

Chapter amendments approved:	OMPC	Owensboro	Daviess Co.	Whitesville
Re-adoption of Public Improvement Specifications	24-Mar-77	01-Apr-77	20-Apr-77	?
<u>Revised Public Improvement Specifications</u>	<u>18-Apr-81</u>	<u>22-May-81</u>	<u>26-May-81</u>	<u>06-Jul-81</u>
<u>2002 Revised Public Improvement Specifications</u>	<u>08-Aug-02</u>	<u>No action required by legislative bodies</u>		
<u>2014 Revised Public Improvement Specifications</u>	<u>09-Jan-14</u>	<u>No action required by legislative bodies</u>		
<u>2017 Revised Public Improvement Specifications</u>	<u>11-May-17</u>	<u>No action required by legislative bodies</u>		

2.0 PURPOSE. The purpose of this chapter is to give the specifications for the primary materials utilized in the construction of roads, bridges, storm and sanitary systems, sewage force mains and other related items in the construction of public facilities.

2.1 CEMENT CONCRETE. See Chapter 13 “Concrete Specifications Materials and Methods.”

2.2 BITUMINOUS CONCRETE AND TACK COAT. Bituminous concrete courses shall be of types and thicknesses as shown on the plan typical section or as directed by the Engineer. All base course, binder course and surface course bituminous pavements shall meet KTC Specifications for Class I or Superpave requirements.

2.2.1 TACK COAT. This item shall consist of the application of liquid bituminous material to existing bituminous or concrete surfaces. Unless otherwise directed by the Engineer, a tack coat will not be required between layers of newly constructed, fresh bituminous mixes. Tack coat shall be required on old bituminous or concrete surfaces and on new bituminous surfaces that have become dirty or tracked by traffic.

When resurfacing old pavements the tack coat shall be undiluted SS-1, SS-1h, RS-1, CSS-1, CSS-1h, AE-60, CRS-1 or asphalt of the same grade as used in the mixture. On newly constructed bituminous base, binder, or surface mixtures, the tack coat shall be asphalt grade SS-1h, or asphalt of the same grade as used in the mixture.

2.3 AGGREGATES. Aggregates to be used in base courses, concrete and bituminous pavements shall be in accordance with the following specifications.

2.3.1 AGGREGATE BASE COURSE – DENSE GRADE AGGREGATE. This base course shall consist of graded aggregate and water mixed with or without an admixture. The aggregate shall be crushed limestone, crushed slag, or crushed sandstone, meeting the applicable requirements of KTC Specifications.

2.3.2 AGGREGATE FOR BITUMINOUS BASES AND PAVEMENTS. The several aggregate fractions shall be sized, graded and combined in such proportions that the resulting mixture meets the requirements of KTC Specifications.

a. COARSE AGGREGATE. Coarse aggregate shall be crushed stone or gravel having clean, hard, uncoated particles. Crushed stone is preferred for coarse aggregate; gravel shall not be used unless written approval is obtained from the Engineer. It shall be free from injurious amounts of soft, friable, thin, elongated or laminated pieces and shall meet the requirements of ASTM C-33.

b. FINE AGGREGATE. Fine aggregate shall consist of natural sand having clean uncoated grains, free from injurious amounts of clay, flaky material, lignite, organic material and other such foreign substances and shall meet the requirements of ASTM C-33. Sand shall be furnished by the Contractor from sources that have been tentatively approved by the Engineer.

c. AGGREGATE FOR STREETBASE STABILIZATION - shall be #3 Stone.

2.3.3 AGGREGATE FOR BEDDING - shall be #610 or #710. Allowance for usage of #8, #57, or #67 Stone with Engineer’s approval.

2.4 GEOTEXTILE FABRICS MATERIALS.

2.4.1 NON-WOVEN FABRICS. The geotextile shall be of non-woven construction and shall consist of long chain polymeric fibers composed of polypropylene, polyethylene or polyamide. The fibers shall be oriented into a random web and stabilized whereby they retain their positions relative with each other. The geotextile shall be free of any chemical treatment or coating that reduces permeability and shall be inert to chemicals commonly found in soil.

2.4.2 WOVEN FABRICS. The geotextile shall be of woven, two-dimensional construction, of the slit-film or monofilament types, and shall consist of long chain polymeric filaments composed of polypropylene, polyethylene, or polyamide. The filaments shall be oriented into a stable network whereby they retain their positions relative to each other. The geotextile shall be free of any chemical treatment or coating that reduces permeability and shall be inert to chemicals commonly found in soil.

2.4.3 GEOGRID. The geogrid shall be a regular grid structure formed by biaxially drawing a continuous sheet of select polypropylene material and shall have aperture geometry and rib and junction cross-section sufficient to permit significant mechanical interlock with the material being reinforced. The geogrid shall have high flexural rigidity and high tensile modulus in relation to the material being reinforced and shall also have high continuity of tensile strength through all ribs and junctions of the grid structure. The geogrid shall maintain its reinforcement and interlock capabilities under repeated dynamic loads while in service and shall also be resistant to ultraviolet degradation, to damage under construction practices and to all forms of biological and chemical degradation normally encountered in the material being reinforced.

The respective geotextile shall also conform to the following property requirements, as applicable:

ASTM D 4632 Grab Tensile Strength and Elongation
ASTM D 4595 Wide Width Strip Tensile
ASTM D 4533 Trapezoidal Tear

2.5 PIPEWORK. This Work shall consist of the furnishing, bedding, laying, jointing, and testing of all sanitary sewer, force main or drainage pipe shown on the approved plans.

Sanitary sewer, force main or drainage pipe may be of any type identified in the following sections (2.6-2.8), or in accordance with an approved plan. Pipe strength classes listed in these sections are the minimum acceptable classes for each type of pipe. Conditions of the construction may warrant a stronger pipe than listed herein. Any pipe found defective, or otherwise not meeting the Specifications shall be rejected and replaced.

The Engineer retains the right to require any Contractor/Developer to furnish three copies of the supplier's certification stating that pipe materials were

manufactured, sampled, tested and inspected in accordance with the standards listed in this Section and have been found to meet those requirements.

2.6 SANITARY SEWERS.

2.6.1 CLAY PIPE AND FITTINGS. Vitrified clay pipe and fittings shall meet the requirements of ASTM C700, Standard Specification for Vitrified Clay Pipe, Extra Strength. Joints shall be approved factory-molded compression types or confined O-ring joints. Joints shall meet the requirements of ASTM C425, Standard Specification for Compressive Joints for Vitrified Clay Pipe and Fittings

2.6.2 DUCTILE IRON PIPE AND FITTINGS. Ductile iron pipe shall meet the requirements of ANSI/AWWA C151/A21.51, Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids. Unless shown otherwise on the approved plans, the thickness class shall be determined based on a working pressure of 150 psi, in accordance with ANSI/AWWA C150/A21.50, Thickness Design for Ductile Iron Pipe.

Flanged joint ductile iron fittings shall meet the requirements of ANSI/AWWA C110/A21.10, Ductile Iron and Gray Iron Fittings, three (3) inch through 48 inch for Water and Other Liquids. Unless shown otherwise approved, Class 250 fittings with class 53-wall thickness shall be used.

Mechanical, push on and other such joints shall meet the requirements for ductile iron fittings, three (3) inch through 16 inch, ANSI/AWWA C153/A21.53. Where these short bodied compact fittings are to be fitted to aged existing cast iron pipe of larger diameter than specified in A21 standards, mechanical joint sleeves or bell-and-spigot (caulked joint) sleeves shall provide transition.

All pipe and fittings shall be polyurethane lined. The polyurethane lining shall be an ASTM Type V, chemical cure, 100% solids, elastomeric and aromatic with no sand fillers or extenders added. It shall be capable of being spray applied to 50 mils nominal thickness in a single application. Minimum lining thickness shall be 40 mils. The polyurethane lining shall be monolithic, flexible membrane that is corrosion, abrasion, and impact resistant; with a Shore "D" hardness of 60 to 65 at 78°F (25.5°C); a tensile strength of 2.878 psi and elongation of 52% per ASTM D-412; shall be resistant to abrasion as measured by a weight loss of no more

than 42 mgs. Per ASTM D-1044; and shall have a water vapor transmission rate (WVTR) of no more than 0.016 grams per 100 square inches (254 cm²) per 24 hours (75 mils DFT @ 73°F (22.7°C), 100% RH, per ASTM F1249-90).

Joints shall be push-on rubber gasket types that meet the requirements of ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings. When flanged joints are required, they shall meet the requirements of ANSI/AWWA 115/A21.15, Flanged Ductile Iron with Threaded Flanges. Mechanical flanged restrained joints may be used when approved by RWRA. All flanged and mechanical joints for ductile iron pipe and fittings shall be made with stainless steel nuts, bolts, etc.

2.6.3 PVC (POLYVINYL CHLORIDE) PIPE & FITTINGS. Unless shown otherwise on the approved plans or stipulated by the Engineer, the Contractor/ Developer may, at his option, use any of the following types of PVC pipe:

- a. **PVC** pipe meeting the requirements of ASTM D 3034, Standard Specification for Type PSM PVC Sewer Pipe and Fittings. Material shall meet the cell classification of ASTM 12454B. Unless shown otherwise on the approved plans or more than 16' deep, SDR 35 pipe shall be required. Pipes and fittings shall be heavy wall SDR 26 whenever design depths greater than 16 feet (from finish grade to pipe flow-line elevation at any point between manholes) are encountered.
- b. **PVC** pipe meeting the requirements of ASTM F 679, Standard Specification for PVC Large Diameter Plastic Gravity Sewer Pipe and Fittings. Unless shown otherwise on the approved plans or more than 16' deep, SDR 35 pipe shall be required. Pipes and fittings shall be heavy wall SDR 26 whenever design depths greater than 16 feet (from finish grade to pipe flow-line elevation at any point between manholes) are encountered.
- c. **PVC** pipe meeting the requirements of ASTM D 1785, Standard Specification for PVC Plastic Pipe, Schedules 40, 80, and 120. Unless shown otherwise on the approved Plans, Schedule 40 pipe shall be required. Fittings shall meet the requirements of ASTM D 2466, Standard Specification for PVC Plastic Pipe Fittings, Schedule 40.
- d. **PVC** truss pipe meeting the requirements of ASTM 2680, Standard Specification for PVC Sewer Pipe and Fittings.

PVC Pipe shall be installed in accordance with the Public Improvement Specifications, the manufacturer's recommendations and ASTM Standards for "Underground Installation of Flexible Thermoplastic Sewer Pipe", D2321 requiring a minimum trench width of not less than the greater of either the pipe outside the diameter plus 16 inches or the pipe outside diameter times 1.25 plus 12 inches.

PVC pipe shall not be used in any system that may receive industrial waste or materials with temperatures greater than 140°F.

Joints for PVC pipe meeting the requirements of ASTM D 3034, ASTM F 679, ASTM F 789, ASTM 2680. shall be gasket, bell and spigot, push-on types which meet the requirements of ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe. For 4-inch diameter pipe meeting the ASTM F 949 requirements, double gaskets shall be used at the Tee/Wye. Solvent cement joints shall not be used. Gaskets shall be chemically immune from normal sewage and sewer gases and certified as such by the manufacturer. The gasket design arrangement on the bell shall be approved by the Engineer

All tees and wyes for pipe up to 18" in diameter for service connections should be factory-made in-line fittings. Tees and wyes for pipe greater than 18" in diameter shall be either factory-made in-line fittings or Insert-a-tees or gasketed saddle type. For any particular size, if molded fittings are commercially available, these are required in lieu of fabricated fittings.

All pipe shall be provided with home marks to insure proper gasket seating. The home mark shall be situated so that, on a seated pipe, it is within one-half inch of the bell end of the previous pipe.

2.7 FORCE MAINS.

2.7.1 PVC (POLYVINYL CHLORIDE) PIPE AND FITTINGS. Unless shown otherwise on the approved plans, the Contractor/Developer may use any of the following types of PVC pipe:

- a. **PVC** pipe meeting the requirements of AWWA C 900, Standard Specification for PVC Pressure

Pipe, four (4) inch through 12 inch. The minimum pressure class allowance should be class 150 (DR18). PVC pipe meeting the requirements of AWWA C 905, Standard Specification for PVC Water Transmission Pipe, Nominal Diameters 14 inch through 36 inch, pressure rated 165 psi (DR25). The minimum pressure class allowed shall be Class 150 (DR18).

Joints shall be gasket, bell and spigot, push-on types that meet the requirements of AWWA C 900. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

- b. PVC pipe meeting the requirements of ASTM D 1785, Standard Specification for PVC Plastic Pipe, Schedules 40, 80, or 120. The minimum pressure rating allowed shall be 150 psi.

Joints can be solvent-cement joints on pipes less than four (4) inch and shall meet the requirements of ASTM D 2855, Standard Specification for Making Solvent-Cement Joints with PVC Pipe Fittings. The solvent-cement shall meet the requirements of ASTM D 2564, Standard Specification for Solvent-Cement PVC Plastic Pipe and Fittings.

- c. PVC pipe meeting the requirements of ASTM D 2241, Standard Specification for PVC Pressure-Rated Pipe (SDR Series). The minimum pressure rating shall be 150 psi.

Joints shall be gasket, bell and spigot, push-on types which meet the requirements of ASTM D 3139, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

2.8 DRAINAGE PIPE

2.8.1 GENERAL. Pipe manufactured from material other than RCP, PVC or Corrugated metal shall be used only at the discretion of the Engineer. All manufacturer's recommendations must be followed, unless more stringent requirements are established by the Engineer.

2.8.2 CORRUGATED METAL PIPE AND PIPE ARCHES. These specifications cover riveted corrugated metal culvert pipe and pipe arches intended to be used for the construction of culverts.

Corrugated metal pipe less than 60 inches shall not be used. Pipes greater than 60 inches (with coupling bands not less than 24 inches wide) shall be used only at the Engineers discretion.

All corrugated pipe and pipe-arches shall be bituminous coated.

The pipe and pipe arches shall be fabricated in full compliance with the specifications of AASHTO M36, except as herein modified.

The coupling bands shall not be less than 24 inches wide for culvert pipe having diameters of 60 inches or greater.

Corrugated metal pipe and coupling bans shall meet the requirements of AASHTO M 36, Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains. Pipes shall be fabricated from aluminum-coated steel sheet which meets the requirements of AASHTO M 274, Standard Specification for Steel Sheet, Aluminum-Coated (Type 2) for Corrugated Metal Pipe. The gage of the steel sheet used to fabricate the pipe shall be shown on the Plans.

2.8.3 REINFORCED CONCRETE PIPE. Circular reinforced concrete pipe shall meet the requirements of ASTM C 76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Storm Pipe. Elliptical reinforced concrete pipe shall meet the requirements of ASTM C 507, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe. Unless shown otherwise on the approved plans, Class III pipe shall be used.

Rubber and plastic joints shall meet the requirements of AASHTO M 198, Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets, for Type A (Rubber Gaskets), Type B (Flexible Plastic Gaskets) gaskets, or other RWRA approved gaskets. Bituminous mastic joint sealing material shall not be allowed in the construction of reinforced concrete pipe systems.

2.8.4 REINFORCED ELLIPTICAL CONCRETE PIPE. Reinforced elliptical pipe shall conform to the requirements of AASHTO M-207.

2.8.5 PVC (POLYVINYL CHLORIDE) PIPE AND FITTINGS. PVC pipe shall meet the requirements of Subsection 2.6.3 of these Specifications.

PVC plastic pipe for storm sewers shall only be used at the Engineer's discretion. PVC plastic pipe shall not be used under roadways or heavy traffic conditions nor in locations of inadequate cover. PVC plastic storm sewers shall be air tested in accordance with manufactures recommendations at the discretion of the Engineer. Water stops shall be used at all storm drainage structures when using PVC pipe. Bedding for PVC pipes shall conform to sanitary sewers bedding as outlined in Chapter 5 "Sanitary Sewers."

2.8.6 ADAPTERS AND COUPLINGS. Connections of sanitary sewer pipes of dissimilar materials or different sizes shall be made with connectors or adapters of the compression, non-shear Ferncos(or approved equal) or mechanical seal types, and which have been approved by RWRA. Bitumastic, butyl resin and mastic types of connections will not be acceptable.

2.8.7 NON-SHEAR PIPE COUPLINGS. When connecting one cut section of pipe to another and the gasketed bell-and-spigot system cannot be used, whether pipes are of similar or dissimilar material and size, the Contractor/Developer shall make this connection by utilizing an approved non-shear coupling or non-shear adapter coupling correctly sized for this purpose. Acceptable non-shear couplings are DWF/HPI non-shear coupling, Cascade Style CSST transition clamp coupling, and Fernco non-shear coupling. Any other coupling type must be approved by the Engineer before installation. For pipes of identical size and material, Contractor may also use a sleeve type repair coupling, as manufactured by HARCO (The Harrington Corporation), or prior-approved equal.

2.9 MANHOLES

2.9.1 BRICK and BLOCK. The brick used in the construction of manholes shall be sound, hard-burned, firm and compact in structure with true and square edges, and shall meet all of the requirements of the ASTM C 32 for Grade MM clay brick, ASTM C 55 for U-11 cement brick and ASTM C90-96 for Concrete masonry block. Only solid concrete bricks or blocks shall be used.

2.9.2 MANHOLE GASKETS AND BOOTS. To connect a sanitary sewer to a manhole, either a flexible boot KOR-N-SEAL 1 or 2 flexible connector, cast-in-

place Dura-Seal gasket, "A"-Lock gasket or an approved equal shall be used. Connections to an existing manhole shall be a flexible boot KOR-N-SEAL or approved equal.

All flexible connectors shall conform to ASTM C-923, and shall be resistant to ozone, weather elements, chemicals including acids and alkalis, animal and vegetable fats, oils and petroleum products.

The stainless steel elements of the connector shall be totally non-magnetic Series 305 stainless steel. The stainless steel clamp shall be capable of sustaining applied torque in excess of eighty (80) inch-pounds.

It shall be the responsibility of the Contractor/Developer to submit details of the proposed connection to the Engineer for approval. Connections not approved by the Engineer shall be subject to removal and replacement with an approved connector.

2.9.3 MANHOLE SEALANTS. Manhole sealants shall be used at all sanitary manholes. Concrete batch admixtures shall be IPA Systems Inc. (Ipanex) or Xypex Chemical Company (Xycrylic-Admix) in compliance with manufacturer's dosage and mixing instructions. If addition of concrete admixtures are not a possibility for an application, the engineer may approve an IPA Systems Inc. (Farbertite) coating system or approved equal.

2.9.4 CASTINGS. Sanitary manhole frames and covers shall be Neenah catalogue number R1772 with RWRA logo or approved equivalent (see detail Exhibit 5-18). Lids shall be Gasket Seal Cover catalog number 1020A, heavy duty, or approved equivalent. Castings shall be set in $\frac{3}{4}$ " minimum bed of non-shrink, waterproof cement mortar.

Storm inlet castings shall be Neenah R-3246, East Jordan 7030 M-4 or approved equal. All storm inlet castings shall be stamped with the environmental note "Dump No Waste – Drains to Waterway" in addition to the note the casting shall be stamped with a single fish logo (see detail Exhibit 7-5). The words "Storm Sewer" shall be cast in each storm manhole cover. All grates shall be bicycle traffic compatible.

2.9.5 PRECAST CONCRETE ADJUSTMENT RINGS Precast concrete rings for manholes shall conform to ASTM C 478.

2.9.6 PRECAST CONCRETE CONES Precast concrete cones shall be of the size and shape shown on the plans and shall conform to ASTM C 478.

2.9.7 STEPS. Manhole steps shall be Fiberglass reinforced polyester type and shall meet requirements of ASTM C478.

2.10 GROUT. Grout shall consist of a mixture of water and cement or cement with fly ash, or water and one part cement or cement with fly ash to two parts mortar sand as defined in the KTC Specifications by volume. The water may be adjusted to produce a mixture of a consistency suitable for job conditions; however, not over 5 1/2 gallons of water shall be used per sack of cement.

2.11 NON-SHRINK GROUT. Non-shrink grout shall be an approved non-shrink, non-staining grout consisting of either a mixture of hydraulic cement, water, fine aggregate, and an approved nonferrous expansive admixture, or a packaged commercial product and shall meet the requirements of the KTC Specifications.

2.12 FLOWABLE FILL. Flowable fill is a low strength mixture consisting of Portland cement, sand, class F fly ash, water and other materials as approved by the Engineer. Flowable fill has a density between 115 lb/cf and 130lb/cf and is of a consistency that will flow under and around pipe.

Unless otherwise approved by the Engineer flowable fill shall be proportioned as follows, per cubic yard:

Cement	30 lbs
Fly Ash, Class F	300 lbs
Sand (S.S.D.)	3,000 lbs
Water (Maximum)	550 lbs

2.13 STEEL CASING PIPE. Encasement pipes shall be steel seamless pipe and shall be new material, with a minimum yield of 35,000 psi. All steel pipe shall conform to requirements of ASTM A53-B and A139. Pipe thickness shall be as follows:

Casing pipe size	min. thickness (under hwy)
14" & under	0.250"
16" to 22"	0.375"
24" to 36"	0.500"

An ethylene propylene diene monomer (EPDM) elastomeric membrane shall be wrapped around the end of the encasement pipe in three layers and securely bound to the casing and carrier pipe barrel with stainless steel bands.

The EPDM membrane shall be a minimum 0.045 inches thick and have a tear resistance of 125 pounds/inch. Spacers and end seals shall be as manufactured by Advance Products, Inc., PSI, or other approved equal. Timber spacer's are not allowed.

2.14 WARNING TAPE. Warning tape shall be installed with all force mains. The warning tape shall be at least five (5) mils in thickness, made of bonded layer plastic with a metallic foil core. The minimum tensile strength shall be 185 lbs, or 5,000 psi, and impervious to acids, alkalis and other destructive elements found in soil. The tape shall be at least three (3) inches in width, colored A.P.W.A green, and shall be permanently imprinted with a warning message that reads "Caution Buried Sewer Below".

2.15 TRACER WIRE. Tracer wire shall be a single insulated, AWG No. 12 solid core copper wire, THNN or THWN, gasoline and oil resistant (Double wire for horizontal directionally drilled pipe).