expansion joints shall be rounded with a 1/4-inch-radius edger. Honeycombed areas along the back of the curb shall be pointed with mortar.

C. Before final finishing of curb and gutter, a 10-foot straight edge shall be used to check the surface. Any areas showing a variation of more than 1/4 inch from the straight edge shall be corrected. Final finishing shall be delayed a sufficient time so that excess water and grout will not be brought to the surface.

D. Concrete for sidewalk shall be placed to a minimum thickness of 5 inches except at driveways and alleys which shall have a minimum thickness equal to the driveway. Driveways shall have a minimum thickness of 6 inches. The concrete shall be thoroughly spaded and tamped to remove all voids. The surface of the driveway or sidewalk shall be thoroughly troweled and finished with a brush at right angles to the driveways or sidewalk line.

3.05 MACHINE FORMED CURB AND GUTTER

A. CONTRACTOR may elect to use a machine for placing, forming, and consolidating concrete curb and gutter. If a machine is used, the resulting curb and gutter shall be of such a quality as to equal or exceed that produced by the method described above.

3.06 DRIVEWAY OPENINGS

A. The details for curb and gutter through a driveway is shown on Drawing 01-975-82A.

3.07 REJECT SECTIONS

A. At locations shown on the Drawings, the curb and gutter shall be warped so as to reject the flow of water. The transition from a standard section to a reject section shall not be abrupt but shall be a minimum of 10 feet in length. The reject section shall conform to the detail shown on Drawing 01-975-82A.

3.08 JOINTING–CURB AND GUTTER

A. A 3/4-inch expansion joint filler shall be placed through the curb and gutter at the radius points of all intersection curbs. This expansion joint filler shall extend through the entire thickness of concrete and shall be perpendicular to the surface and at right angles to the line of the curb and gutter.

B. At intervals of not more than 10 feet, a contraction joint shall be tooled to a depth of one-fifth of the total concrete thickness with a 1/4-inch radius jointer. The contraction joint shall be at right angles to the line of the curb and gutter.

C. If machine-formed curb and gutter is provided by CONTRACTOR, CONTRACTOR shall create a plane of weakness at all joints that is sufficient to cause contraction cracking at the joints.

D. CONTRACTOR may saw contraction joints. The depth of cut shall be a minimum of one-fifth of the total concrete thickness. Sawing shall be done as soon as practicable after the concrete has set sufficiently to preclude raveling during the sawing and before any shrinkage cracking takes place in the concrete. If this method results in random cracking, CONTRACTOR will be required to tool the contraction joints as specified above.

E. The use of steel separator plates will not be allowed.

F. Jointing shall be included in the price bid for curb and gutter.

3.09 JOINTING–SIDEWALKS AND DRIVEWAYS

A. Concrete sidewalk shall be cut into rectangular blocks approximately 5 feet long. The cut must extend at least one-fifth of the total thickness of concrete. The edges of the sidewalk along forms and joints shall be rounded with an edging tool of 1/4-inch radius. All joints shall be at right angles to the centerline of the sidewalk.

B. Concrete driveways shall be jointed in approximately square sections. The depth of the joint and the finishing of the edges shall be the same as for concrete sidewalk.

3.10 EXPANSION JOINTS

A. A 1-inch-thick expansion joint filler shall be placed between curb ramps and back of curb.

B. A 3/4-inch-thick expansion joint shall be placed at all sidewalk corners, between sidewalks and buildings, and between back of curb and sidewalk.

3.11 SLOPE

A. Sidewalk cross slope shall be 1/4 inch per foot unless otherwise noted in the Drawings or requested by ENGINEER.

3.12 CURB RAMP

A. Curb ramps shall be constructed in accordance with the Drawings.

3.13 INLET CASTING ADJUSTMENT

A. Inlet casting shall be adjusted to grade as required for the installation of the new curb and gutter. Inlet casting backs shall be adjusted for a depressed flow line at all inlets in the low points (0.72 feet). All other inlets shall be adjusted for a normal flow line (0.50 feet).

3.14 UTILITY MARKINGS

A. The ends of utility service lines (sewer, water, and electrical conduits) shall be marked during installation. The curb top shall be marked immediately adjacent to these utility markers. Curb markers shall be 2 inches in height and shall consist of a “W” for water, “S” for sewer, and “E” for electric and blank conduits. Markings shall be embossed a minimum of 1/4 inch deep and be 3/8 inch thick. Utility markings shall be considered incidental work to curb and gutter.

3.15 CURING

A. As soon after finishing operations as the free water has disappeared, the concrete surface shall be sealed by spraying on it a uniform coating of curing material in such a manner as to provide a continuous water impermeable film on the entire concrete surface.

B. The material shall be applied to form a uniform coverage at the rate of not less than one-half gallon per 100 square feet of surface area.

C. Within 30 minutes after the forms have been removed, the edges of the concrete shall be coated with the curing compound applied at the same rate as on the finished surface.

3.16 PROTECTION OF CONCRETE

A. CONTRACTOR shall erect and maintain suitable barricades to protect the new concrete. Where it is necessary to provide for pedestrian traffic, CONTRACTOR shall, at their own cost, construct adequate crossings. Crossing construction shall be such that no load is transmitted to the new concrete.

B. Any part of the work damaged or vandalized prior to final acceptance shall be repaired or replaced at the expense of CONTRACTOR in a manner satisfactory to ENGINEER.

C. Pedestrian traffic shall not be permitted over new concrete prior to 72 hours after application of curing material. Vehicular traffic shall not be permitted over newly placed concrete within seven days after completion when temperatures are 70°F or higher, 10 days when temperatures are not lower than 60°F, and up to a maximum of 21 days when the temperatures are generally lower than 60°F.

3.17 CONCRETE TESTING

A. The following tests of fresh concrete shall be performed by CONTRACTOR. CONTRACTOR shall prepare, protect, transport, and have tested all cylinders at its expense.
   1. Sampling of concrete for slump tests, air tests, temperature tests, and for making concrete test cylinders shall be performed in accordance with ASTM C172.
   2. Cylinders:
      a. Three test cylinders shall be made for each pour less than 25 cubic yards, four test cylinders shall be made for each pour between 25 and 100 cubic yards, and eight test cylinders shall be made for each pour in excess of 100 cubic yards. Each concrete mix shall be represented by at least four cylinders for the entire job. Concrete for cylinders shall be collected near the middle of the load and/or as requested by ENGINEER.
      b. Cylinders shall be made and tested in accordance with ASTM C31 and ASTM C39, respectively. The cylinders must be kept moist and at temperatures between 60°F and 80°F and shall remain undisturbed and stored in a location free from vibration. In hot weather, the cylinders shall be covered with wet burlap and stored in a shaded area. It is CONTRACTOR's responsibility to provide a suitable protected location for storing cylinders on the jobsite.
      c. After 24 hours, the cylinders shall be transferred to an independent testing laboratory acceptable to OWNER. The cylinders shall be packed in sawdust or other cushioning material for transit to avoid any bumping or jarring of the cylinders.
      d. Cylinders shall be broken at 7 and 28 days or as requested by ENGINEER. Test results shall be transmitted immediately and directly to ENGINEER and OWNER. Test data shall include date and location of pour and concrete mix used.
   3. Slump Test: CONTRACTOR shall make one slump test near the beginning of all pours with two tests being made for all pours in excess of 25 cubic yards, or as requested by ENGINEER. Slump tests shall conform to ASTM C143.
   4. Air Test:
      a. When air-entrained concrete is used, the air content shall be checked by CONTRACTOR near the beginning of all pours with at least two checks being made for all pours in excess of 25 cubic yards, or as requested by ENGINEER.
      b. The air contents shall be checked using the pressure method in accordance with ASTM C231. The pocket-sized alcohol air indicator shall not be used unless it is first used in conjunction with the pressure method test.

END OF SECTION

SECTION 33 00 10

BURIED PIPING AND APPURTENANCES

PART 1–GENERAL

1.01 SUMMARY

A. Work Included:
   1. All underground piping, valves, and appurtenances of every description.
   2. Excavation, dewatering, and backfilling for all work under this section unless otherwise noted.
   3. Concrete foundations and anchor bolts for all equipment furnished under this section.
   4. Underground piping connections to all equipment, whether furnished under this section or not.

B. Related Sections and Divisions: Applicable provisions in the Contract Documents shall govern work in this section.

C. Measurement and Payment: Payment for all work, including materials, equipment, and miscellaneous items necessary to complete the installation, will be made at the Unit Price Bid for buried piping and appurtenances.

1.02 REFERENCED SPECIFICATIONS

A. KYTC Specifications in the Standard Specifications shall refer to the Kentucky Transportation Cabinet Standard Specifications for Road and Bridge Construction, Latest Edition.

B. Conservation Practice Standards in the Standard Specifications shall refer to the Kentucky Transportation Center, University of Kentucky Best Management Practices (BMPs) for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites.

PART 2–PRODUCTS

2.01 MATERIALS OF CONSTRUCTION

A. All materials used in the manufacture, assembly, and painting of piping and valves in contact with water shall be compatible with potable water supplies and in contact with chemical feed systems shall be compatible with the chemicals being used. All glues, solvents, solders, etc., shall likewise be compatible. For instance, no lead-base solders shall be used. All materials in contact with water to be used for potable water supplies shall be National Sanitation Foundation (NSF)-approved.

B. Size and Type:
   1. All materials shall conform to the size and type shown on the Drawings or called for in the specifications.
   2. In joining two dissimilar types of pipe, standard fittings shall be used when available. In the event standard fittings are not available, the method of joining shall be standard selected by CONTRACTOR and submitted for review by ENGINEER.

C. Materials provided shall be suitable for the conditions in which they are being installed and used. CONTRACTOR shall review installation requirements of the Contract with material suppliers and incorporate any additional installation requirements necessary to meet the required use within the price bid for the Work.

D. All pipe and materials used in performance of the Work shall be clearly marked as to strength, class, or grade. Pipe and materials not so marked shall be subject to rejection.

E. When requested by ENGINEER, material suppliers shall furnish certificates of compliance indicating that all tests required by various Standards have been conducted and that the text results comply with the Standards.

F. Piping appurtenances shall be made of the materials specified. All appurtenances not designated as to type shall be selected by CONTRACTOR and submitted for review by ENGINEER.

2.02 MANHOLES

A. General: All provisions of Drawing 01-975-41A, 01-975-42A, or 01-975-43A, enclosed in these specifications, except those contrary to provisions delineated herein or on the Drawings shall apply to manholes.

B. Unless otherwise specified or shown on the Drawings for special manholes, all manholes shall be reinforced concrete precast manholes. Reinforced concrete manhole base sections, riser sections, cones, and flat slabs shall conform to the requirements of ASTM C478. Solid precast manhole bottoms shall be provided except where shown on the Drawings. Manholes shall be provided with minimum diameters as shown on Drawings 01-975-41A or 01-975-43A.

C. Manhole top sections shall be precast reinforced eccentric cones unless precast reinforced flat slabs are specifically required or shown on the Drawings or are necessary because of shallow depth. Flat slabs shall have opening offset unless otherwise required or shown. Flat slabs shall be designed for HS20 loadings.

D. Unless otherwise specified or shown on the Drawings, all underground utility structures shall be precast, reinforced concrete. Reinforced concrete base sections, riser sections, and flat slabs shall conform to the requirements of ASTM C858. Flat slabs shall be designed for HS20 loadings. Solid precast bottoms shall be provided unless otherwise shown on the Drawings.

E. Manhole Chimney Adjusting Rings:
   1. Provide concrete manhole adjusting rings as shown in Drawing 01-975-43A.
   2. Precast concrete adjusting rings for standard manholes shall have an inside diameter of 26 inches, be not less than 2 inches nor more than 6 inches high, and shall have a wall thickness of 6 inches unless otherwise specified. The rings shall contain a minimum of one No. 2 reinforcing rod centered within the ring. The joints between rings and between rings and castings shall be sealed with preformed flexible joint sealant as specified herein.
   3. CONTRACTOR shall supply ring materials, adhesive, labor, and equipment to install the rings in strict accordance to manufacturer’s recommendations. CONTRACTOR shall permanently install rings with adhesive so that all manhole casting rims are set level with constructed road surface. Castings within roadways shall be set 1/4 inch to

1/2 inch below finished pavement grade. Ring inside diameter shall be 24-inch nominal, or larger to match frame.

4. CONTRACTOR shall have all ring sizes available when rebuilding tops of manholes, including tapered sections to allow for seamless adjusting of frame elevations on flat and sloped surfaces.
5. Concrete adjusting rings shall not be used for manhole adjustments. Substitute HDPE adjusting rings for concrete rings shown in Standard Detail Drawing 01-975-43A.

F. Manhole Chimney Seals:
1. External manhole chimney seals shall be provided for all new manholes. Chimney seal shall be Cretex, or equal.
2. Existing manholes exposed during the construction period shall have the adjustment rings replaced and a new chimney seal installed. Existing castings shall be reused.
3. Manhole frame-chimney seals shall be designed to prevent the leakage of water into the manhole at the area of the joint between the manhole frame and chimney continuously throughout a 20-year design life. The seal shall remain flexible, allowing repeated vertical movements of the frame because of frost lift, ground movement, or other causes of up to 2 inches and/or repeated horizontal movements of the frame because of thermal movement of the pavement or other causes of up to 1/2 inch, both rates of movement occurring at rates not less than 0.10 inch per minute. If the seal is an internal seal, it and its appurtenances shall not extend far enough into the manhole opening to restrict entry or exit from the manhole.
4. The seal shall be made of only materials that have been successfully used in sanitary sewer construction for at least 10 years and have proven to be resistant to sanitary sewage; corrosion or rotting under wet or dry conditions; the gaseous environment in sanitary sewers and at road surfaces including common levels of ozone, carbon monoxide and other trace gases at the sites of installations; the biological environment in soils and sanitary sewers; chemical attacks by road salts, road oil and common street spillages or solvents used in street construction or maintenance; the temperature ranges, variations and gradients in and between manhole frames and chimneys in the climate of the location of construction; variations in moisture conditions and humidity; fatigue failure caused by a minimum of 30 freeze thaw cycles per year; or vibrations because of traffic loadings; fatigue failure because of repeated variations of tensile, compressive and shear stresses and repeated elongation and compression; and any combination of the foregoing. The materials used shall be compatible with each other and the manhole materials.

G. Valve Boxes:
1. A valve box shall be provided for fire hydrant auxiliary valves and for valves in the main. The valve box shall be centered and plumb over the wrench nut of the valve with the box cover flush with the finished ground elevation. Solid 4-inch concrete blocks shall be placed under the base of valve boxes so that the bottom of the base is about 2 inches away from contact with the valve bonnet. A Gate Valve Adaptor by Adaptor Inc., or equal, shall be provided. The valve box shall not transmit shock or stress to the valve.
2. Valve boxes shall be made of cast iron conforming to ASTM A48. The castings shall be free from blowholes, porosity, hard spots, shrinkage defects or cracks, or other injurious defects and shall have a normal smooth casting finish. The castings shall be thoroughly coated with a 1 mil minimum thickness bituminous coating. Valve boxes shall be 5 1/4 inches in diameter. Valve boxes shall have a maximum length of 7 feet when extended without extension sections. Extensions shall be provided for deeper mains.

3. Valve boxes shall consist of a base section, tubular mid and top sections, both with cast threads by which one can be telescoped on the other, extension sections if required, and a circular drop cover unless indicated otherwise.
4. Valve boxes shall be installed in accordance with Drawing 01-975-64A.
5. Valve boxes shall be Tyler/Union 6850 Series, 4 inches through 12 inches, or equal. Extension heights shall be provided as required. Lids shall be marked for appropriate use. CONTRACTOR shall verify that all valve boxes are large enough to accommodate all operating nuts and wrenches. Provide one “Tee” valve key operator for each valve manhole and one for each tank with tank or channel drain.

H. Precast Reinforced Concrete Manholes:
1. Lengths of manhole riser (barrel) shall be furnished in such combinations as to conveniently make up the depth of the manhole. A maximum of two handling holes per length of riser will be permitted.
2. Drop entrances to sanitary sewer manholes shall be installed where indicated on the Drawings and as shown on Drawing 01-975-43A. Drop entrances shall be of the same diameter as the sewer main from sizes 8 inches through 18 inches. For larger diameters, the drop shall be 18 inches unless otherwise shown on the Drawings. Drop entrances for storm sewer manholes are not required.
3. The interior bottom of sanitary sewer and storm sewer manholes shall be constructed of concrete benches which shall be precast or poured in place in the field. Benches shall extend to the top of each pipe to a maximum height of 42 inches. Flow lines shall be made smooth with uniform curves to promote flow through the manhole.
4. All joints between manhole pipe sections and top shall be tongue and groove conforming to ASTM C443. Manhole joints shall be sealed with circular O ring or preformed flexible joint sealant that shall be Ram-nek, Kent-Seal, Mas-stik, or equal.
5. Manhole connections for sanitary sewer mains shall be made using flexible, watertight connections, PSX Press Seal, Kor N Seal, or equal, for sewers up through 18-inch diameter. All other sanitary sewer manhole connections shall be made with A Lok, PSX Press Seal, Kor N Seal, or equal. The joint shall provide a flexible, watertight connection between pipe and manhole. Manhole connections for storm sewer mains and leads may be made with cast-in-place concrete during completion of manhole interior in lieu of above.
6. Manhole bottoms for sanitary sewer shall be monolithically precast with the bottom section for manholes up through 6-foot diameter. Bottoms for larger diameter manholes shall be precast but need not be monolithically cast with the bottom section. All other manhole bottoms shall be either poured in place or precast concrete.
7. Manhole bottoms for air release manholes, force main cleanout manholes and water system valve manholes shall have an 18-inch diameter sump hole. Sump hole shall have a solid concrete bottom where groundwater is above the bottom of the manhole.
8. Manholes shall be furnished of minimum diameters as shown on Drawing 01-975-43A. Manholes shall be furnished large enough to provide a minimum distance, between adjacent pipe, measured tangentially along the inside face of the manhole, equal to one half the outside diameter of the intersecting sewer pipe. In any event, manholes shall be furnished in the diameter necessary to accommodate intersecting sewer pipe and the pipe to manhole connection as proposed for use.
9. Steps shall be installed in all manholes by the manufacturer as shown on Drawings 01-975-41A and 01-975-43A and shall be cast iron conforming to ASTM A48 or steel reinforced plastic conforming to ASTM A615, Grade 60 and ASTM D4101 with molded copolymer polypropylene covering conforming to ASTM D4101, Type PP200B33450Z02, or equal. Manhole steps shall be spaced 16 inches on center with an allowable tolerance of (plus or minus) 1 inch. Steps shall be inserted in

manhole riser, cone, and flat slab sections prior to the initial set of the concrete in accordance with ASTM C478 and shall have maximum embedment and pullout resistance in accordance with ASTM C497. The top step shall be located 10 inches or less from the top of the manhole cone section or uppermost structure section. Manhole steps shall be Neenah Type R-1981-N, M.A Industries, Inc. PS1-PF, or equal.

10. Precast reinforced concrete manhole risers and tops shall be tested in accordance with ASTM C497. Precast reinforced concrete manhole risers and tops meeting the strength requirements will be considered acceptable and shall be stamped with an appropriate monogram. When requested, copies of test reports shall be submitted to ENGINEER before the manhole sections are installed in the Project. Final acceptance will be made after field inspection upon delivery to the jobsite.
11. Precast reinforced concrete manhole sections shall be subject to rejection for failure to conform to any of the requirements of the Standard Specifications. In addition, individual sections of manhole risers and tops may be rejected because of any of the following reasons:
    a. Fracture or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
    b. Defects that indicate imperfect proportioning, mixing, and molding.
    c. Surface defects indicating honey combed or open texture.
    d. Damaged ends, where such damage would prevent making a satisfactory joint.
    e. Manhole steps out of line, or not properly spaced.
    f. Noticeable infiltration into manhole.
    g. Variation in diameter of the manhole section of more than 1% from the nominal diameter.
    h. Any continuous crack having a surface width of 0.01 inch or more and extending for a length of 12 inches or more regardless of position in the section wall.

I. Each precast reinforced concrete manhole riser and top section shall be clearly marked with the name or trademark of the manufacturer and the date of manufacture. This marking shall be indented into the manhole section or shall be painted thereon with waterproof paint.

J. Masonry:
1. Concrete block shall meet the requirements of ASTM C139.
2. The face size of stretcher units shall be 7 5/8 inches by 15 5/8 inches. Variations in the face size shall be within the limits permitted by the above standards. Special shapes and sizes shall be furnished and installed as necessary.
3. Sewer brick shall conform to ASTM C32. All sewer brick shall be Grade SS and manhole brick shall be Grade MS. Sewer brick shall be installed as shown on the Drawings furnished by ENGINEER and as required in the construction of sewer appurtenances.

K. Manhole and Inlet Castings:
1. All manhole and inlet castings shall be gray iron and meet the requirements of ASTM A48. Unless otherwise shown on the Drawings, standard manhole castings shall be Neenah R1550 with machined frame, Type B solid lid, concealed pick holes and self-sealing gaskets, East Jordan Iron Works, or equal. Floodproof castings shall be Neenah R1916 C with machined frame, type B solid lid, concealed pick holes and self-sealing gaskets, East Jordan Iron Works, or equal.
2. Inlet castings for locations with curb and gutter shall be Neenah R3067 with type L grates on slopes and type R grates at low points, East Jordan Iron Works, or

equal. For driveway areas, inlet castings shall be Neenah R3290 with Type C grates, East Jordan Iron Works, or equal.

L. Mortar: Mortar shall meet the requirements of ASTM C270. Mortar shall be one part Portland cement and 2 1/4 parts washed mortar sand.

M. Preformed Flexible Joint Sealant: Preformed flexible joint sealant shall be EZ Stik, Kent Seal, Ram Nek, or equal, meeting the requirements of ASTM C990.

N. O-Rings: O-rings shall meet the requirements of ASTM C443.

2.03 BURIED PIPING

A. Ductile Iron Piping and Fittings:

1. Unless otherwise shown or specified, all underground piping 3 inches in diameter or larger shall be ductile iron conforming to AWWA C151/A21.51 with mechanical joints or push-on joints. Pipe wall thickness shall be furnished as required by AWWA C150 for buried piping with the depth of cover as shown on the Drawings for laying condition 4, minimum Special Thickness Class or Pressure Class as listed below, unless otherwise shown or specified.

Pipe Size (Inches)	Special Thickness (Class)	Pressure Class
3	53	---
4	53	---
6	53	---
8	53	---
10	53	---
12	53	---
14	52	---
16	52	---
18	52	---
20	---	250
24	---	250
30	---	250
36	---	250
42	---	250
48	---	250
54	---	250
60	---	250
64	---	250

2. Each pipe and fitting shall have the weight, class or nominal thickness, country where cast, casting period, manufacturer's mark, the year in which the pipe was produced, and the letters DI or DUCTILE cast or stamped thereon. Improper or incomplete marking will be cause for rejection of the pipe or fitting.
3. CONTRACTOR shall furnish certification data representing each class of pipe or fitting furnished. The certification report shall clearly state that all pipe and fittings furnished meet the appropriate AWWA specification. Ductile iron pipe shall consist of pipe centrifugally cast in metal or sand-lined molds. Pipe wall shall be homogeneous from

inside to outside and shall be completely free of laminations, blisters, or other imperfections. Defects may be removed at the factory only.

4. Except as otherwise specified, underground pipe shall have mechanical joints or push-on joints conforming to AWWA C110 and C111, as well as AWWA C153 (compact), with vulcanized styrene butadiene rubber gaskets conforming to AWWA C111. Gaskets that include metal locking segments vulcanized into the gasket to grip the pipe and provide joint restraint are not acceptable. Bolts on mechanical joints shall be high-strength low-alloy steel (Corten, or equal), conforming to AWWA C111. Certificate to that effect shall be provided.
5. For ductile iron pipe systems requiring pressure testing, restrained joints shall be provided in accordance with Part 3–Execution. Mechanical joints shall be restrained with MEGALUG® Series 1100 or 1100 SD, by EBAA Iron Sales, Inc., UNIFLANGE Series 1400 by Ford Meter Box Co., Inc., or equal, restraint. Push-on joints for ductile iron piping shall be restrained with MEGALUG® Series 1700 or 1100 HD, by EBAA Iron Sales, Inc., UNIFLANGE Series 1450 by Ford Meter Box Co., Inc., Flex-Ring or Lok-Ring by American Cast Iron Pipe Company, TR Flex by U.S. Pipe Company, TR Flex by McWane, or equal.
    a. Pipe restraint fittings shall be provided as follows:
        (1) For ductile iron pipe with ductile iron mechanical joints MEGALUG® Series 1100 or 1100SD by EBAA Iron Sales, Inc.; Series D SLDE or SSLD by Sigma; Series 3000 or 3000S by Star Pipe Products; or equal.
        (2) For ductile iron pipe with ductile iron push on joints MEGALUG® Series 1100HD or 1700 by EBAA Iron Sales, Inc; Series SLDEH or SSLDH by Sigma; Series 3100P or 3100S by Star Pipe Products; Flex Ring or Lok Ring by American Cast Iron Pipe Company; TR Flex by U.S. Pipe Company; or equal.
        (3) For PVC pipe with ductile iron mechanical joint fittings–MEGALUG® Series 2000 PV, 1100SV, or 2000SV by EBBA Iron Sales, Inc.; Series D SLCE or PVM by Sigma; Series 1000C or 4000 by Star Pipe Products; or equal.
        (4) For PVC pipe with PVC push on joints (not solvent welded)–MEGALUG® Series 1100HV, 1900, or 2800 by EBAA Iron Sales, Inc.; Series SLCEH, PWP (greater than 12-inch only), or D PWP (12 inches or less) by Sigma; Series 4100P by Star Pipe Products; or equal.
    b. Gland body, wedges, and wedge actuating components shall be ductile iron conforming to ASTM A536 Grade 65 45 12. Bolts and tie rods shall be high strength low alloy steel conforming to AWWA C111.
    c. Gaskets that include metal locking segments vulcanized into the gasket to grip the pipe to provide joint restraint are not acceptable.
6. Joint restraint is not required for gravity sewers, drains, and those pipes designated in Paragraph 3.02.G.1. Infiltration/Exfiltration Tests.
7. Underground pipe shall have mechanical joint or push-on joint ductile iron fittings conforming to AWWA C110 and C111 or AWWA C153 compact fittings with a minimum rated working pressure of 150 psi. Gaskets for fittings shall be as specified for underground piping.
8. All ductile iron fittings shall be American Cast Iron Pipe, Tyler Union, U.S. Pipe, McWane Ductile, Griffin, or equal.
9. Ductile iron wall pipes shall be provided as shown on the Drawings. For piping over 24 inches that does not require restraints, wall pipes shall be provided with push-on joint connection at exterior end of wall pipe. For piping over 24 inches that requires restraint, wall pipes shall be provided with Flex Ring or Lok Ring by American Ductile Iron Pipe Company, TR Flex by U.S. Pipe Company, TR Flex by McWane, or equal,

connection. For piping over 24 inches, wall pipes may also be provided with mechanical joint connection at exterior end of wall pipe. For piping that requires restraint, mechanical joint connections at exterior end of wall pipe shall be restrained as specified for mechanical joints.

10. Unless otherwise specified, all exterior ductile iron piping and fittings shall be cement-mortar lined and asphaltic-coated inside. Cement-mortar lining shall be in accordance with AWWA C104. Unless otherwise specified, underground piping and fittings shall be shop primed or asphaltic-coated outside. Asphaltic coating shall conform to applicable standards herein for the pipe and fittings.
11. Tapping and Bonding: In cases where corporation stops are to be tapped into mains, pipe wall thickness shall be furnished as specified in AWWA C151 to provide four threads or pipe saddles shall be furnished as approved by manufacturer.
12. Cutting in and Repair Tees and Sleeves and Tapping Tees: Cutting-in and repair tees and sleeves and tapping tees shall be of ductile or cast iron with the same rated working pressure of the pipe in which they are installed but no less than 150 psi.
13. Exterior Joints, Fittings, and Gaskets: Joints, fittings, and gaskets shall have the same rated working pressure of the pipe in which they are installed but no less than a minimum rated working pressure of 150 psi.

B. Solid Wall PVC:

1. Polyvinyl chloride (PVC) pipe shall meet the requirements of ASTM D3034 for pipe sizes 4 inches through 15 inches and ASTM F679 for pipe sizes 18 inches through 60 inches.
2. PVC material for ASTM D3034 pipe shall have cell classification 12454 or 12364 as defined in ASTM D1784 with minimum modulus of elasticity of 400,000 psi. Pipe stiffness shall be minimum 46 psi when tested in accordance with ASTM D2412. Pipe shall have a maximum standard dimension ratio (SDR) of 35.
3. PVC material for ASTM F679 pipe shall have cell classification 12454 or 12364 as defined in ASTM D1784 with a minimum modulus of elasticity of 500,000 psi. Pipe stiffness shall be a minimum 115 psi when tested in accordance with ASTM D2412.
4. Pipe and fittings shall be the product of one manufacturer, and the manufacturer shall have experience records substantiating acceptable performance of the pipe and fittings to be furnished. The minimum wall thickness of fittings shall be the same as the pipe to which it connects.
5. Acceptance of piping and fittings shall be subject to tests conducted in accordance with ASTM D3034 and/or ASTM F679.
6. Fittings such as saddles, elbows, tees, wyes, and others shall be of material and construction corresponding to and have a joint design compatible with the adjacent pipe. Approved adapters shall be provided for transitions to other types of pipe.
7. Joints shall be of the elastomeric type for pipes 4 inches or larger and elastomeric or solvent cement for pipes less than 4 inches.
8. Elastomeric joints shall be a bell and spigot joint conforming to ASTM D3212 sealed by a rubber gasket conforming to ASTM F477 so that the assembly will remain watertight under all conditions of service, including the movements resulting from the expansion, contraction, settlement, and deformation of the pipe. Bells shall be formed integrally with the pipe and shall contain a factory-installed positively restrained gasket.
9. Solvent cement joints shall be assembled using solvent cement obtained from the pipe manufacturer, which conforms to the requirements of ASTM D2564.
10. The assembled joint shall pass the performance tests as required in ASTM D3212.

C. Gravity Sanitary Sewer Service Branches and Laterals:
1. Branches (tees and wyes) shall be of the same material as the main except for reinforced concrete pipe used for sanitary sewer. For reinforced concrete pipe, special branches shall be furnished and installed to accept the lateral. Such special branches are subject to review by ENGINEER.
2. If a different thermoplastic material is specified for laterals than for the main line, appropriate solvent welds, fittings, transition couplings, and other appurtenances shall be provided to effect a water tight seal.
3. Fittings for laterals shall be of the same material as the lateral pipe unless special fittings are needed for transition between material types or sizes or standard fittings are not manufactured.
4. Where the wye or tee branches and laterals are of dissimilar materials, CONTRACTOR shall provide a transition coupling for the connection.
5. All fittings used, including type of jointing, are subject to review by ENGINEER.

D. Steel or Aluminum Corrugated Pipe:
1. Corrugated pipe composed of corrosion protected steel or of aluminum shall meet the requirements of AASHTO M36 and of structural steel plate shall meet the requirements of M167. Pipe provided shall be new and free of defects and scale. Pipe and fittings that are dented, deformed, or have damaged coatings shall be removed from the site at CONTRACTOR's expense.
2. The average inside diameter of circular pipe shall not vary more than 1/2 inch or 1%, whichever is greater, from the nominal diameter.
3. The span and rise dimensions shall not vary more than 1 inch or 2% of the equivalent circular diameter, whichever is greater.
4. Coupling bands shall conform to AASHTO M36 and shall be made of the same base metal as the pipe. The bands shall not be less than 7 inches wide for diameters of 8 inches to 30 inches, inclusive; not less than 12 inches wide for pipe with diameters 36 inches to 60 inches, inclusive; and not less than 24 inches wide for pipe with diameters greater than 60 inches. Such bands shall be so constructed as to lap on an equal portion of each of the pipe sections to be connected and preferably shall be connected at the ends by galvanized angles having minimum dimensions of 2 inches by 2 inches by 3/16 inch.
5. All connections shall be shop fabricated where possible.
6. All cuts in corrugated pipe and pipe arch shall be saw cut. Connections cut in the field shall be saw cut with a saddle connection of 16-gauge material bolted on the corrugated pipe with 1/2-inch-diameter galvanized bolts.

E. PVC Pipe (AWWA) and PVC Pressure Pipe Fittings (4 Inches and Larger):
1. PVC water main shall be AWWA PVC pressure-rated pipe and shall conform to the requirements of AWWA C900 for pipe from 4 inches to 60 inches. Pipe shall be furnished with integral elastomeric bell and spigot joints.
2. PVC pipe diameter shall conform to ductile iron pipe sizes (DIPS). The type of PVC material, nominal pipe size, standard dimension ratio, and pressure class shall be not less than pressure class 235 and not greater than pipe dimension ratio 18.
3. Markings on pipe shall include the following: Nominal pipe size, type of plastic pipe material, DR number, AWWA Designation with which the pipe complies, manufacturer's name, and the seal or mark of the laboratory making the evaluation of the suitability of the pipe for transport of potable water.
4. All fittings for PVC pressure pipe shall be iron pipe fittings as specified herein.
5. Provide tracer wire for underground PVC piping as specified herein, unless otherwise noted.

F. Transition Couplings for Gravity Sewer Service: Transition couplings shall be provided to join dissimilar pipe materials or to connect pipe where a standard pipe joint cannot be provided. Couplings shall be designed to join the pipe materials matching flow line elevations. Transition couplings for gravity sewer service shall be Fernco 5000 RC Strongback, Mission Flex Seal ARC Shielded, or equal. Shear rings shall be provided to minimize differential settlement. All bands, clamps, shear rings and other metal components shall be stainless steel. Bushings or transitions shall be provided to accommodate pipe size differences.

G. Miscellaneous Pipe:
1. Piping needed for repair or reconstruction of existing utilities and appurtenances shall be of the same type and strength as the existing. The type of jointing used in repair and reconstruction shall be reviewed by ENGINEER. Special fittings shall be furnished and installed as necessary for repair, reconstruction, or connection of existing facilities.
2. All special fittings on or for connection to utilities shall be specifically built for the type of gasket used. Special fittings shall have joints of the same type as the utility to which the connection is being made.

H. Tracer Wire:
1. Provide minimum 10-gauge solid insulated copper tracer wire with buried thermoplastic pressurized pipe. Wire shall be continuous, terminate, and be accessible at valve boxes, manholes, fire hydrants, or at test stations as specified below. Tracer wire shall be located 12 inches above the top of the pipe. Any splices in copper wire shall be made with a 3M™ DBR/Y-6 splice kit, or equal.
2. Tracer wire test stations shall be SnakePit magnetized tracer boxes by Copperhead Industries, or equal. Tracer box shall be corrosion-resistant brass wire lugs and wax pad to cover wire connection. Cover shall be color-coded according to APWA standards for fluid conveyed. Provide SnakePit Lite Duty Box in unpaved areas and Roadway Box in paved areas. Provide Rhino Triview Marker Posts, or equal, at all test stations. Provide custom decals to identify fluid in piping. The tracer wire shall be accessible at a minimum of every 500 feet along the pipeline and at horizontal bends in piping. The tracer wire shall run into and up the sides of all manholes and be secured near the casting. Test stations shall be placed as required between manholes to comply with the minimum 500-foot tracer wire accessibility requirement.
3. CONTRACTOR shall perform continuity testing of all tracer wire in the presence of OWNER.

2.04 VALVES

A. Gate Valves: Shutoff valves in cast or ductile iron lines containing wastewater and shutoff valves in potable and non-potable water lines 4-inch diameter and larger shall be AWWA C515, ductile iron AWWA C509, cast iron, resilient seat, nonrising stem, OS&Y (rising stem) for wastewater applications, 150 psi working pressure with O-ring packing box, Kennedy, American, American AVK, or equal.

B. Corporation Stop and Curb Stop Valves:
1. Performance Requirements: Lead Free Requirements: All materials that contact potable water shall be lead free. Lead free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤0.25% per the Federal Safe Drinking Water Act as amended January 4, 2011, Section 1417. All products used in potable water systems shall

be UL classified in accordance with ANSI/NSF 61 for potable water service and shall meet the low lead requirements of NSF 372.

2. Corporation Stop Valves: 2 Inches and smaller: Bronze body ground key valve, bronze plug, AWWA taper thread inlet and copper flare outlet nut connections or compression type, AWWA C800.
3. Curb Stop Valves: Boxes 2 Inches and smaller: Bronze body plug valve, bronze plug, quarter turn check, O ring seals, copper flare nut connections or compression type, AWWA C800. Provide Minneapolis type curb box complete with lid and stationary rod.

2.05 FIRE HYDRANTS

A. Fire hydrants provided under these Standard Specifications shall conform to AWWA C502 for Dry Barrel Fire Hydrants. Hydrants shall have the following features:

Bury Length	Approximately 7 1/2 feet to traffic flange.
Nozzle Size	One 4 1/2-inch- and two 2 1/2-inch-diameter openings.
Nozzle Threads	National standard fire hose coupling screw threads.
Drain Port:	Drain port at base of hydrant barrel. Plug drain port when hydrant installed in area where groundwater level may rise above drain port.
Size of Main Valve Opening	5 1/4-inch-diameter minimum. The hydrant lead connection shall be minimum 6-inch-diameter mechanical joint.
Torque Requirements	Hydrant shall comply with AWWA C502 even if greater than 5-foot bury.
Lubrication	Nontoxic and providing proper lubrication for a temperature range of -30°F to +120°F.

B. Hydrants shall have permanent markings identifying the manufacturer by name, initials, insignia, or abbreviations in common usage, and designating the size of the main valve opening and the year of manufacture. Markings shall be so placed as to be readily discernible and legible after hydrants have been installed.

C. CONTRACTOR shall furnish certification to ENGINEER that the hydrant and all material used in its construction conform to the applicable requirements of AWWA C502 and the supplementary requirements thereto.

D. All joints on fire hydrant leads shall be made using pipe restraint specified herein. Approximately 1/2 cubic yard of bedding stone shall be placed from the bottom of the trench around the hydrant elbow and up the hydrant barrel. Bedding stone shall be wrapped completely in filter fabric to prevent the in migration of fine materials.

E. CONTRACTOR shall furnish all necessary fittings in the fire hydrant lead to install the fire hydrant in a plumb condition at locations shown on the Drawings and at the specified depth of bury. The pumper nozzle of all fire hydrants shall be installed with the nozzle pointing toward the street. ENGINEER reserves the right to alter the location of fire hydrants from that shown on the Drawings.

F. Hydrants shall be installed as shown on Drawing 01-975-65A.

G. Fire Hydrant:
1. Fire hydrant shall be Waterous W 67 Pacer, or equal.
2. Hydrant to be painted red.

3. Provide restrained joint system from auxiliary valve in road box back to tee.
4. Connect hydrant to auxiliary valve with 2 foot length of pipe.
5. Provide drain port at base of hydrant barrel. Plug drain port when hydrant installed in area where groundwater level may rise above drain port.

2.06 CONCRETE

A. All concrete poured under this Contract, unless shown or specified otherwise, shall conform to the requirements of these Specifications.

2.07 AGGREGATE SLURRY (FLOWABLE) BACKFILL

A. Aggregate slurry (flowable) backfill shall consist of fine and coarse aggregate conforming to ASTM C33. Coarse aggregate shall be size number 67 and fine aggregate shall be size number 4. The material shall be mixed with water to provide an approximate 3-inch slump. The mix shall be deposited in the trench from ready-mix concrete transit mix trucks and shall be consolidated using concrete vibrators or vibratory plate compactors.

PART 3–EXECUTION

3.01 INSTALLATION

A. Underground Piping:
1. Utility lines shall be laid and installed to the lines and grades specified with valves, fittings, manholes, and other appurtenances at the specified locations; spigots centered in bells; and all manholes and riser pipes plumb. Water main and force main shall be installed at the minimum depth of 4 feet, as indicated on the Drawings. Gravity sewer mains and laterals shall maintain a minimum 3 feet of cover but shall be deep enough to provide service to buildings. Water main, force main, and other pressure mains shall be installed to within (plus or minus) 0.1 feet of designed grades. Sanitary and storm sewer and laterals shall be installed to within (plus or minus) 0.03 feet of designed grades. Service lines shown on the Drawings are approximate.
2. Deviations Occasioned by Underground Facilities: Wherever significant obstructions not shown on the Drawings are encountered during the progress of the Work, CONTRACTOR shall proceed in accordance with the General Conditions to notify owners and protect the facilities. Existing items unnecessarily damaged during the performance of the Work shall be repaired and replaced at the expense of CONTRACTOR.
3. Prior to commencing pipe laying, CONTRACTOR shall notify ENGINEER of the intended date for starting Work. ENGINEER may request at CONTRACTOR's expense the removal and relaying of pipe which was installed prior to notification of ENGINEER.
   a. Proper implements, tools, and facilities shall be provided and used by CONTRACTOR for the safe and convenient prosecution of the Work. All pipe, fittings, and appurtenances shall be carefully lowered into the trench piece by piece with a crane, rope, or other suitable tools or equipment, in such manner as to prevent damage to materials. Under no circumstance shall pipe be dropped or rolled into the trench.
   b. Materials shall be as shown on the Drawings or as specified herein.
4. Material Inspection: CONTRACTOR shall inspect the pipe, fittings, and appurtenances for defects when delivered to the jobsite and prior to lowering into the

trench. Defective material shall be removed from the jobsite. All material shall be clean and free of deleterious substances prior to use in the Work.

5. Except where noted or specified, all ductile iron underground piping shall be laid in accordance with AWWA C605 with the conditions that (a) blocking shall not be used to support pipe and (b) all bends and fittings shall be restrained as specified below, and pipe joints shall be restrained in all directions from all bends and fittings to the length as specified below.
6. Pipe Length:
   a. The minimum length of pipe to be restrained shall be as shown in the following table.
   b. This table assumes horizontal orientation of fittings, 150 psi test pressure plus a 100 psi water hammer allowance, ductile iron pipe, and a 3-foot bury. Lengths shall be adjusted for other conditions and fittings. For other fittings and for more specific requirements, see the Drawings:

REQUIRED LENGTH OF RESTRAINED PIPE BEYOND FITTING IN FEET

Fitting	Minimum Length–Ft
90 Degree Bend (≤ 6 inches)	36
90 Degree Bend (8 inches to 10 inches)	54
90 Degree Bend (12 inches to 14 inches)	72
90 Degree Bend (16 inches)	84
45 Degree Bend (≤ 8 inches)	18
45 Degree Bend (10 inches to 16 inches)	36
22 1/2 Degree Bend ≤ 16 inches	18
11 1/4 Degree Bend ≤ 16 inches	9
Fire Hydrant Leads	All Joints
Tees (≤ 4 inches)*	18 (Along Branch)
Tees (6 inches to 8 inches)*	36 (Along Branch)
Tees (10 inches to 12 inches)*	54 (Along Branch)
Tees (14 inches to 16 inches)*	72 (Along Branch)

*Restrained run length on tees assumed 18 feet on each side of fitting.

7. Force main and water main shall be installed in accordance with AWWA C600 for iron pipe, AWWA C605 for PVC pipe, and AWWA M55 for HDPE pipe. All plugs, caps, tees, hydrants, bends, and other fittings for water mains and force mains shall be provided with restrained joints.
8. PVC sewer and plant drain piping shall be installed in accordance with ASTM D2321. Except where noted or specified, PVC or other thermoplastic pressure piping shall be installed in accordance with ASTM D2774.
9. CONTRACTOR shall lay all gravity pipe to the line and grade shown on the Drawings with bell ends uphill wherever possible. If not possible, CONTRACTOR shall lay pipe to the line and grade shown on the Drawings with bell ends in the direction of laying. Water piping and chemical solution piping shall have a minimum of 6 1/2 feet of cover. Unless shown otherwise, drainage piping shall clear floor slabs or footings by a minimum of 6 inches.
10. Any pipe or fittings cracked in cutting or handling or otherwise not free from defects shall not be used. Pipe must be kept clean of mortar, cement, clay, sand, or other material. When PVC piping is installed during hot weather, it shall be laid in the trench with slack or permitted to cool to ground temperature before it is cut to length for making final connections. PVC expansion joints shall be provided where needed.

11. At times when pipe laying is not in progress, the open ends of pipe shall be closed with plugs to prevent the entry of foreign material. Acceptable plugs include Foreman Nite Caps by APS, mechanical joint cap or plug, bladder plug, or test plug. All foreign material shall be removed from the pipe prior to acceptance.
12. The locations and elevations of existing piping and manholes are approximate. Where necessary, existing piping shall be exposed by CONTRACTOR to confirm location and elevation before installing new piping. Any changes in pipe location or elevation shall be approved by OWNER.
13. General Excavation:
    a. Pipe Laying:
        (1) All pipe shall be laid accurately to the line and grade as designated. Preparatory to making pipe joints, all surfaces of the portions of the pipe to be joined or of the factory made jointing material shall be clean and dry. Lubricants, primers, adhesives, and other joint material shall be used and installed as recommended by the pipe or joint manufacturer's specifications. The jointing materials or factory fabricated joints shall then be placed, fitted, joined, and adjusted in such a workmanlike manner as to obtain the degree of watertightness specified. Pertinent specifications from the joint and pipe manufacturer which outline procedures to be followed in making the joint shall be furnished to ENGINEER.
        (2) Wyes, tees, and special fittings shall be installed as called for on the Drawings, or as requested by ENGINEER. Wyes, tees, and special fittings, shall, in general, be jointed with the same type of joint as used in the pipe.
        (3) In joining two dissimilar types of pipe, manufactured adapters and fittings shall be used. Adapters and fittings shall be configured to maintain invert elevations at same level.
        (4) Joint deflections shall not exceed the limits established by the pipe manufacturer for the pipe and joint being used.
        (5) Joints that are damaged because of carelessness, improper handling, or failure to prevent imperfections in manufacture shall be subject to rejection and gaskets shall be subject to rejection whenever they show surface cracking, tears, or splice separation.
        (6) At times when pipe laying is not in progress, the open ends of pipe shall be closed with plugs to prevent the entry of foreign material. All foreign material shall be removed from the pipe prior to acceptance.
        (7) After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with specified backfill material tamped around it except at the bells.
        (8) Pipe shall be brought home by using a cross member and levers or jacks. It will not be permissible to push pipe home with motor powered excavation equipment.
        (9) Force main and water main shall be installed in accordance with AWWA C600 for iron pipe, AWWA C605 for PVC pipe, and AWWA M55 for HDPE pipe. All plugs, caps, tees, hydrants, bends, and other fittings for water mains and force mains shall be provided with restrained joints.
    b. Sewer Service Branch and Lateral Installation:
        (1) CONTRACTOR shall furnish and install sanitary sewer and storm sewer branches, laterals, and leads as shown on the Drawings or requested by ENGINEER. Under normal circumstances, service laterals will be installed within the right of way or easement to serve all existing buildings and all platted lots. In certain cases, only wye or tee branches will be installed to

vacant lots. Service laterals shall consist of a branch fitting at the main and extension of the specified lateral pipe to the end of lateral as called for and requested. All necessary fittings shall be furnished and installed to complete the installation as shown on Drawing 01-975-75A. All necessary fittings shall be furnished and installed to complete installation of storm sewer leads as shown on Drawing 01-975-41A.

(2) Wye or tee branches: Wherever shown on the Drawings or requested by ENGINEER, wye or tee branches shall be provided for use in making sanitary sewer service and storm sewer inlet connections. Unless specified otherwise on the Drawings, wye or tee branches for sanitary sewer service lateral connections to single family residences shall be 4-inch diameter. All other sanitary sewer service lateral connections shall be 6 inches. Wye or tee branches for storm sewer inlet connections shall be of the size called for on the Drawings, 12 inches minimum.

(3) Sanitary sewer service branches shall be turned so that the branch is at an angle of 30 degrees or 45 degrees from the horizontal.

(4) Sanitary Sewer Service Laterals: Under normal conditions and unless otherwise shown on the Drawings or requested by ENGINEER, all service laterals shall be Standard Laterals, Type 1, as shown on Drawing 01-975-75A. Service laterals of Types 2 through 6 may be requested by ENGINEER to meet field conditions.

(5) It is the general intent to install Modified Laterals, Type 2, 4, or 5 for service to homes that presently have shallow or no basements or where the depth to groundwater at the end of lateral is shallow. Types 3 and 6 risers are only to be provided where shown on the Drawings.

(6) Installation and Testing Requirements: Except for those branches that are to be used on storm sewers or for extending sanitary sewer service laterals, wye and tee branches shall be closed with airtight stoppers blocked to withstand air test pressures.

(7) The ends of all laterals shall be plugged and blocked to resist air test pressures. All plugs shall be manufactured to fit the pipe used and shall be watertight. The ends of all laterals shall be marked as shown on Drawing 01-975-75A using flagging tape and 2 by 4 markers.

(8) Unless otherwise provided for in the Drawings, each service lateral shall have a tracer wire installed from the main to the property line or the location of the connection to the existing service, whichever is greater or applicable. The tracer wire shall be 10-gauge solid copper with no splices. The wire shall be secured to the pipe with duct tape at a minimum of 3-foot intervals. The ends of the tracer wire shall be brought to the ground surface and stored in an access terminal box, DWS–Tracer Wire Access Box, or equal, at a location selected by OWNER. Eighteen inches of additional wire length shall be coiled at the location of the terminal box. CONTRACTOR shall confirm the method of installation is compatible with OWNER’s means of detecting the location of the service lateral. Each tracer wire shall be tested by CONTRACTOR to confirm it accurately provides the location and depth of the sewer lateral.

(9) A complete and accurate tabulation of length, depth, and location of all branches, risers, and laterals shall be kept by CONTRACTOR on cards available from ENGINEER. Measurements shall be made from the nearest downstream manhole. Lateral installation to meet these Standard Specifications and field conditions are the responsibility of CONTRACTOR.

Problems occurring because of failure to provide proper installation or proper records shall be corrected by CONTRACTOR at its expense.

(10) No installed lateral shall be backfilled until ENGINEER has been notified that the lateral is complete and reasonable time is allowed for observation of the Work.

c. Water Service Lateral Installation:

(1) Water service laterals requiring reconstruction and new service laterals shall be installed in accordance with AWWA C600. CONTRACTOR shall perform all excavation, backfill, and other Work necessary for a complete installation. The service tubing shall be continuous and shall be placed at a minimum depth of 6 1/2 feet. Each service shall include a corporation stop at the main, copper service tubing, curb stop, curb box, couplings, and all other appurtenances necessary for a complete installation. Where existing services in the street are being reconstructed, the new service shall be connected to the existing service at the property line unless otherwise shown or specified. Taps in the main shall be at an angle of 45 degrees above the horizontal.

(2) OWNER reserves the right to make taps and connections to the new mains prior to backfilling by CONTRACTOR. CONTRACTOR shall delay backfilling until OWNER has completed its Work.

(3) All curb boxes on new services shall be marked by placing a 4-foot long 2 by 4 adjacent to it. The 2 by 4 shall project 1 foot above existing ground and shall be painted blue. All services shall be extended to the street property line, unless otherwise shown or specified.

d. Manholes:

(1) Manholes shall be installed in accordance with Drawing 01-975-41A for storm sewer and Drawing 01-975-43A for sanitary sewer. Manholes shall be plumb with any steps aligned and openings located over steps. For sanitary sewers, openings shall be located over the bench and not the sewer flow line itself.

(2) All manholes shall be made watertight and shall show no visible signs of leakage at the time of final review and within the correction period. Any leakage shall be sealed from the exterior of the manhole.

e. Masonry:

(1) No masonry shall be laid when the temperature of the outside air is below 40°F unless all masonry materials are heated and protected against freezing.

(2) Only enough mortar shall be mixed that can be conveniently used before it reaches initial set. Retempering of mortar will not be permitted.

f. Abandoning Utilities: Utilities to be abandoned shall, unless otherwise noted on the Drawings**,** be abandoned in place. Open ends of pipes shall be plugged with 12 inches of concrete. Manhole barrels, valve boxes and other such structures shall be removed to a point 3 feet below existing or final ground surface, whichever is lower, and shall then be filled with backfill material compacted to that of the trench backfill. An approximate 9-inch-diameter opening shall be made in the bottom of the structure to allow for groundwater movement.

g. Connections to and Modifications of Structures and Mains:

(1) Unless otherwise noted on the Drawings, openings in existing structures to allow for connection of mains shall be core drilled, and the mains themselves shall be connected by use of watertight connections as specified in the Standard Specifications. Flow channels in the bottoms of existing structures shall be modified as necessary to provide smooth transition for incoming flow

and/or orientation of mains. These modifications may include breaking out and reforming flow channels.

(2) Where mains, new and existing, are to intersect, dog house manholes shall be provided to facilitate connection and to gain access to the intersecting mains. Manholes shall be provided at the manufacturing plant with arched openings in lower barrel section to span each of the intersecting mains. Reinforcing shall be cut and bent back. In the field, manhole shall be set on concrete blocks, with reinforcing provided according to Drawings 01-975-41A or 01-975-43A for the bottom slab. Concrete shall be poured under and around the manhole to seal all openings, cover and adhere to the slab and bent reinforcement, and provide for benches or fillets in the manhole. Sanitary and storm sewer mains shall be kept intact until the bench or fillet is poured. Then the top of pipe to springline shall be removed to provide access.

14. Valve Boxes: The valve box shall be centered and plumb over the wrench nut of the valve with the box cover flush with the finished ground elevation. Solid 4-inch concrete blocks shall be placed under the base of valve boxes so that the bottom of the base is about 2 inches away from contact with the valve bonnet. The valve box shall not transmit shock or stress to the valve.

3.02 FIELD QUALITY CONTROL

A. CONTRACTOR shall include the cost of all televising, testing, cleaning, and disinfection in the price bid.

B. Work shall be tested as specified in this section. Unless indicated in writing before testing begins, tests shall be witnessed by ENGINEER and others as necessary. Test results shall be recorded, and reports or appropriate certificates shall be submitted to ENGINEER in triplicate.

C. New piping shall be tested. Prior to conducting the pressure and leakage test, CONTRACTOR shall backfill the trench for its full depth. All bends and special connections to the main shall be adequately blocked and tied prior to the test. Any damage caused to the main or its appurtenances during performance of these tests shall be corrected by CONTRACTOR at its expense. Should underground piping fail test, CONTRACTOR shall be responsible for removal and replacement of backfill, and relay new pipe if necessary, to repair the defective pipe. Under no circumstances shall defects be sealed from the interior of the pipe, and only where specifically allowed by ENGINEER, shall defects be sealed from the exterior of the pipe. Piping, interior or exposed, shall be subject to test before being covered with insulation or paint. Piping and appurtenances shall be watertight or airtight and free from visible leaks. Manholes and appurtenances shall be free of any visible leaks. Any leakage shall be sealed by methods acceptable to OWNER, from the exterior of the manhole or structure. Precast reinforced concrete manhole risers and tops shall be tested in accordance with ASTM C497.

D. Piping shall be flushed or blown out after installation prior to testing. CONTRACTOR shall provide all necessary piping connections, water, air, test pumping equipment, water meter, bulkheads, valves, pressure gauge and other equipment, materials, and facilities necessary to complete the specified tests. CONTRACTOR shall provide all temporary sectionalizing devices and vents for testing.

E. Pressure Tests:
   1. Pressure tests shall be performed as required by AWWA C600 and AWWA C605, unless otherwise noted herein.
   2. When test medium for piping is water, all air shall be removed from piping by flushing, opening vents, loosening flanges, utilizing equipment vents and/or installation of corporations at high points in system. Test pumping equipment used shall be centrifugal pumps or other pumping equipment that will not place shock pressures on the main. Power plunger pumps will not be permitted for use on closed pipe systems. Pumps shall be disconnected during test periods. Presence or absence of air will be determined during pressurization of the piping system.
   3. The test pressure in all lines shall be held for two hours, during which time the leakage allowance shall not exceed that specified. In case repairs are required, the pressure test shall be repeated until the pipeline installation conforms to the specified requirements. Pumps, air compressors, instrumentation, and similar equipment shall not be subjected to the pressure tests. All piping conveying a combination of fluids, such as SCM/WAS, shall be tested at the higher test pressure.
   4. During performance of the hydrostatic pressure test, water main shall be subjected to a minimum pressure of at least 50% above normal working pressure with a minimum pressure 125 psi. Force main shall be tested to 200% of normal operating pressure in the main, but to no more than the pressure rating of the pipe.
   5. CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results.
   6. Where connections are made to existing mains, it shall be the responsibility of CONTRACTOR to provide the necessary hydrostatic tests on all new mains installed. This may necessitate, but is not limited to, the installation of temporary valves and restraint to isolate the new system from the existing system. All materials, Work, and equipment necessary for this Work shall be furnished by CONTRACTOR at its expense.
   7. All testing of pipelines shall proceed concurrently with installation. CONTRACTOR is encouraged to conduct daily preliminary testing of its Work.
   8. Water from disinfection testing shall not be discharged to a stream, creek, river, storm sewer tributary thereto, or to a navigable water without first neutralizing the chlorine residual in the water and complying with local, state, and federal laws thereto.
   9. Gauges used for testing shall have increments as follows:
      a. Tests requiring a pressure of 10 psi or less shall use a testing gauge having increments of 0.10 psi or less.
      b. Tests requiring a pressure of greater than 10 psi by less than or equal to 100 psi shall use a testing gauge having increments of 1 psi or less.
      c. Tests requiring a pressure of greater than 100 psi shall use a testing gauge having increments of 2 psi or less.

F. Prior to making final connection between new and existing piping, new piping shall be tested as specified above.

G. Infiltration/Exfiltration Tests:
   1. Leakage Testing:
      a. All sanitary sewer gravity mains shall be tested for leakage after installation of laterals and placement of backfill. Leakage testing of thermoplastic and iron sanitary sewer gravity mains shall be conducted in accordance with ASTM F1417. Testing of clay sanitary sewer mains shall be in accordance with ASTM C828. Testing for concrete sanitary sewer mains shall be in accordance with ASTM

C1214. CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results.

b. Sewers 18 inches and larger may be tested for leakage by infiltration or exfiltration in lieu of vacuum testing. Concrete pipe shall be tested per ASTM C969 except as modified herein. If groundwater is 2 feet or more above the sewer, measurements will be taken to determine the rate of infiltration into the sewer. If groundwater is below 2 feet above the sewer, the stretch of sewer shall be plugged at its downstream end and water shall be placed inside the sewer to provide a minimum of 4 feet of head above the upstream end.
c. Measurements will then be taken to determine the rate of leakage out of the sewer. CONTRACTOR shall furnish all labor and materials necessary for making the tests. The allowable leakage shall be as indicated below for final acceptance.
d. At the conclusion of construction and before final acceptance of the Work, the downstream end of all sanitary sewer will be measured for infiltration. Allowable infiltration shall not exceed 100 gallons/inch of pipe diameter/mile/day for that portion of the Work under groundwater. If infiltration is exceeded, the leak or leaks shall be located and repaired.
e. CONTRACTOR shall prepare all pipeline for testing and shall furnish all equipment, materials, tools, and labor necessary for performance of the tests. Equipment for the low pressure air test of gravity mains shall be equal in all operational aspects to that as furnished by Cherne Industries, Inc., United Survey, or equal.
f. Test apparatus and gauges shall be located such that ENGINEER or OWNER do not have to enter a confined space to verify readings.
g. Air and leakage testing of storm sewers will not be required.

2. Deflection Testing:
   a. All PVC pipe used for sanitary sewer shall be tested for vertical deflection. Maximum deflection after completion of backfilling shall be 5% of the inside pipe diameter. Testing shall not be started until trench backfill has been in place for 30 days. CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results. Deflection shall be measured by pulling a mandrel with a vertical diameter equal to 95% of the pipe inside diameter through the line, after thoroughly flushing the lines to be tested. The testing device shall be controlled using cables at both the upstream and downstream manholes. The testing device must pass freely through the sewer without the use of unreasonable force on the control cables. Any line that will not pass the test cylinder will not be accepted until the faulty sections have been removed and replaced and the line retested.
   b. Deflection testing of thermoplastic storm sewer shall be provided in accordance with the above requirements.

H. Manhole Testing:
   1. If required on the Drawings, sanitary sewer and process piping manholes shall be vacuum tested in accordance with ASTM C1244. Pipes entering the manhole shall be plugged and the seal inflated in accordance with manufacturer's recommendations. CONTRACTOR shall provide all required test apparatus, including vacuum pump and gauges.
   2. Vacuum testing of storm sewer and other manholes will not be required.

I. Televised Inspection: A color televised survey of installed sanitary sewer and storm sewer shall be provided after testing to confirm branch locations, verify cleanliness of sewer, and confirm presence or absence of sags or deviations in sewer alignment. Sewers shall be

cleaned immediately prior to the survey. The survey shall conform to NASCO PACP standards.

3.03 CLEANING AND DISINFECTION

A. All equipment and materials shall be clean before installation. CONTRACTOR shall disinfect and flush the potable water system before it is put online. Water main shall be disinfected according to AWWA C651.

B. In accordance with the requirements of AWWA C651, at least one set of samples shall be collected from every 1,200 feet of new water main, plus one set from the end of the line and at least one set from each branch.

C. CONTRACTOR shall obtain water samples and arrange for analysis of water in potable systems for bacteria in accordance with Option A of Section 5.1 of AWWA C651. Copies of test results shall be submitted to OWNER and ENGINEER.

D. CONTRACTOR shall furnish all water and other materials, equipment, and labor necessary to disinfect all new water mains and all existing water mains disturbed by construction. CONTRACTOR shall notify the Health Department to observe disinfection test and shall coordinate and bear cost for necessary laboratory testing and shall provide safe bacteriological sample results to OWNER prior to placing the water main in service. Sampling and testing shall be scheduled to complete the Work within the Contract Times. Items of material for testing shall be furnished in the size and quantity necessary to properly complete the test. Interruption or delay of CONTRACTOR's Work progress caused by testing and sampling shall not be cause for extra payment under the Contract nor shall they be cause for extension of Contract Time.

3.04 CLEANUP

A. Upon completion of the work, all improvements disturbed by CONTRACTOR's operations shall be repaired or replaced. Broken concrete, rubble fill, and other excess material shall be removed from the site and wasted.

B. All areas used for the storage of materials or the temporary deposit of excavated earth shall be leveled off and cleaned up. All surplus material, tools, and equipment shall be removed, and the premises shall be left free of everything of the kind.

C. All pipes and manholes shall be flushed until clean, and all debris and mud shall be removed.

3.05 DEMOLITION

A. All exterior piping removals, including manholes and appurtenances and abandonment, shall be by CONTRACTOR. The locations and elevations of existing piping are approximate. Where necessary, existing piping shall be exposed before installing new piping. Any changes in pipe location or elevation shall be reviewed by ENGINEER.

B. CONTRACTOR shall remove or abandon all existing piping and appurtenances as noted. Unless otherwise shown or specified, piping and appurtenances to be removed shall become the property of CONTRACTOR and shall be removed from the site for salvage or disposal. Unless otherwise shown or specified, piping shown or specified to be abandoned shall have each end plugged with concrete or nonshrink grout. Nonshrink grout shall be as

specified in Division 03. Wherever excavations cross piping to be abandoned, piping shall be removed to the limits of the excavation and the ends shall be filled as specified above.

C. Valve boxes and exposed valves and operators on piping to be abandoned shall be removed. All concrete surfaces to remain shall be patched as required to provide a smooth surface. Repiping and connections to new piping shall be as specified for new piping.

D. It is the responsibility of CONTRACTOR to remove the items listed below, including piping and appurtenances, as specified, and patch all holes resulting therefrom unless specified or shown otherwise. The intent of these specifications is to require that the removal of materials, patching of all existing holes, and repiping be done in a workmanlike manner. All costs shall be included in the Lump Sum Bid.

END OF SECTION

SECTION 33 01 31

SEWER BYPASS PUMPING

PART 1–GENERAL

1.01 SUMMARY

A. Work Included: Providing all materials, labor, equipment, power, and maintenance necessary to perform bypass pumping while the Work is being completed.

B. Related Sections and Divisions: Applicable provisions in the Contract Documents shall govern work in this section.

C. Unit Price: A unit price is not provided for Sewer Bypass Pumping.

D. Payment:
1. No separate payment item is included for Sewer Bypass Pumping. All costs for bypass pumping required to complete the Work shall be considered incidental to the Work and included in the cost of adjacent or related Work.
2. The cost of retrieving equipment under all circumstances, including when it becomes lodged, shall be incidental to the Work.

1.02 SUBMITTALS

A. Submittals shall be in accordance with Contract Documents.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

3.01 SEWER BYPASS PUMPING

A. Where required by sewage flows or inability to prevent debris from falling into the flow stream, CONTRACTOR shall bypass the sewage around the sewer sections or manholes as required to complete the Work.

B. Precautions shall be taken when bypass pumping is required to prevent the flooding of nearby property.

C. Under no circumstances will the diversion or dumping of raw sewage be allowed onto the streets, trenches, or into storm sewers. The bypass shall be made by plugging an existing upstream manhole and pumping the sewage into a downstream manhole or adjacent sanitary sewer system if acceptable to OWNER. Bypass pumping shall mean the use of pumps, tanks, hoses, and other necessary equipment to cause uninterrupted flow of sewage around the section or reach in which the Work is being accomplished.

D. All bypass pumping operations must be attended by personnel to prevent flooding in case of pump failure. Under no conditions shall a bypass pumping operation be left unattended. All personnel for setup, operation, and supervision of the bypass pumping equipment shall be provided as necessary.

E. All hoses and pumps shall be sized by CONTRACTOR to be of sufficient capacity to handle the existing sewage flow, plus additional flow that may occur during wet weather periods and during periods of high runoff. All equipment used in bypass pumping shall be operated and maintained in proper running condition at all times.

F. All hose connections shall be watertight and no leakage shall be allowed to the surface. Pumping system hoses and appurtenances shall be tested prior to use in the sewer system to provide watertightness.

G. CONTRACTOR shall provide a pump capable of conveying all flow that passes through the sewers within the bypassed area. A backup pump capable of conveying all flow that passes through the existing sewer pipes within the bypass area shall be present on site during bypass pumping operations. A backup generator capable of powering the bypass pump, if not integral to the backup pump, shall be provided on site during bypass pumping operations.

H. No bypass pumping shall occur during non-working hours or on Saturday or Sunday without prior approval by OWNER. OWNER shall have the authority to prevent bypass pumping operations from occurring on a specific day or days if OWNER decides that bypass pumping operations could occur during periods of forecasted rain events. CONTRACTOR shall adjust bypass pumping schedule based on comments and restrictions from OWNER at no cost to OWNER.

I. At the end of each working day, the reach or section being bypassed shall be placed in service and the bypass plug removed.

J. The pumps shall be specifically designed for sewage, capable of passing 3-inch solids.

K. CONTRACTOR shall satisfactorily demonstrate to OWNER that the bypass system works for at least the diurnal flow pattern before beginning any Work.

END OF SECTION

SECTION 33 11 13.19

CONDUCTIVE TRACE WIRE FOR NONMETALLIC PIPE INSTALLATION

PART 1–GENERAL

1.01 SUMMARY

A. This section covers the requirements for installation of a conductive trace wire with non-metallic pipe underground.

1.02 MEASUREMENT AND PAYMENT

A. Work performed under this section shall be paid for in the unit price for pipe installation, as applicable, unless otherwise indicated in the Bid Form.

1.03 SYSTEM DESCRIPTION

A. Install electrically continuous trace wire with access points as described herein to be used for locating nonmetallic pipe with an electronic pipe locator after installation.

1.04 SUBMITTALS

A. Submit copies of shop drawings showing materials being offered and catalog data verifying the products meet the requirements of this section. CONTRACTOR shall submit four copies of each submittal, which will be retained by ENGINEER, plus the number of copies that are to be returned to CONTRACTOR by ENGINEER after review is completed.

PART 2–PRODUCTS

2.01 PRODUCTS

A. Trace wire to be 10-gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors to be 3M DBR, or approved equal and shall be watertight and provide electrical continuity.

PART 3–EXECUTION

3.01 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

A. Trace wire shall be installed in the same trench and inside bored holes and casing with nonmetallic pipe during pipe installation. It shall be secured to the pipe as required to so that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all new water valve boxes, water meter boxes, fire hydrants, sewer manholes, sewer cleanouts, gas valves and gas meter risers, as applicable to the utility line being installed. At manholes, the wire shall be installed from the exterior of the manhole to the interior by installing a 24-inch loop in the wire underneath the manhole frame. A single branch wire shall be terminated at each access location (new water valve boxes, water meter

boxes, etc. as previously listed), and the wires shall be spliced underground using the specified connector. For lines with more than 5 feet of cover, the wire shall be installed directly over the pipe at a depth of 5 feet. If the spacing of valves and meters is greater than one mile, install an intermediate trace wire access assembly as detailed on the Drawings. Where access points for trace wire on gas lines exceeds 500 feet, install test lead boxes such that maximum access point spacing is 500 feet.

B. For termination of trace wire at locations other than a manhole, a valve box, or a water meter, provide a standard plastic water meter box and terminate the wire inside the meter box.

3.02 TESTING

A. CONTRACTOR shall provide line location (tracing) equipment (sending unit and receiver) and shall demonstrate in the presence of ENGINEER that the trace wire functions properly throughout all of the work.

3.03 REPAIR/RESTORATION

A. CONTRACTOR shall replace all trace wire that does not function properly or shall make repairs to make the trace wire function properly.

END OF SECTION

DRAWINGS

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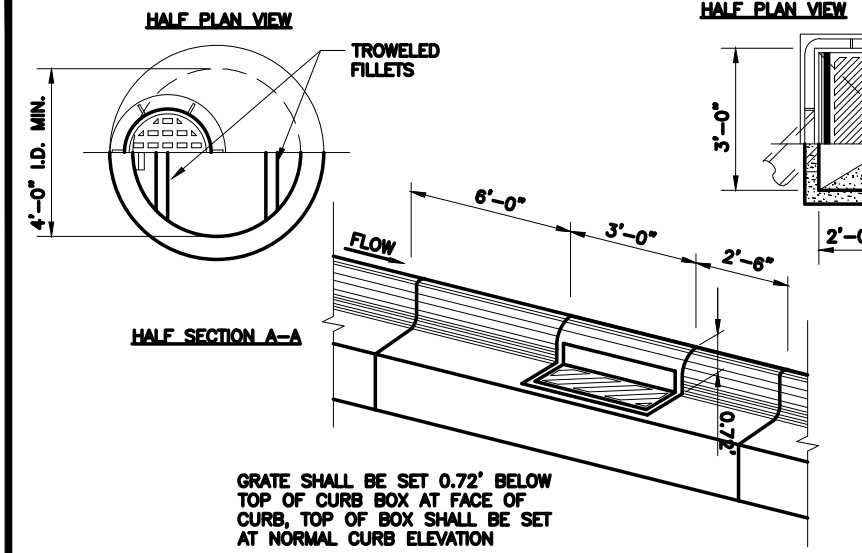
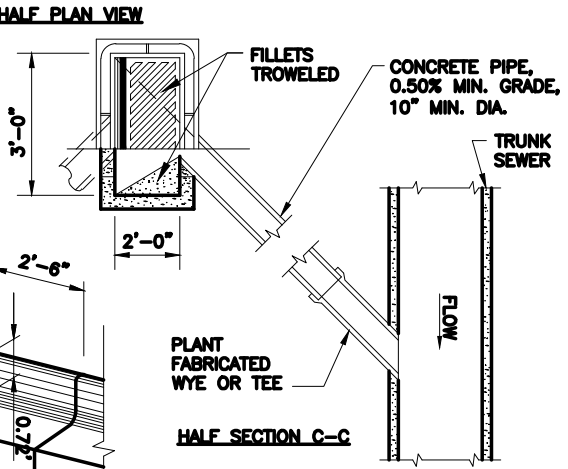
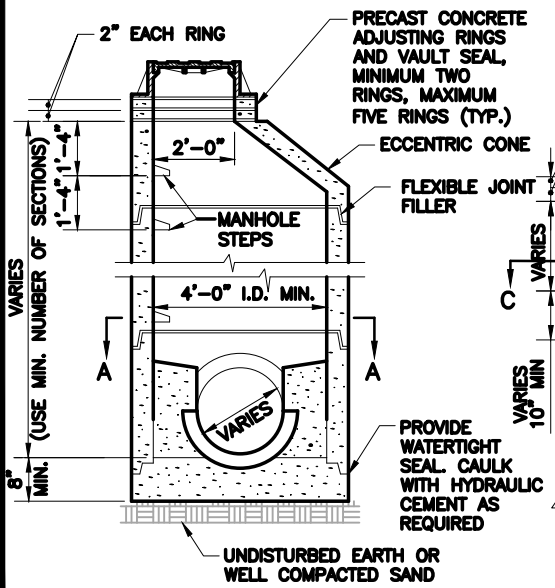
STORM SEWER
MANHOLES AND INLETS
STANDARD DETAIL

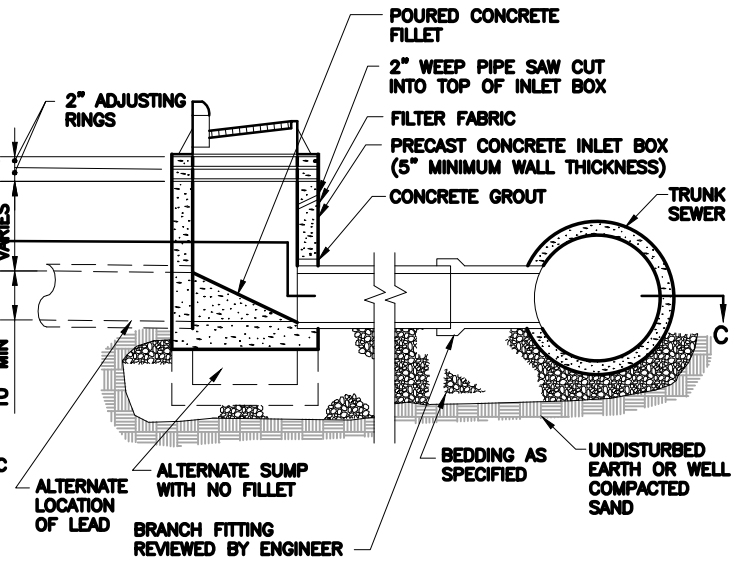


DEPRESSED INLET DETAIL





STANDARD PRECAST MANHOLE



PRECAST INLET DETAIL

NOTES

1. DETAILS RELATIVE TO ITEMS SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE SPECIFICATIONS.
2. VARIATIONS IN DIMENSIONS AND DESIGN MAY BE PERMISSABLE PROVIDING EQUIVALENT CAPACITY AND STRENGTH ARE ATTAINED.
3. WHEN ANY STRUCTURE IS CONSTRUCTED OF CONCRETE, CONCRETE BLOCK OR REINFORCED CONCRETE CULVERT PIPE, THE TOP OF THE MASONRY SHALL BE LEFT SUFFICIENTLY LOW TO PERMIT PROPER ADJUSTMENT OF COVER TO GRADE.
4. REINFORCED PRECAST FLAT SLAB SHALL BE USED IN LIEU OF PRECAST ECCENTRIC CONE WHEN SHOWN ON THE DRAWINGS AND SHALL BE DESIGNED FOR H-20 TRUCK LOADING.
5. PRECAST REINFORCED CONCRETE MANHOLE RISERS AND TOPS SHALL CONFORM TO ASTM C-478. JOINTS BETWEEN MANHOLE SECTIONS SHALL BE SEALED WITH RAM NEK, HANDLING HOLES SHALL BE FILLED WITH MORTAR, AND BOTH MADE WATER TIGHT.
6. STEPS SHALL BE INSTALLED IN ALL MANHOLES.
7. AT ALL BENDS IN SEWER, A SMOOTH RADIUS FLOW LINE SHALL BE PROVIDED IN MANHOLES. ALL CONCRETE FILLETS SHALL BE HAND TROWELED.
8. INSIDE DIMENSIONS FOR MANHOLES: USE MINIMUM 4' DIAMETER FOR SEWER LESS THAN 18" IN DIAMETER; USE MINIMUM 5' DIAMETER FOR SEWER 18" THRU 24" IN DIAMETER; USE MINIMUM 6' DIAMETER OR MINIMUM 6' SQUARE FOR SEWER OVER 24" IN DIAMETER, UNLESS OTHERWISE SPECIFIED.
9. ARRANGEMENT AND NUMBER OF INLETS AND DISCHARGE PIPES SHALL CONFORM TO THE NEEDS OF THE PERTINENT LOCATION.
10. PROVIDE MINIMUM 2'-0" COVER FOR ALL INLET LEAD PIPE, UNLESS OTHERWISE SPECIFIED.
11. ALL INLETS SHALL BE DEPRESSED AS SHOWN.
12. INLET DEPTH AND GRADE OF INLET LEAD PIPE VARY ACCORDING TO DEPTH OF TRUNK SEWER. MINIMUM INLET DEPTH BELOW TOP OF CURB SHALL BE 4'-0".

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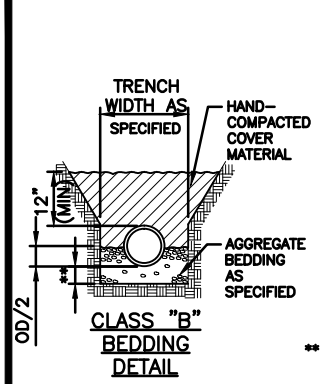
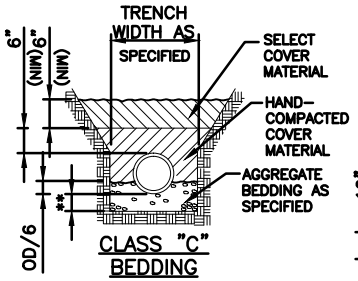
SANITARY SEWER APPURTENANCES

STANDARD DETAIL

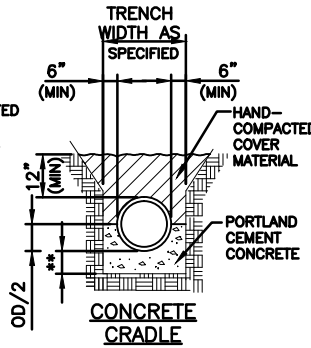


CLASS "B" BEDDING DETAIL

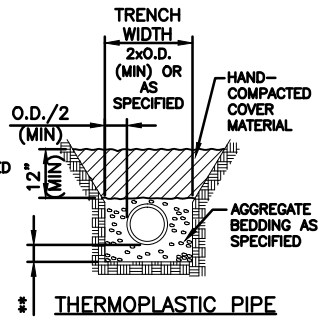


CLASS "C" BEDDING DETAIL

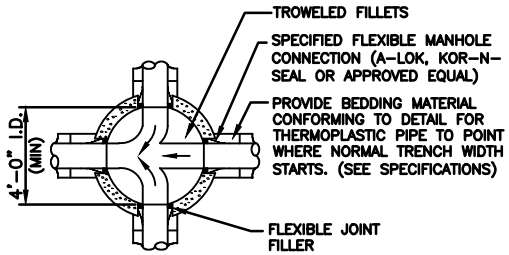
** OUTSIDE DIAMETER/4, 4" MINIMUM.



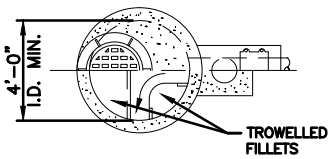
CONCRETE CRADLE DETAIL



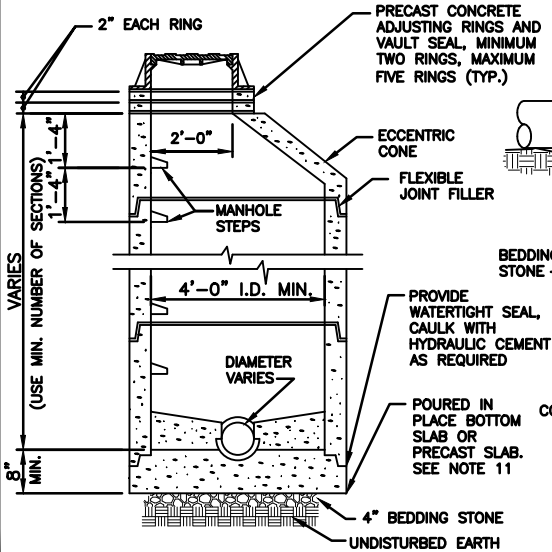
THERMOPLASTIC PIPE BEDDING DETAIL



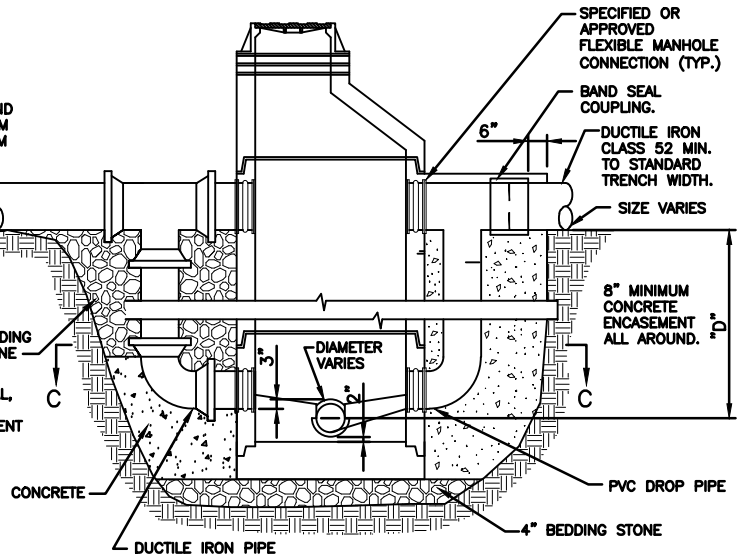
JUNCTION MANHOLE



HALF SECTION C-C



STANDARD PRECAST MANHOLE



DROP TYPE ENTRANCE OPTIONS TO STANDARD MANHOLE

DROP TYPE ENTRANCE TO BE USED WHEREVER DIMENSION "D" EXCEEDS 2'-0".

NOTES

1. DETAILS RELATIVE TO ITEMS SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

2. VARIATIONS IN DIMENSIONS AND DESIGN MAY BE PERMISSIBLE, PROVIDING EQUIVALENT CAPACITY AND STRENGTH ARE ATTAINED.

3. ALL CONCRETE FILLETS SHALL BE HAND TROWELED WITH A 1/4"/FT. SLOPE.

4. INSIDE DIMENSIONS FOR MANHOLES: USE MINIMUM 4' DIAMETER FOR SEWER LESS THAN 18" IN DIAMETER; USE MINIMUM 5' DIAMETER FOR SEWER 18" THRU 24" IN DIAMETER; USE MINIMUM 6' DIAMETER OR MINIMUM 6' SQUARE FOR SEWER OVER 24" IN DIAMETER.

5. BEDDING CLASSES "B" AND "C" SHALL MEET OR EXCEED ASTM C12 REQUIREMENTS.

6. DROP TYPE ENTRANCE TO STANDARD MANHOLE WILL BE PAID FOR SEPARATELY IF SO LISTED IN THE BID.

7. SEE DRAWINGS FOR DROP TYPE ENTRANCES FOR SANITARY SEWERS LARGER THAN 15".

8. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF REGULATORY BODIES OF THE STATE AND APPLICABLE MUNICIPAL ORDINANCES.

9. ALL NEW CONSTRUCTION SHALL BE PLACED ON UNDISTURBED EARTH OR STONE BEDDING.

10. FLAT SLAB TOPS SHALL BE DESIGNED FOR H-20 TRUCK LOADING AND SHALL MEET REQUIREMENTS OF ASTM C-478.

11. BASE SLABS SHALL BE REINFORCED AS FOLLOWS: REINFORCING SHALL BE PLACED IN EACH DIRECTION AT 2" CLEAR FROM TOP SURFACE OF SLAB, REINFORCING SHALL BE GRADE 60. USE OF CAST-IN-PLACE SLAB SHALL NOT RELIEVE CONTRACTOR OF REQUIREMENTS TO PROVIDE WATERTIGHT JOINTS.

INSIDE DIA.	DEPTH	REINF.
4'	≦ 30'	#3@8"
5'	≦ 20'	#3@8"
5'	20'-30'	#4@10"
6'	≦ 20'	#4@10"
6'	20'-25'	#4@8"
6'	25'-30'	#4@6"

12. FLAT SLABS SHALL BE PROVIDED IN SHALLOW DEPTH SITUATIONS IN LIEU OF ECCENTRIC CONES.

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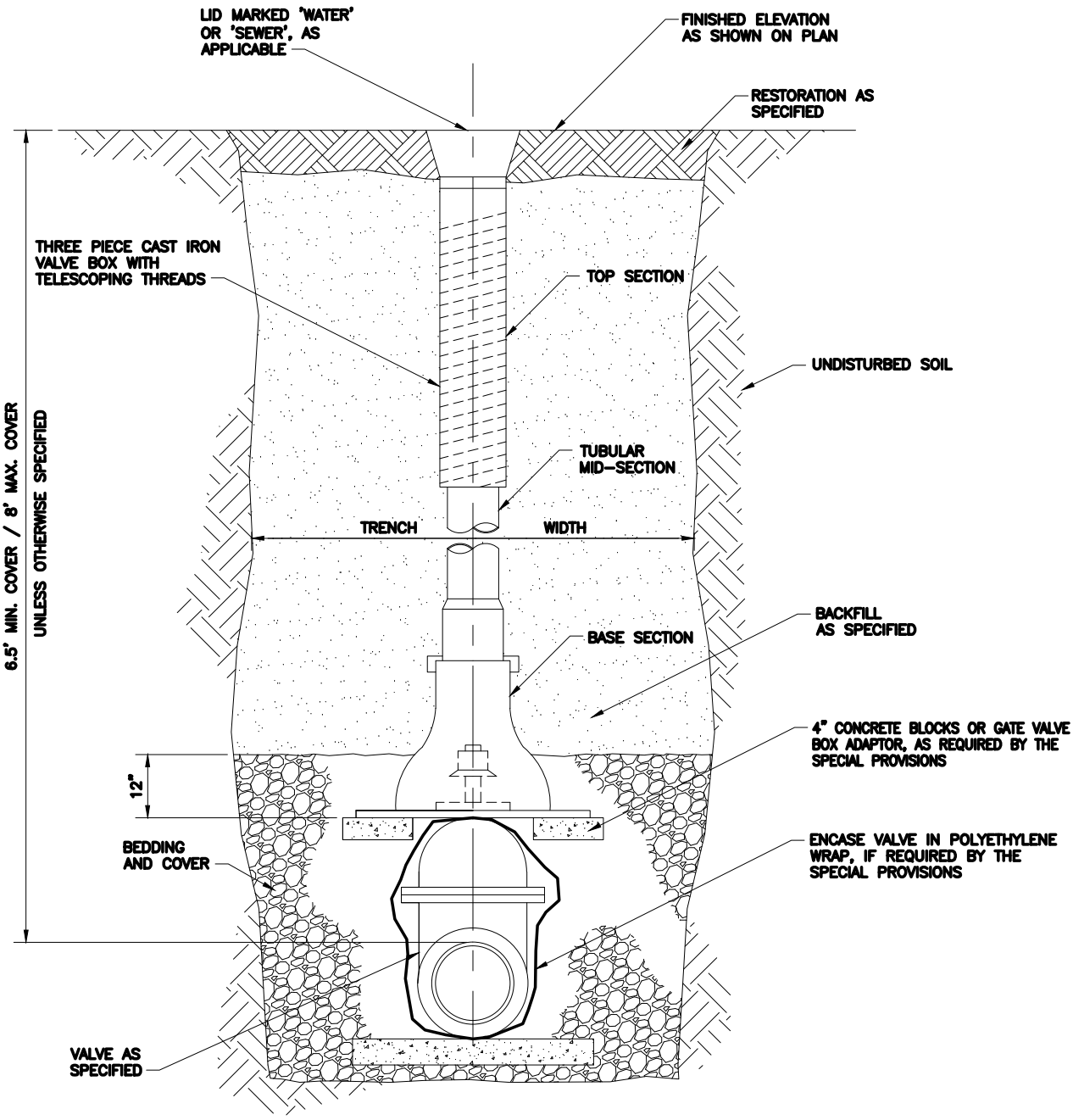

STANDARD BURIED GATE VALVE BOX SETTING

STANDARD DETAIL

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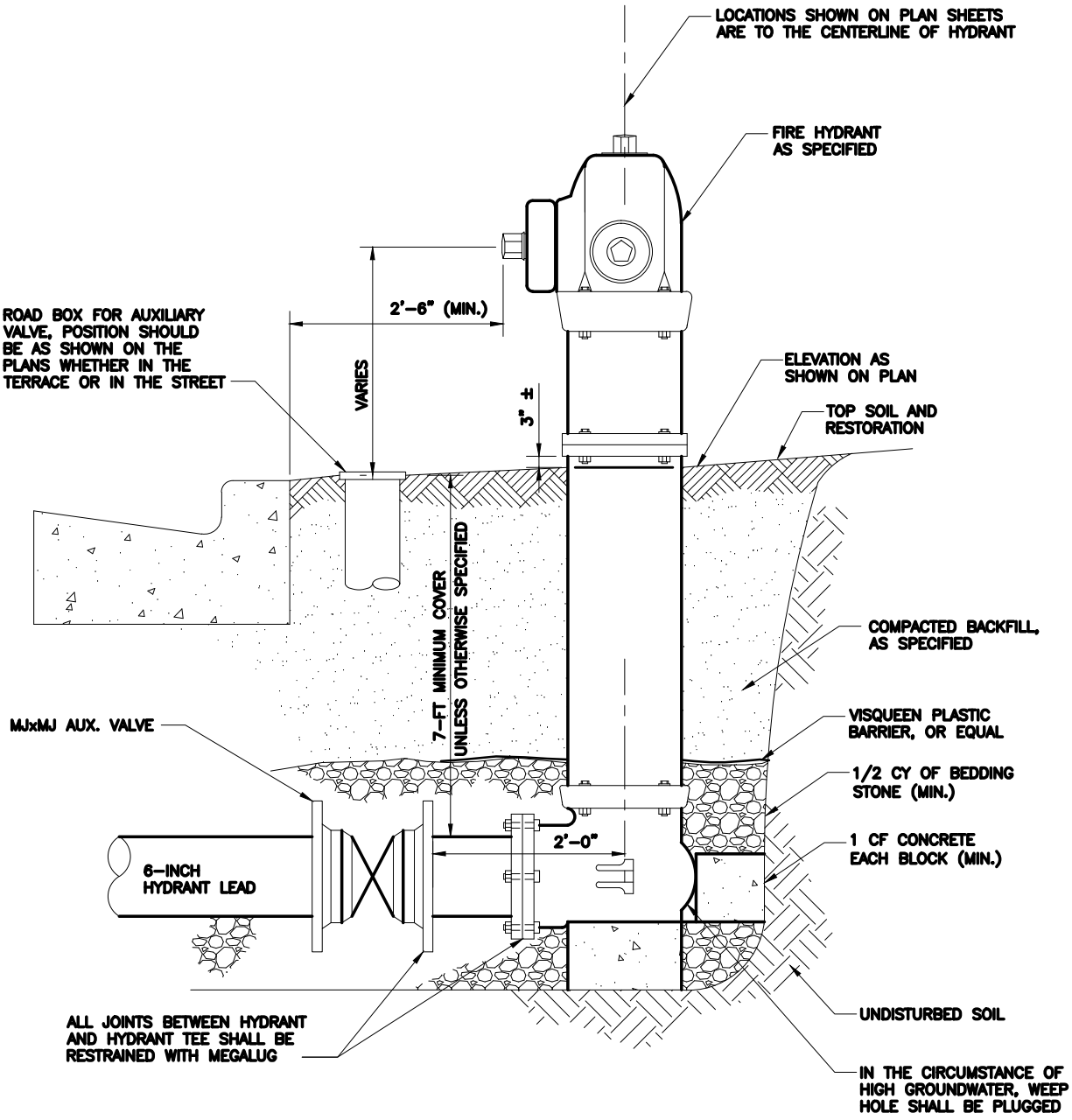

HYDRANT INSTALLATION

STANDARD DETAIL

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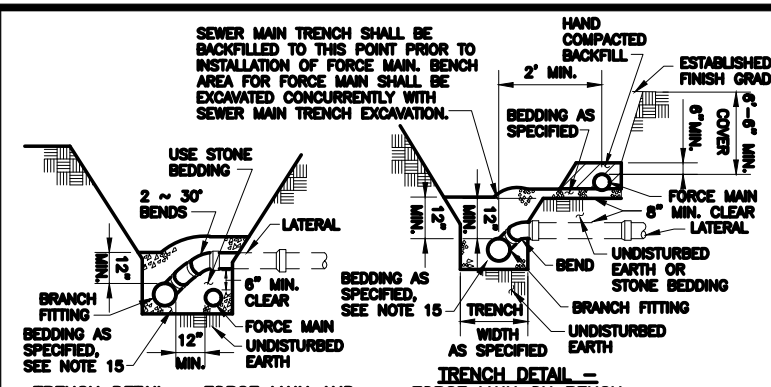
SANITARY SEWER LATERALS

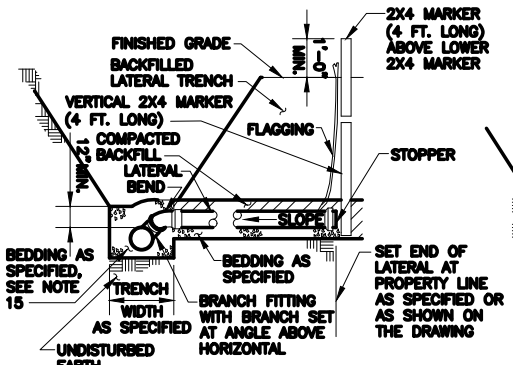
STANDARD DETAIL



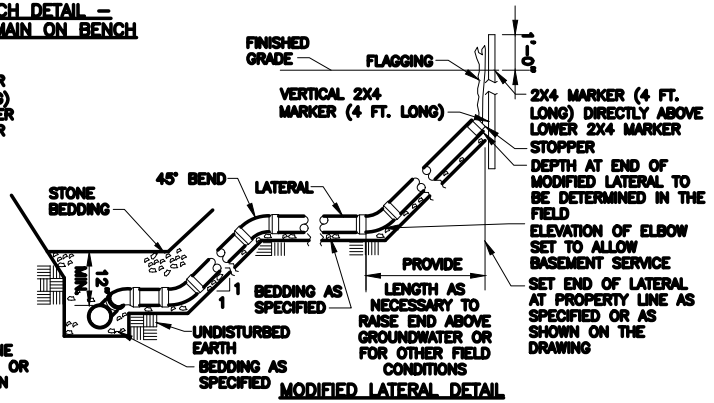
TRENCH DETAIL - FORCE MAIN AND GRAVITY SEWER AT THE SAME ELEVATION

TRENCH DETAIL - FORCE MAIN ON BENCH

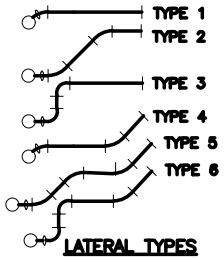
SEWER INSULATION DETAIL



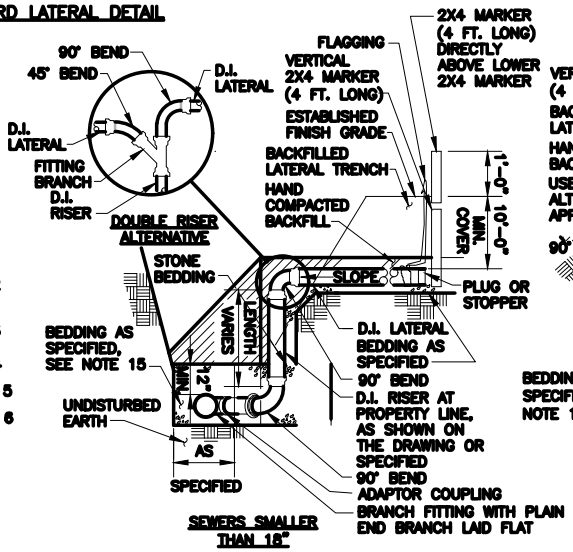
STANDARD LATERAL DETAIL



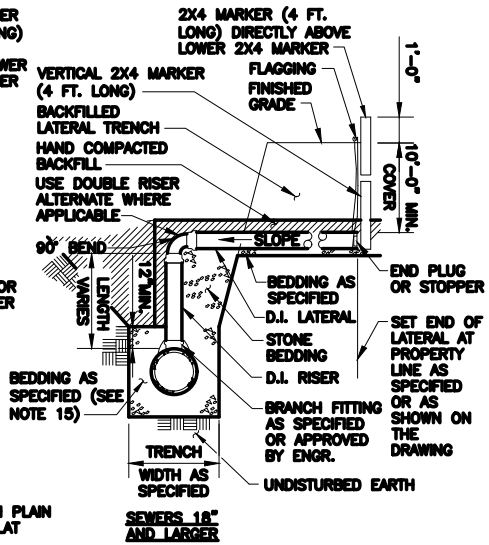
MODIFIED LATERAL DETAIL



LATERAL TYPES



SEWERS SMALLER THAN 18"



SEWERS 18" AND LARGER

STANDARD RISER DETAILS

NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF REGULATORY BODIES OF THE STATE AND APPLICABLE MUNICIPAL ORDINANCES.

2. DETAILS RELATIVE TO ITEMS SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

3. VARIATIONS IN DIMENSIONS AND DESIGN MAY BE PERMISSABLE, PROVIDING EQUIVALENT CAPACITY AND STRENGTH ARE ATTAINED.

4. ALL NEW CONSTRUCTION SHALL BE PLACED ON UNDISTURBED EARTH OR STONE BEDDING.

5. BEDDING CLASSES "B" AND "C" SHALL MEET OR EXCEED ASTM C12 REQUIREMENTS.

6. ALL LATERALS SHALL BE LAID AT A STANDARD SLOPE OF 1/4-INCH PER FOOT UNLESS OTHERWISE NOTED ON THE DRAWINGS, OR SPECIFIED. IN NO CASE SHALL LATERAL SLOPE BE LESS THAN 1/8-INCH PER FOOT. MAXIMUM LATERAL SLOPE SHALL BE 1 TO 1.

7. END PLUGS OR STOPPERS FOR THE ENDS OF LATERALS AND BRANCH FITTINGS SHALL BE PROVIDED.

8. 2x4'S SHALL BE PLACED AT ALL LATERALS ENDS SO THAT ONE PROTRUDES 12 INCHES ABOVE FINISHED GRADE AND ONE IS LOCATED IN THE GROUND AT THE END OF THE LATERAL. 2x4'S SHALL BE PAINTED FLOURESCENT ORANGE. 2x4'S SHALL EACH BE AT LEAST 4 FT. LONG.

9. BAR STEEL REINFORCEMENT SHALL BE IMBEDDED 1 1/2-INCH CLEAR MINIMUM.

10. THE TOP OF ANY MANHOLE STRUCTURE SHALL BE LEFT SUFFICIENTLY LOW TO PERMIT PROPER ADJUSTMENT OF COVER TO GRADE.

11. INSTALL DOUBLE RISERS WHERE SHOWN ON THE DRAWINGS OR SPECIFIED.

12. STANDARD LATERALS AND MODIFIED LATERALS SHALL BE CONSTRUCTED OF MATERIAL AS SPECIFIED.

13. RISERS AND LATERALS FROM RISERS SHALL BE CONSTRUCTED OF DUCTILE IRON. FITTINGS FOR RISERS AND LATERALS FROM RISERS SHALL BE GRAY IRON OR DUCTILE IRON.

14. FLAGGING SHALL BE 4-INCH WIDE STANDARD ORANGE VINYL TAPE. TIE FLAGGING AROUND END OF ALL LATERALS AND EXTEND UNBROKEN TO FINISHED GRADE DIRECTLY ABOVE ENDS OF LATERALS.

15. STONE BEDDING SHALL BE USED AROUND AND TO ONE FT. ABOVE TOP OF ALL SEWER MAINS AT LATERAL CONNECTIONS. PROVIDE BEDDING AS SPECIFIED ELSEWHERE.

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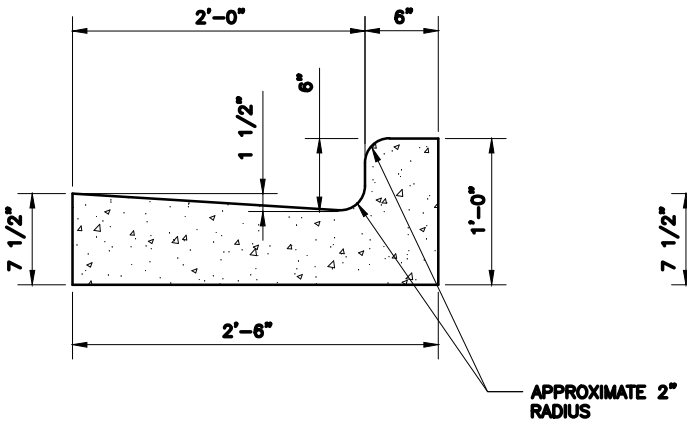
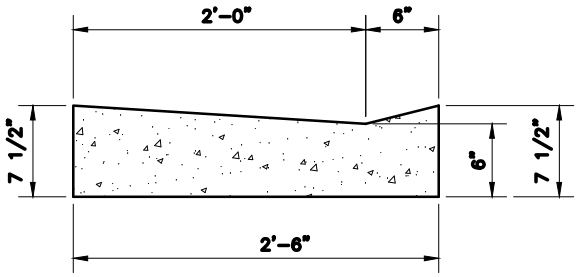
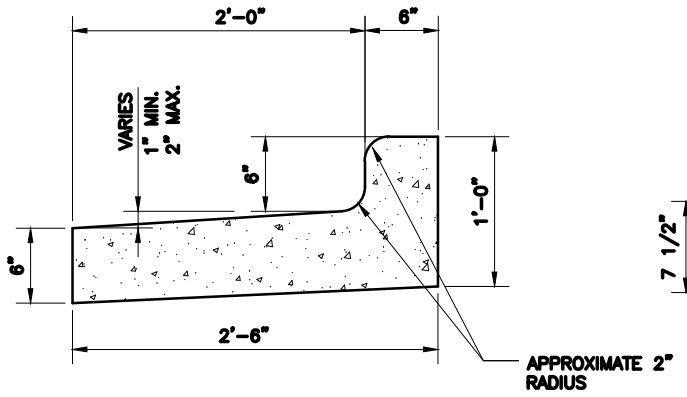


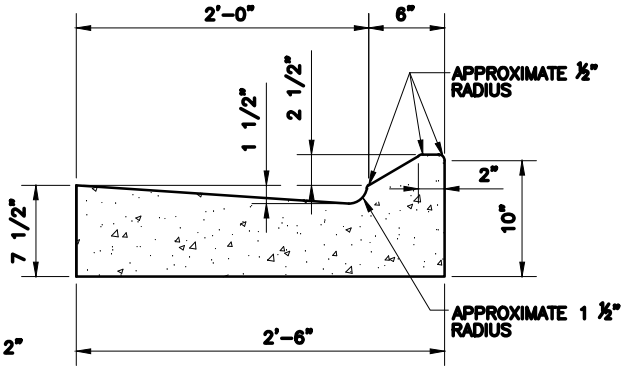
STANDARD SECTION



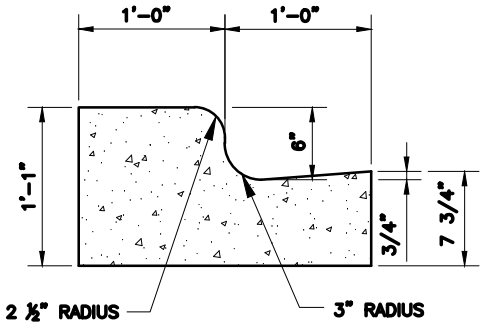
DRIVEWAY SECTION



REJECT SECTION



MOUNTABLE SECTION



TYPE 'E' SECTION

30-INCH CONCRETE CURB AND GUTTER

STANDARD DETAIL

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