literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. **No material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.**

(6) Touch-Up and Repair

Protecto Joint Compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.

d. Inspection and Certification

(1) Inspection

(a) All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 Film Thickness Rating.

(b) The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500-volt test. Any defects found shall be repaired prior to shipment.

(c) Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

(2) Certification

The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified.

e. Handling

Protecto 401 lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc., shall be placed inside the pipe and fittings for lifting, positioning, or laying.

2. Exterior Coating

Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A 21.51 for pipe and ANSI/AWWA C110/A 21.10 for fittings.

F. Fittings and gaskets for mechanical and push-on joint ductile and cast iron pipe shall conform to the latest revisions of ANSI/AWWA C110/A 21.10 for mechanical and push-on joint fittings, ANSI/AWWA C111/A 21.11 for gaskets and ANSI/AWWA C153/A 21.53 for mechanical and push-on joint compact fittings. Mechanical and push-on joint fittings shall have pressure class rating of 150 psi minimum.

G. All ductile and cast iron fittings shall be ductile iron grade 80-60-03 in accordance with ASTM A339-55.

H. Restrained joint pipe and fittings shall be a boltless system equal to "Field-Lok" restraining gaskets or "TRFLEX Joint" as manufactured by U.S. Pipe and Foundry Company.

I. Pipe shall be as manufactured by U.S. Pipe and Foundry Company, Clow, American Pipe Company, or equal.

J. Pipe or fitting shall have the ANSI/AWWA standard, pressure (or thickness) class, diameter,

DI or ductile noted, manufacturer, and country and year where cast on the outside of the body.

## 2.04 COUPLING AND ADAPTORS

A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5 inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.

B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, unless otherwise specified and/or noted on the Drawings.

## 2.05 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

A. Where indicated on the Drawings, required by the specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed. Concrete shall be Class A. Thrust blocking shall be in accordance with LFUCG Standard Drawings.

# PART 3 – EXECUTION

## 3.01 EXCAVATION FOR PIPELINE TRENCHES

A. See Section 02225 for trenching specification.

**B. Minimum cover of 36" shall be provided for all force mains.**

## 3.02 PIPE BEDDING

A. Bedding shall be in accordance with LFUCG Standard Drawings.

## 3.03 LAYING PIPE

A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.

B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.

C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure it's clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.

D. Pipe shall not be laid on solid rock. Pipe bedding shall be installed prior to laying pipe. Irregularities in subgrade in an earth trench shall be corrected by use of #9 crushed limestone.

E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.

F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.

G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

## 3.04 BACKFILLING PIPELINE TRENCHES

A. Backfilling shall be in accordance with LFUCG Standard Drawings.

## 3.05 SETTLEMENT OF TRENCHES

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

## 3.0.6 CONCRETE THRUST BLOCKS OR ENCASEMENT

A. Concrete thrust blocks or encasement shall be placed at all bends or where shown on the Drawings and in accordance with LFUCG Standard Drawings.

## 3.07 TESTING

A. All force mains shall be given a hydrostatic test to 150 psi or 250% of working design pressure, whichever is greater, and tested at the lowest level of the pipeline. In no case shall the pipe be tested at a pressure exceeding the pressure class rating of the pipe. Loss of pressure during the test shall not exceed 0 psi in a 4 hour period and 2 psi in a 24 hour period. Any test results that do not meet either of these requirements shall constitute a failure of the pressure test.

B. Leakage in force mains, when tested under the hydrostatic test described above, shall not exceed 10 gallons per 24 hours per inch of diameter per mile of pipe.

C. Contractor shall furnish a recording gauge and water meter for measuring water used during

leakage test and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-hour spring wound clock, designed for 9-inch charts, and shall be approved by the Engineer.

D. Duration of test shall be not less than 24 hours.

E. Where leaks are visible at exposed joints, evident on the surface where joints are covered and/or identified by isolating a section of pipe, the joints shall be repaired.

F. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the owner.

G. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.

H. The Contractor will provide water for testing the pressure piping.

END OF SECTION

## SECTION 02532 – SEWAGE COLLECTION LINES

## PART 1 – GENERAL

### 1.01 SUMMARY

A. The Contractor shall furnish all labor, material, and equipment necessary to install gravity sewer piping together with all appurtenances as shown and detailed on the Drawings and specified herein.

## PART 2 – PRODUCTS

### 2.01 DUCTILE IRON (DI) PIPE

A. Ductile iron pipe shall be furnished cement lined in accordance with ANSI/AWWA C104/A21.4 with bituminous seal coat unless otherwise noted on the drawings or in Bid Form. Ductile iron pipe shall be furnished with rubber gasket push-on joints except as may otherwise be noted on the drawings or in difficult working areas and with approval of the Engineer. All pipe inside of casing pipe shall have restraining gaskets as specified in this Section. **All DI pipe and fittings within 2,000 LF downstream or to nearest manhole beyond 2,000 LF of a force main discharge shall be lined with Protecto 401 coating, or approved equal as specified hereinafter.**

B. Pressure class shall be 150 psi minimum for mechanical and push-on joint pipe.

C. Thickness design of ductile iron shall conform in all aspects to the requirements of ANSI/AWWA C150/A 21.50 latest revision.

D. Manufacture and testing of ductile iron pipe shall conform in all aspects to the requirements of ANSI/AWWA C151/A 21.51 latest revision.

E. Pipe Coatings

1. Interior Lining

a. Condition of Ductile Iron Prior to Surface Preparation

All ductile pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. Because removal of old linings may not be possible, the intent of this specification is that the entire interior of the ductile iron pipe and fittings shall not have been lined with any substance prior to the application of the specified lining material and no coating shall have been applied to the first six (6) inches of the exterior of the spigot ends.

b. Lining Material

The standard of quality is Protecto 401 Ceramic Epoxy. The material shall be an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. Any request for substitution must be accompanied by a successful history of lining pipe and fittings for sewer service, a test report verifying the following properties, and a certification of the test results.

(1) A permeability rating of 0.00 when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of 30 days.

(2) The following test must be run on coupons from factory lined ductile iron pipe:

(a) ASTM B-117 Salt Spray (scribed panel) – Results to equal 0.0 undercutting after two years.

(b) ASTM G-95 Cathodic Disbondment 1.5 volts @ 77°F. Results to equal no more than 0.5 mm undercutting after 30 days.

(c) Immersion Testing rated using ASTM D-714-87.

i. 20% Sulfuric Acid – No effect after two years.
ii. 25% Sodium Hydroxide – No effect after two years.
iii. 160°F Distilled Water – No effect after two years.
iv. 120°F Tap Water (scribed panel) – 0.0 undercutting after two years with no effect.

(3) An abrasion resistance of no more than 4 mils (.10mm) loss after one million cycles – European Standard EN 598: 1994 section 7.8 Abrasion resistance.

c. Application

(1) Applicator

The lining shall be applied by a competent firm with a successful history of applying linings to the interior of ductile iron pipe and fittings.

(2) Surface Preparation

Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, etc. Any areas where oil, grease, or any substance which can be removed by solvent is present, shall be solvent cleaned using the guidelines outlined in DIPRA-1 Solvent Cleaning. After the surface has been made free of grease, oil, or other substances, all areas to receive the protective compounds shall be abrasively blasted using compressed air nozzles with sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering annealing oxide may be left on the surface. Any area where rust reappears before lining must be reblasted.

(3) Lining

After the surface preparation and within eight (8) hours of surface preparation, the interior of the pipe shall receive 40 mils nominal dry film thickness of Protecto 401. No lining shall take place when the substrate or ambient temperature is below 40 degrees Fahrenheit. The surface also must be dry and dust free. If flange pipe or fittings are included in the project, the lining shall not be used on the face of the flange.

(4) Coating of Bell Sockets and Spigot Ends

Due to the tolerances involved, the gasket area and spigot end up to six (6) inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum Protecto Joint Compound. The Joint Compound shall be applied by brush to ensure coverage. Care should be taken that the Joint Compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be done after the application of the lining.

(5) Number of Coats

The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the

dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. **No material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.**

(6) Touch-Up and Repair

Protecto Joint Compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.

d. Inspection and Certification

(1) Inspection

(a) All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 Film Thickness Rating.

(b) The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500-volt test. Any defects found shall be repaired prior to shipment.

(c) Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

(2) Certification

The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified.

e. Handling

Protecto 401 lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc., shall be placed inside the pipe and fittings for lifting, positioning, or laying.

2. Exterior Coating

Bituminous outside coating shall be in accordance with ANSI/AWWA C151/A 21.51 for pipe and ANSI/AWWA C110/A 21.10 for fittings.

F. Fittings and gaskets for mechanical and push-on joint ductile and cast iron pipe shall conform to the latest revisions of ANSI/AWWA C110/A 21.10 for mechanical and push-on joint fittings, ANSI/AWWA C111/A 21.11 for gaskets, and ANSI/AWWA C153/A 21.53 for mechanical and push-on joint compact fittings.

G. All ductile and cast iron fittings shall be ductile iron grade 80-60-03 in accordance with ASTM A339-55.

H. Restrained joint pipe and fittings shall be a boltless system equal to "Field-Lok" restraining gaskets or "TRFLEX Joint" as manufactured by U.S. Pipe & Foundry Company.

I. Pipe shall be as manufactured by U.S. Pipe & Foundry Company, Clow, American Pipe Company, or equal.

J. Pipe or fitting shall have the ANSI/AWWA standard, pressure (or thickness) class, diameter, DI

or ductile noted, manufacturer, and country and year where cast on the outside of the body.

## 2.02 POLYVINYL CHLORIDE (PVC) PIPE (SOLID WALL)

A. PVC pipe and fittings less than 15 inches in diameter shall conform to the requirements of ASTM Standard Specifications for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, Designation D 3034. Pipe and fittings shall have a minimum cell classification of 12454B or 12454C as defined in ASTM D-1784. For depths 10 feet and less, pipe shall have a pipe diameter to wall thickness ratio (SDR) of 35. For depths greater than 10 feet up to 20 feet maximum, pipe shall be SDR 26.

B. PVC pipe and fitting with diameters 18-inch through 27-inch shall conform to the requirements of ASTM D-17845 and ASTM F-679. Pipe and fittings shall have a minimum cell classification of 14545C. The minimum wall thickness shall conform to T-1 as specified in ASTM F-679. For depths 10 feet and less, pipe shall have pipe stiffness 46 (SDR 35). For depths greater than 10 feet up to 20 feet maximum, pipe shall have pipe stiffness of 115 (SDR 26).

C. Joints shall be push-on bell and spigot type using elastomeric ring gaskets conforming to ASTM D 3212 and F 477. The gaskets shall be securely fixed into place in the bells so that they cannot be dislodged during joint assembly. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oils and groundwater, and which will endure permanently under the conditions of the proposed use.

D. Pipe shall be furnished in lengths of not more than 13 feet. The centerline of each pipe section shall not deviate from a straight line drawn between the centers of the openings at the ends by more than 1/16 inch per foot of length.

E. PVC pipe shall not have a filler content greater than ten percent (10%) by weight relative to PVC resin in the compound.

F. PVC pipe shall be clearly marked at intervals of 5 feet or less with the manufacturer's name or trademark, nominal pipe size, PVC cell classification, the legend "Type PSM SDR 35 PVC Sewer Pipe" and the designation "ASTM D 3034", or "ASTM F-679". Fittings shall be clearly marked with the manufacturer's name or trademark, nominal size, the material designation "PVC", "PSM" and the designation 'ASTM D 3034", or "ASTM F-679".

G. PVC pipe shall have minimum pipe stiffness of 46 psi (SDR 35) or 115 psi (SDR 26) for each diameter when measured at 5 percent vertical ring deflection and tested in accordance with ASTM D 2412.

H. PVC pipe installation shall conform to ASTM D-2321 latest revision.

I. Pipe shall be as manufactured by JM Eagle, H & W Pipe Company, or equal.

## 2.03 FIBERGLASS REINFORCED POLYMER MORTAR PIPE (FRPM)

A References

1. ASTM D3262 – Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.

2. ASTM D4161 – Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastorneric Seals.

3. ASTM D2412 – Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

4. ASTM D3681 – Standard Test Method for Chemical Resistance of "Fiberglass" Pipe in a Deflected Condition.

5. ASTM D638 – Test Method for Tensile Properties of Plastics.

B. Materials

1. Pipe Class: Pipe shall be stiffness class 46 (SN) for depths 30 feet or less; SN 72 for depths greater than 30 feet.

2. Resin Systems: The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.

3. Glass Reinforcements; The reinforcing glass fibers used to manufacture the components shall be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.

4. Silica Sand: Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.

5. Additives: Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally effect the performance of the product.

6. Elastomeric Gaskets: Gaskets shall meet ASTM F477 and be supplied by qualified gasket manufactures and be suitable for the service intended.

C. Manufacture and Construction

1. Pipes: Manufacture pipe to result in a dense, nonporous, corrosion-resistant, consistent composite structure. The interior surface of the pipes exposed to sewer flow shall be manufactured using a resin with a 50% elongation (minimum) when tested in accordance with D638. The interior surface shall provide crack resistance and abrasion resistance. The exterior surface of the pipes shall be comprised of a sand and resin layer which provides UV protection to the exterior. Pipes shall be Type 1, Liner 2, Grade 3 per ASTM D362.

2. Joints: Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilized elastomeric sealing gaskets as the sole means to maintain joint watertightness. The joints must meet the performance requirements of ASTM D4161. Joints at tie-ins, when needed, may utilize gasket-sealed closure couplings.

3. Fittings: Flanges. Elbows, reducers, tees, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays. Fittings shall be FRPM. Tees with 6 inch stub for laterals may have stubs constructed of FRPM or PVC SDR 35. Ductile iron (DI) fittings may be substituted for FRPM fittings. The **DI fittings shall be lined with Protecto 401 coating, or approved equal, and in accordance with DI pipe specification in this Section 02532.**

4. Acceptable Manufacturer: HOBAS Pipe USA or Flowtite.

D. Dimensions

1. Diameters: The actual outside diameter (18 inches to 48 inches) of the pipes shall be in accordance with ASTM D3262 and be in cast iron pipe sizes. For other diameters, OD's shall be per manufacturer's literature.

2. Lengths: Pipe shall be supplied in nominal lengths of 20 feet. Actual laying length shall be nominal +1, -4 inches. At least 90% of the total footage of each size and class of pipe,

excluding special order lengths, shall be furnished in nominal length sections.

3. Wall Thickness: The minimum wall thickness shall be the stated design thickness.

4. End Squareness: Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/8".

E. Testing

1. Pipes: Pipes shall be manufactured and tested in accordance with ASTM D3262.

2. Joints: Coupling joints shall meet the requirements of ASTM D4161.

3. Stiffness: Minimum pipe stiffness when tested in accordance with ASTM D2412 shall normally be 36 psi.

4. Strain Corrosion: The extrapolated 50-year strain corrosion value shall not be less than 0.9% as determined in accordance with STM D3681 and ASTM D3262.

F. Installation

1. Burial: The bedding and burial of pipe and fittings shall be in accordance with the project plans and specifications and the manufacturer's requirements.

2. Pipe Handling: Use textile slings, other suitable materials or a forklift. Use of chains or cables is not allowed.

3. Jointing:

a. Clean ends of pipe and coupling components

b. Apply joint lubricant to pipe ends and elastomeric seals of coupling. Use only lubricants approved by the pipe manufacturer.

c. Use suitable equipment and end protection to push or pull the pipes together.

d. Do not exceed forces recommended by the manufacturer for coupling pipe.

e. Join pipes in straight alignment then deflect to required angle. Do not allow the deflection angle to exceed the deflection permitted by the manufacturer.

4. Field Tests:

a. Testing shall be in accordance with specification hereinafter in this Section 02532.

## 2.04 REINFORCED CONCRETE PIPE

A. All reinforced concrete pipe shall conform to the requirements of ASTM C76, latest edition. Class shall be as shown on the Drawings.

B. Joints shall be bell and spigot type using rubber Hamilton Kent TSS Series pre-lubricated profile gasket (or approved equal) and shall conform to ASTM C443.

C. The pipe shall be furnished in standard lengths of 8 feet to 16 feet.

D. The pipe shall be permanently marked showing the nominal inside diameter, manufacture date, ASTM C76 class, and manufacturer's name. These markings for 30-inch diameter and larger shall be inscribed on the pipe exterior and stenciled on the interior with paint or

permanent ink.

E. There shall be no lift holes.

F. Pipe shall be as manufactured by Independent Concrete Pipe Company, Sherman Dixie, or approved equal.

G. Cement used in the manufacture of circular reinforced concrete pipe shall meet the requirements of ASTM C 150 Standard Specification for Portland cement, for Type II cement.

H. A three-edge-bearing test shall be conducted by the manufacture according to ASTM C 497 Standard Test Method for Concrete Pipe, Manhole Sections, or Tile as proof of design by determining the ultimate load capacity of the pipe. One segment from each pipe class must pass the three-edge-bearing test such that the load required to produce the ultimate load rating of the pipe. The test results shall be maintained in a log and provided to the Owner. Manufacturer shall also maintain concrete cylinder testing data and quality control records to verify that the pipe meets the required ASTM standards.

I. Joint test shall be conducted at the manufacturing plant by the manufacturer according to the ASTM C 1103 Standard Practice for Join Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines to determine if the joint design is allowing leaks that need to be corrected in the manufacturing of the pipe or gasket. The joint test shall be conducted on 25% (minimum) of the pipe segments and the test results shall be maintained in a log and provided to the Owner.

J. An alkalinity test shall be conducted on the concrete mixture used for each type and class of reinforced concrete sewer pipe used in the project. The alkalinity test shall be conducted according to ASTM C 479-05 Item 14 – Alkalinity of Concrete Mixture and the alkalinity of all concrete mixtures shall be equal to or greater than 0.2 grams of CaCO3 equivalently reactive per gram of concrete. The manufacturer shall complete the alkalinity tests. The cost of the tests shall be incidental to the pipe cost. The Contractor shall include all such cost in the price bid for the Work. The Contractor shall submit a signed, dated, and certified copy of the test data to the Owner (in a format acceptable to the Owner) for review prior to delivering any pipe to the project site. No additional compensation will be made to the Contractor for requiring the testing.

K. **All reinforced Concrete Sanitary Sewer Pipe shall include full thickness internal protection to prevent microbiologically induced corrosion with concrete admixture ConShield Technologies, Inc. or approved equal.**

## PART 3 – EXECUTION

### 3.01 PIPE LAYING

A. Excavation, trenching, backfilling, and bedding requirements are set forth in Section 02225.

B. All pipe shall be laid with ends abutting and true to the lines and grades indicated on the Drawings. The pipe shall be laid straight between changes in alignment and at uniform grade between changes in grade. Pipe shall be fitted and matched so that when laid in the trench, it will provide a smooth and uniform invert.

C. Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure its being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe and beveled to match the factory bevel for insertion into gasketed joints. Bevel can be made with hand or power tools.

D. The interior of the pipe, as work progresses, shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted into the pipe bell so as to exclude earth or other material and precautions taken to prevent flotation of pipe by runoff into trench.

E. All pipe shall be laid starting at the lowest point and installed so that the spigot ends point in the direction of flow.

## 3.02 JOINTING

A. All joint surfaces shall be cleaned immediately before jointing the pipe. The bell or groove shall be lubricated in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. All pipe shall be provided with home marks to insure proper gasket seating. Details of gasket installation and joint assembly shall follow the direction of the manufacturer's of the joint material and of the pipe. The resulting joints shall be watertight and flexible. **No solvent cement joints shall be allowed.**

## 3.03 UTILITY CROSSING CONCRETE ENCASEMENT

A. At locations shown on the Drawings, required by the Specifications, or as directed by the Engineer, concrete encasement shall be used when the clearance between the proposed sanitary sewer pipe and any existing utility pipe is 18 inches or less. Utility pipe includes underground water, gas, telephone and electrical conduit, storm sewers, and any other pipe as determined by the Engineer.

B. There are two cases of utility crossing encasement. Case I is applicable when the proposed sanitary sewer line is below the existing utility line. Case II is applicable when the proposed sanitary sewer line is laid above the utility line. In either case, the concrete shall extend to at least the spring line of each pipe involved.

C. Concrete shall be Class A and shall be mixed sufficiently wet to permit it to flow between the pipes to form a continuous bridge. In tamping the concrete, care shall be taken not to disturb the grade or line of either pipe or damage the joints.

## 3.04 TESTING OF GRAVITY SEWER LINES

A. After the gravity piping system has been brought to completion, and prior to final inspection, the Contractor shall rod out the entire system by pushing through each individual line in the system, from manhole to manhole, appropriate tools for the removal from the line of any and all dirt, debris, and trash. If necessary during the process of rodding the system, water shall be turned into the system in such quantities to carry off the dirt, debris, and trash.

B. During the final inspection the Engineer will require all flexible sanitary sewer pipe (PVC and FRP) to be mandrel deflection tested after installation.

1. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with nine (9) evenly spaced arms of prongs. The mandrel dimension shall be 95 percent of the flexible pipe's published ASTM average inside diameter. Allowances for pipe wall thickness tolerances of ovality (from shipment, heat, shipping loads, poor production, etc.) shall not be deducted from the ASTM average inside diameter, but shall be counted as part of the 5 percent allowance. The contact length of the mandrel's arms shall equal or exceed the nominal diameter of the sewer to be inspected. Critical mandrel dimensions shall carry a tolerance ± 0.001 inch.

2. The mandrel inspection shall be conducted no earlier than 30 days after reaching final trench backfill grade provided, in the opinion of the Engineer, sufficient water densification or rainfall has occurred to thoroughly settle the soil throughout the entire trench depth. Short-term (tested 30 days after installation) deflection shall not exceed 5 percent of the pipe's average inside diameter. The mandrel shall be hand pulled by the contractor through all sewer lines. Any sections of the sewer not passing the mandrel test shall be uncovered and the Contractor shall replace and recompact the embedment backfill material to the satisfaction of the Engineer. These repaired sections shall be retested with the go/no-go mandrel until passing.

3. The Engineer shall be responsible for approving the mandrel. Proving rings may be used to assist in this. Drawings of the mandrel with complete dimensioning shall be furnished by the Contractor to the Engineer for each diameter and type of flexible pipe.

C. Low-pressure air tests shall be performed on all gravity sanitary sewers to verify water tightness of pipe joints and connections. The Contractor shall perform testing on each manhole-to-manhole section of sewer line after placement of backfill.

1. Testing of Polyvinyl Chloride (PVC), Fiberglass Reinforced Polymer Mortar (FRPM), and Ductile Iron (DI) pipe sewer lines shall be performed in accordance with the current editions of ASTM F1417, "Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air," and UNI-B-6, "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe," respectively. Testing of reinforced concrete pipe sewer lines shall be performed in accordance with the current edition of ASTM C 924, "Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method" and ASTM C 1103-03 Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

2. All testing equipment shall be inspected by the Engineer to ensure that equipment is functioning properly.

3. The rate of air loss in the section under test shall be determined by the time-pressure drop method. The time required in minutes for the pressure in the section under test to decrease from 3.5 to 2.5 psig shall be not less than that indicated in the referenced standards.

4. Immediately following the low-pressure air test, the Contractor shall notify the Engineer of the test results. A Low-Pressure Air Test Report shall be completed by the Contractor during testing. The report shall be completed according to the procedures outlined in LFUCG's Construction Inspection Manual, current edition. A copy of the completed Low-Pressure Air Test Report shall be provided to the Engineer and LFUCG-Division of Water Quality for each test.

5. Pipes failing the pressure test will not be accepted and shall be repaired or replaced until a successful test is achieved.

6. When conducting a low-pressure air test, the Contractor shall securely install and brace all plugs prior to pressurizing the pipe. Personnel shall not be permitted to enter manholes when the sewer pipe is pressurized.

D. Infiltration tests (for concrete pipe only) shall be made after underdrains, if present, have been plugged and other groundwater drainage has been stopped such that the groundwater is permitted to return to its normal level insofar as practicable.

1. Upon completion of a section of the pipeline, the line shall be dewatered and a satisfactory test conducted to measure infiltration for at least 24 hours. The amount of infiltration, including manholes, tees and connections, shall not exceed 100 gallons per nominal inch diameter per mile of sewer per 24 hours.

E. Exfiltration tests (for concrete pipe only) which subject the pipeline to an internal pressure, shall be made by plugging the pipe at the lower end and then filling the line and manholes with clean water to a height of 2 feet above the top of the sewer at its upper end. Where conditions between manholes may result in test pressures which would cause leakage at the plugs or stoppers in branches, provisions shall be made by suitable ties, braces and wedges to secure the plugs against leakage resulting from the test pressure.

1. The rate of leakage from the sewers shall be determined by measuring the amount of water required to maintain the level 2 feet above the top of the pipe.

2. Leakage from the sewers under test shall not exceed the requirements for leakage into sewers as hereinbefore specified.

F. TV Survey

1. TV survey and cleaning shall be performed on all gravity sewers.

2. Hydraulic cleaning and vacuum must be done prior to TV survey.

3. TV survey must be of dry pipe.

4. TV survey shall be Pipe Assessment Certification Program (PACP) level of quality and TV equipment must include a slope-inclinometer.

5. Acceptance of TV survey, completed sewers, and the repairs needed are to be determined at sole discretion of LFUCG.

6. TV survey shall include:

   a. Video file and shall be re-named to LFUCG's assets.

   b. PACP database must be in Microsoft Access format, version 4.4.2 which includes photos embedded in database.

   c. Report shall be provided in electronic version in PDF format.

G. The Contractor shall furnish suitable test plugs, water pumps, and appurtenances, and all labor required to properly conduct the tests. Suitable bulkheads shall be installed, as required, to permit the test of the sewer. The Contractor shall construct weirs or other means of measurements as may be necessary.

H. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing the leaks and retesting as the Engineer may require without additional compensation.

END OF SECTION

## SECTION 02608 – MANHOLES

## PART 1 - GENERAL

### 1.01 SUMMARY

A. The Contractor shall furnish all labor, material, and equipment necessary to construct manholes for sanitary storm sewers, including steps, frames, and covers, together with all appurtenances as shown and detailed on the Drawings and specified herein. Manhole materials shall be precast concrete.

### 1.02 DEFINITIONS

A. Standard Manhole: A standard manhole is defined as any manhole that is greater than 5 feet in depth, as measured from the invert of the manhole base at its center to the top (rim) of the manhole cover.

B. Shallow Manhole: A shallow manhole is defined as any manhole that is 5 feet or less in depth, as measured in the preceding sentence.

## PART 2 - PRODUCTS

### 2.01 CONCRETE MANHOLES - GENERAL

A. Manholes shall conform in shape, size, dimensions, materials, and other respects as shown on the Drawings or specified herein.

B. All concrete manholes shall have precast reinforced concrete developed bases. No other type of base will be allowed. Invert channels shall be factory constructed when the base is made. Sloping invert channels shall be constructed whenever the difference between the inlet and outlet elevation is 2 feet or less.

C. The concrete manhole walls (barrels and cones) and base shall be precast concrete sections manufactured with **Xypex C-500 cementitious crystalline admixture at dosage of 2%-3% by weight of cement.** The top of the cone shall be built of reinforced concrete to allow adjustment rings to be added for adjustment of the frame to meet the finished surface. Minimum strength of the concrete for the precast sections shall be 4,000 psi at the time of shipment.

**D. Manholes that receive sewage from a force main discharge, and within 2,000 LF downstream or to the nearest manhole beyond the 2,000 LF, shall have concrete admixture ConShield, or approved equal, as specified in Section 02532 for reinforced concrete pipe.**

E. Manholes located in the 100-year floodplain shall have a concrete base that includes an anti-flotation collar. The collar shall have a radius 6-inches larger than the exterior wall of the base section.

F. For concrete manholes, the inverts of the developed bases shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerlines of adjoining pipelines.

G. For concrete manholes, the cast iron frames and covers shall be the standard frame and cover as indicated on the LFUCG Standard Drawings.

H. Manholes shall be manufactured by Sherman Dixie, Oldcastle Precast or approved equal.

## 2.02 PRECAST CONCRETE SECTIONS

A. Precast concrete sections and appurtenances shall conform to the ASTM Standard Specifications for Precast Reinforced Concrete Manhole Sections, Designation C478, latest revision, with the following exceptions and additional requirements.

B. The base section shall be monolithic for 4-foot and 5-foot diameter manholes. Manholes with diameter of 6 feet or larger shall have a monolithic base or base slab.

C. The wall sections shall be not less than 5 inches thick.

D. Type II cement shall be used except as otherwise permitted.

## 2.03 CONCRETE MANHOLE - FRAMES AND COVERS

A. The Contractor shall furnish all cast iron manhole frames and covers as shown in LFUCG Standard Drawings.

B. Castings shall be designed for H-20 traffic loading.

C. The castings shall be of good quality, strong, tough, evengrained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.

D. Frames shall be set in mastic and bolted down in non-traffic areas with four ¾" SS Hilti anchor bolts and washers. Hilti anchor bolts shall be embedded a minimum of 4-inches into precast concrete cone section. In traffic areas, the frame shall be set in mastic and Class A concrete donut poured around frame to the top of concrete cone section. The concrete donut shall be 12-inches in width and in depth up to within 1 ½-inches of surface for bituminous asphalt pavement.

E. All casting shall be thoroughly cleaned and subject to a careful hammer inspection.

F. Castings shall be at least Class 25 conforming to the ASTM Standard Specifications for Gray Iron Casting, Designation A48, latest revision.

G. Unless otherwise specified, manhole covers shall be 22-3/4 inches in diameter, weighing not less than 305 pounds per frame and cover. Manhole covers shall set neatly in the rings, with contact edges machined for even bearings and tops flush with ring edge. They shall have sufficient corrugations to prevent slipperiness. The covers shall have two (2) pick holes about 1-1/4 inches wide and 1/2 inch deep with 3/8-inch undercut all around. Covers shall not be perforated. Frames and covers shall be J.R. Hoe and Sons Mc-350, or approved equal.

H. Watertight lids shall have neoprene T-gasket and concealed pickhole.

I. All covers shall be marked in large letters "LEXINGTON KENTUCKY SANITARY SEWER" as shown in LFUCG Standard Drawings.

## 2.04 MANHOLE STEPS (CONCRETE MANHOLES)

A. Manholes steps shall be the polypropylene plastic type reinforced with a 1/2 inch diameter deformed steel rod. The step shall be 10-3/4 inches wide and extend 5-3/4 inches from the

manhole wall. Steps shall line up over the downstream invert of the manhole. The steps shall be embedded into the manhole wall a minimum of 3-3/8 inches. Steps shall be uniformly spaced at 12-inch to 16-inch intervals.

B. Manhole steps shall be in accordance with LFUCG Standard Drawings.

## 2.05 PREMOLDED ELASTOMERIC-SEALED JOINTS

A. All holes for pipe connections in concrete barrels and bases shall have a factory-installed flexible rubber gasket to prevent infiltration. The manhole boots shall conform to the latest revision of ASTM-C923. The boots shall be Contour Seal or Kor-N-Seal manufactured by National Pollution Control Systems, Inc., Nashua, NH; A-Lok Manhole Pipe Seal manufactured by A-Lok Corporation, Trenton, NJ; or an approved equal.

## 2.06 MANHOLE DIAPHRAGM (FOR WATERTIGHT LID APPLICATIONS)

A. Diaphragm manhole inserts shall be manufactured from corrosion-proof material suitable for atmospheres containing hydrogen sulfide and diluted sulfuric acid. Diaphragm shall be installed in manholes susceptible to inflow as indicated on the Drawings.

B. The body of the manhole insert shall be made of high density ethylene hexene-1 copolymer material meeting ASTM Specification D 1248, Class A, Category 5 (the insert shall have a minimum impact brittleness temperature of -180 degrees Fahrenheit). The thickness shall be uniform 1/8 inch or greater. The manhole insert shall be manufactured to dimensions as shown on the Drawings to allow easy installation within the manhole frame.

C. Gaskets shall be made of closed cell neoprene. The gasket shall have a pressure sensitive adhesive on one side and shall be placed under the weight bearing surface of the insert by the manufacturer. The adhesive shall be compatible with the manhole insert material so as to form a long lasting bond in either wet or dry conditions.

D. Lift strap shall be attached to the rising edge of the bowl insert. The lift strap shall be made of 1 inch wide woven polypropylene web and shall be seared on all cut ends to prevent unraveling. The lift strap shall be attached to the manhole insert by means of a stainless steel rivet. Location of the lift strap shall provide easy visual location.

E. Standard ventilation shall be by means of a valve or vent hole. Vent holes shall be on the side wall of the manhole insert approximately 3/4 inch below the lip. The valve or vent hole will allow a maximum release of 5 gallons per 24 hours when the insert is full.

F. The manhole insert shall be manufactured to fit the manhole frame rim upon which the manhole cover rests. The Contractor is responsible for obtaining specific measurements of each manhole cover to insure a proper fit. The manhole frame shall be cleaned of all dirt, scale and debris before placing the manhole insert on the rim.

G. Diaphragm shall be Rainstopper manufactured by Rainstopper, Inc. in color white, or approved equal.

## 2.07 CLEANOUTS

A. Cleanouts shall be cast iron and extend to the finish grade and capped with a clean-out plug in accordance with details and at locations shown on the Drawings. Pipe shall be the same size as the gravity sewer line in which the cleanout is located. A 4-inch thick concrete pad, with 6" x 6", 1.9 x 1.9 wire mesh, 24 inches square, with the valve box lid section, shall be provided around each cleanout.

B. Cleanouts shall be in accordance with LFUCG Standard Drawings.

## 2.08 DROP CONNECTIONS

A. Drop connections shall be installed on exterior of manhole as shown on the LFUCG Standard Drawings. The pipe material inside the drop manhole shall be of the same material as the sanitary sewer line.

# PART 3 - EXECUTION

## 3.01 FABRICATION - PRECAST SECTIONS

A. Manhole sections shall contain manhole steps accurately positioned and embedded in the concrete when the section is cast.

B. Sections shall be cured in an enclosed curing area and shall attain a strength of 4,000 psi prior to shipment.

C. No more than two (2) lifting hooks may be cast or drilled in each section.

D. Flat slab tops shall have a minimum thickness of 6 inches and reinforcement in accordance with ASTM C478.

E. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the precast sections.

F. Acceptance of the sections will be on the basis of material tests and inspection of the completed product and test cylinders if requested by the Engineer.

G. Cones shall be precast sections of similar construction.

## 3.02 SETTING PRECAST MANHOLE SECTIONS

A. Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.

B. Butyl mastic sealant shall be installed in all manhole joints in accordance with the manufacturer's recommendations and as shown in LFUCG Standard Drawings. Butyl mastic sealant shall meet Federal Spec SS-S-210A, AASHTO M-19875I, and ASTM C990. Butyl mastic sealant shall be NPC Bidco C-56 as manufactured by Trelleborg Engineered Systems, or approved equal. Sealant shall be a minimum bead of 1 inch in rope configuration.

C. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose.

## 3.03 ADJUSTING MANHOLE FRAMES AND COVERS TO GRADE

A. Except where shown on the Drawings, the top of the precast concrete eccentric cone of a standard manhole or the top of the flat slab of a shallow manhole shall terminate 6 inches below existing grade in an unpaved non-traffic area except in a residential yard and 13 inches below existing grade in a paved or unpaved traffic area and in a residential yard. The remainder of the manhole shall be adjusted to the required grade.

B. When a manhole is located in an unpaved non-traffic area other than in a residential yard, the frame and cover shall be adjusted to an elevation 1 inch above the existing grade at the

center of the cover. If field changes have resulted in the installed manhole invert elevation to be lower than the invert elevation shown on the Drawings, the adjustment to an elevation of 1 inch above existing grade shall be accomplished by the use of precast concrete or cast iron adjusting rings. The area around the adjusted frame and cover shall be filled with the required material, sloping it away from the cover at a grade of 1 inch per foot.

C. When a manhole is located in a bituminous, concrete, or crushed stone traffic area, or in a residential yard, the frame and cover shall be adjusted to the grade of the surrounding area by the use of precast concrete or cast iron adjusting rings. The adjusted cover shall conform to the elevation and slope of the surrounding area.

1. The Contractor shall coordinate elevations of manhole covers in paved streets with the local public works department. If resurfacing of the street in which sewers are laid is expected within twelve (12) months, covers shall be set 1-1/2 inches above the existing pavement surface in anticipation of the resurfacing operations.

## 3.04 ADJUSTING SECTIONS

A. Only clean adjusting sections shall be used. Each adjusting section shall be laid in a bead of butyl mastic sealant and shall be thoroughly bonded.

## 3.05 SETTING MANHOLE FRAMES AND COVERS

A. Manhole frames shall be set with the tops conforming to the required elevations set forth hereinbefore. Frames shall be set concentric with the top of the concrete and in a full bead (1") of butyl mastic sealant so that the space between the top of the masonry and the bottom flange of the frame shall be completely watertight.

B. Manhole covers shall be left in place in the frames on completion of other work at the manholes.

## 3.06 VACUUM TESTING (ASTM C1244)

A. Scope

1. This test method covers procedures for testing precast concrete manhole sections when using the vacuum test method to demonstrate the integrity of the installed materials and the construction procedures. This test method is used for testing concrete manhole sections utilizing mortar, mastic, or gasketed joints.

B. References, ASTM Standards:

1. C 822 Terminology Relating to Concrete Pipe and Related Products.

2. C 924 Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.

3. C 969 Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

C. Summary of Practice

All lift holes and any pipes entering the manhole are to be plugged. A vacuum will be drawn and the vacuum drop over a specified time period is used to determine the acceptability of the manhole.

D. Significance and Use

This is not a routine test. The values recorded are applicable only to the manhole being tested and at the time of testing.

E. Preparation of the Manhole

1. All lift holes shall be plugged.

2. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

F. Procedure

1. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

2. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury.

3. The manhole shall pass if the **minimum time** for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury **exceeds 60 seconds (one minute)**.

4. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.

5. Use or failure of this vacuum test shall not preclude acceptance by appropriate water infiltration or exfiltration testing, (see Practice C 969), or other means.

G. Precision and Bias

No justifiable statement can be made either on the precision or bias of this procedure, since the test result merely states whether there is conformance to the criteria for the success specified.

END OF SECTION

## SECTION 02700 - ASPHALTIC CONCRETE PAVING

### PART 1 - GENERAL

### 1.01 SCOPE OF WORK

A. The asphalt concrete paving replacement work includes the construction of an aggregate base course, asphalt binder and wearing courses to match existing courses and as specified herein. This work is to replace paving disturbed by the construction and any damages to paving by Contractor's operations, as well as new pavement and driveways, within the limits shown on the plans.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. The general provisions of the Contract apply to the Work specified in this Section.

B. Section 02225 – Excavating, Backfilling and Compacting for Sewers

### PART 2 - PRODUCTS

### 2.01 MATERIALS

A. All roads in Fayette County shall be constructed in accordance with the following sections of the Kentucky Transportation Cabinet's (KTC) Standard Specifications for Road and Bridge Construction. Items not covered by the KTC specifications shall require a special design by the Engineer and shall be approved by LFUCG.

| | | |
|---|---|---|
| 1. | Embankment | Division 200 |
| 2. | Excavation | Division 200 |
| 3. | Subgrade | Division 200 |
| 4. | Dense Graded Aggregate | Division 300 |
| 5. | Bituminous Concrete | Division 400 |
| 6. | Concrete Paving | Division 500 |
| 7. | Chemical Stabilization | Division 200 |

### 2.02 SUBGRADE

A. The subgrade shall be free from ruts, large stones, and excessive dust. The subgrade shall be subjected to a subgrade proof-roll test so that soft, wet, or pumping areas may be identified. The minimum total weight of the loaded dump truck shall be 37 tons. The truck shall be operated at walking speed over the entire subgrade. Any excessive deflections such as rutting or pumping shall be stabilized as directed by the Engineer.

B. Typical treatments of soft or wet areas of the pavement subgrade include removal and replacement (undercutting), "working-in" No. 2 stone, or installation of a geogrid/geotextile system and crushed stone. The extent and performance requirements of such improvements shall be set forth in the Contract Documents or as directed by the Engineer. Other means to stabilize the subgrade such as lime stabilization or cement modification as described in KTC Section 304, may be necessary.

C. The pavement subgrade shall be compacted to a uniform density throughout according to the requirements of the Contract Documents. If the density of the subgrade has been diminished by exposure or weather, after having been previously compacted, it shall be recompacted to the required density and moisture content.

D. Subgrade drainage systems or perforated pipe underdrains shall be installed in accordance with LFUCG Standard Drawings where indicated on the Improvement Plans.

## 2.03 GRANULAR BASE COURSE

A. The granular base course shall consist of compacted dense-graded aggregate (DGA) meeting the requirements set forth in Kentucky Transportation Cabinet's (KTC) Standard Specifications for Road and Bridge Construction. The Contractor shall submit to the Engineer the results of physical tests performed on the material to verify that it meets the requirements referenced above.

B. The DGA shall be applied in thicknesses of no less than 3 inches and no more than 6 inches in thickness. Each lift of DGA shall be compacted to a density no less than 84 percent of the solid volume density based on the oven-dry bulk specific gravity as determined by KM 64-607. A field density test of DGA placement may be required if deemed necessary by Engineer. The tests shall be conducted at a frequency of one test per 2,000 square feet with a minimum of one test per shift during which DGA is placed. The DGA shall be compacted using a vibratory roller or vibratory plate. The DGA shall be placed to achieve a moisture content less than 5%, and shall be stable with no rutting or pumping.

C. Before arriving at the site, the DGA shall be adequately mixed with water in a pugmill. During transportation and storage on site, the DGA shall be covered to prevent loss of moisture. If drying of the DGA occurs, the Contractor shall add water to the DGA and shall thoroughly mix the material before its placement.

## 2.04 ASPHALT BASE AND SURFACE COURSES

A. The materials and methods for construction for the asphalt base course and surface course shall meet the requirement of Kentucky Transportation Cabinet's (KTC) Standard Specifications for Road and Bridge Construction. The Contractor shall submit test results of the aggregate gradation and asphalt content to the Engineer.

B. The pavement course thicknesses and construction tolerances shall be specified in the Contract Documents. The surface of each course shall be checked with templates, straightedges, and/or stringlines for uniformity. All irregularities exceeding the allowable tolerances must be repaired as required by the Contract Documents or as directed by the Engineer.

## 2.05 TACK COAT

A. The tack coat shall be type SS-1h. Before applying the tack coat the area to receive pavement shall be cleaned. The tack coat shall be applied well in advance of the paving operation to allow all water to evaporate before the surface course is placed. Work shall be planned so that no more tack coat than is necessary for the day's operation is placed on the surface.

END OF SECTION

## SECTION 02775 - SIDEWALKS

## PART 1 - GENERAL

### 1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and services required for constructing concrete sidewalks where shown on the Drawings and as specified herein.

## PART 2 - PRODUCTS

### 2.01 GENERAL

A. Sidewalks shall be in accordance with LFUCG Standard Drawings.

### 2.02 CRUSHED STONE

A. Stone for sidewalk base shall be dense grade aggregate (DGA).

### 2.03 CONCRETE

A. Concrete for sidewalks shall be Class A concrete per Section 03300.

### 2.04 PREMOLDED EXPANSION JOINT FILLER

A. Premolded expansion joint filler shall be closed cell polyethylene foam type, Sonneborn Sonoflex F, Williams Products Expand-O-Foam, or equal. Seal joint with one-part self. leveling polyurethane sealant, Sonneborn Sonolastic SL 1, or equal, maximum 3/8 inches deep. Prepare and prime joints per manufacturer's instructions.

### 2.05 CURING COMPOUND

A. A white pigmented curing compound is required on all sidewalks per LFUCG Standard Drawings.

## PART 3 - EXECUTION

### 3.01 BASE

A. Following finished grading, a base course of DGA shall be placed to a compacted thickness of four (4) inches. Immediately prior to placing concrete, DGA base shall be thoroughly wetted.

### 3.02 SURFACE

A. Concrete shall be in thickness shown on LFUCG Standard Drawings, struck off and worked with a float until mortar appears on the top. After surface has been thoroughly floated, it shall be brushed to leave markings of a uniform type, providing non-slip finish. No dusting or plastering will be allowed.

## 3.03 FINISHING

A. All joints and edges shall be finished with an edging tool. Dummy joints shall be formed about five (5) feet apart to form rectangular blocks. Expansion joints of 1/2 inch premolded expansion joint material shall be provided at the intersection of all vertical surfaces with the sidewalks slabs and at approximately 32 foot intervals along the walks.

END OF SECTION

## SECTION 03300 - CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

### 1.01 THE REQUIREMENT

A. Provide all labor, equipment, materials and services necessary for the manufacture, transportation and placement of all plain and reinforced concrete work, as shown on the Drawings or as ordered by the Engineer.

B. Concrete shall be in accordance with the latest edition of Standard Specifications for Road and Bridge Construction issued by the Kentucky Transportation Cabinet.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03600 - Grout

### 1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the Specifications, all work herein shall conform to or exceed the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Kentucky Dept. of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition.
2. Kentucky Building Code
3. ACI 214 Recommended Practice for Evaluation of Strength Test Results of Concrete
4. ACI 304 Guide for Measuring, Mixing, Transporting, and Placing Concrete
5. ACI 305 Hot Weather Concreting
6. ACI 306 Cold Weather Concreting
7. ACI 318 Building Code Requirements for Structural Concrete
8. ACI 350 Code Requirements for Environmental Engineering Concrete Structures
9. ASTM C 31 Standard Methods of Making and Curing Concrete Test Specimens in the Field
10. ASTM C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
11. ASTM C 42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
12. ASTM C 94 Standard Specification for Ready-Mixed Concrete
13. ASTM C 143 Standard Test Method for Slump of Portland Cement Concrete
14. ASTM C 172 Standard Method of Sampling Fresh Concrete
15. ASTM C 260 Standard Specification for Air-Entraining Admixtures for Concrete

16. ASTM C 457 Standard Recommended Practice for Microscopical Determination of Air-Void Content and Parameters of the Air-Void System in Hardened Concrete

17. ASTM C 1567 Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)

## 1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Sources of all materials and certifications of compliance with specifications for all materials.

2. Certified current (less than 1 year old) chemical analysis of the Portland Cement or Blended Cement to be used.

3. Certified current (less than 1 year old) chemical analysis of fly ash or ground granulated blast furnace slag to be used.

4. Aggregate test results showing compliance with required standards, i.e., sieve analysis, aggregate soundness tests, petrographic analysis, mortar bar expansion testing per ASTM C 1567, etc.

5. Manufacturer's data on all admixtures stating compliance with required standards.

6. Concrete mix design for each class of concrete specified herein.

7. Field experience records and/or trial mix data for the proposed concrete mixes for each class of concrete specified herein.

# PART 2 - PRODUCTS

## 2.01 CONCRETE

A. Sidewalks, entrance pavements, concrete pavement subbase for asphaltic surface course, concrete pavement, curb gutter, and thrust blocking shall be Class A.

B. Concrete shall be as specified in the following table excerpted from Standard Specifications for Road and Bridge Construction, Edition of 2012, Kentucky Transportation Cabinet:

## CONCRETE PROPORTIONIZING AND REQUIREMENTS KYDOT 601.03.03

### INGREDIENT PROPORTIONS AND REQUIREMENTS FOR VARIOUS CLASSES OF CONCRETE

| Class of Concrete | Approximate Percent Fine to Total Aggregate | | Maximum Free Water by W/C Ratio (lb/lb) | 28-Day Compressive Strength[1] (psi) | Slump[4] (inches) | Minimum Cement Factor (lb/yd$^3$) | Air Content (%) |
|---|---|---|---|---|---|---|---|
| | Gravel | Stone | | | | | |
| A[5] | 36 | 40 | 0.49 | 3,500 | 2-4[7] | 564 | 6 ± 2 |
| A Mod | 36 | 40 | 0.47 | 3,500 | 4-7 | 658 | 6 ± 2 |
| AA[2] | 36 | 40 | 0.42 | 4,000 | 2-4 [12] | 620 | 6 ± 2[11] |
| AAA[8] | 36 | 40 | 0.40 | 5,500 | 3-7 | 686 | 6 ± 2[11] |
| B | 40 | 44 | 0.66 | 2,500 | 3-5 | 451 | 6 ± 2 |
| D[3] | 35 | 39 | 0.44 | 4,000 | 3-5[6] | 639 | 6 ± 2 |
| D Mod[3] | 35 | 39 | 0.42 | 5,000 | 3-5[6] | 733 | 6 ± 2 |
| M1[8] w/Type I Cement | 36 | 40 | 0.33 | 4,000[9] | 7 max. | 800 | 6 ± 2 |
| M2[8] w/Type III Cement | 36 | 40 | 0.38 | 4,000[9] | 7 max. | 705 | 6 ± 2 |
| P[5] | 35 | 38 | 0.49 | 3,500 | ---[13] | 564[10] | 6 ± 2[11] |

(1) *The Department may direct non-payment, additional construction, or removal and replacement for concrete which test cylinders indicate low compressive strength and follow-up investigations indicate inadequate strength. The Department may require some classes to attain the required compressive strength in less than 28 hours.*

(2) *When the ambient air temperature while placing slab concrete is 71°F or more, add to the concrete a water-reducing and retarding admixture. The Engineer may require or allow, water-reducing and retarding admixture in slab concrete for ambient air temperatures of less than 71°F. Only use one type of admixture for concrete placed during any individual contiguous pour.*

(3) *The Department will require a compressive strength of 5,000 psi or greater when specified in the Contract, at or before 28 days of prestressed members.*

(4) *The Engineer will allow slumps less than the minimum provided concrete is workable.*

(5) *The Department will allow the use of JPC pavement mixture for non-structural construction.*

(6) *At the option of the prestressed product fabricator, the Department will allow the slump of Class D or Class D Modified concrete to be increased to a maximum of 8 inches for all items, except products with voids. For products with voids, the slump may be increased to 7 inches. Provide a high range water reducer (Type F or G) in an amount not to exceed the following water/cement ratios:*

*Summer mix designs – 0.39*
*Spring and Fall mix designs – 0.37*
*Winter mix designs – 0.34*

(7) *The precast fabricator may increase the slump of Class A concrete to a maximum of 7 inches provided the fabricator uses a high range water reducer (Type F or G) and maximum water/cement ratio of 0.46.*

(8) *Use a high range water reducer (Type F or G).*

(9) *The Department will require 3,000 psi compressive strength before opening to traffic and 4,000 psi at 28 days.*

(10) *611 lb/yd$^3$ when using coarse aggregate sizes No. 8, 78, or 9-M.*

(11) *7 ± 2% when using coarse aggregate sizes No. 8, 78 or 9-M.*

(12) *The Department may allow the slump of AA concrete to be increased up to a 6 inch maximum, provided the W/C ratio does not exceed 0.40 and a high range water reducer (Type F or G) is used. Trial Batches will be required if producer has not previously supplied.*

(13) *The Department does not have slump requirements for Class P concrete mixes except for the edge slump requirements of Section 501.03.19.*

## 2.02 FLOWABLE FILL

A. Flowable fill shall conform to Section 601 of the Standard Specifications for Road and Bridge Construction, Edition of 2012.

B. Flowable fill shall consist of a mixture of cement, sand, fly ash, and water. The loss on ignition for Class F fly ash shall not exceed 12 percent. Ensure that the concrete producer certifies mix proportions for flowable fill as follows:

Flowable Fill for Pipe Backfill. Proportion as follows, per cubic yard batch:

| | |
|---|---|
| Cement | 30 pounds |
| Fly Ash, Class F | 300 pounds |
| Natural Sand (S.S.D.) | 3,000 pounds |
| Water (Maximum) | 550 pounds |

C. Flowable fill shall obtain an average compressive strength of 50 to 100 psi at 28 days for application as pipe backfill. For applications requiring early opening to traffic or placement of pavement as soon as possible, the mixture shall conform to the following general guidelines:

1. Mixture bleeds freely within 10 minutes

2. Mixture supports a 150-pound person within three hours.

# PART 3 – EXECUTION

## 3.01 PRODUCTION OF CONCRETE

A. All concrete shall be machine mixed. Hand mixing of concrete will not be permitted. The Contractor shall supply concrete from a ready mix plant. In selecting the source for concrete production the Contractor shall carefully consider its capability for providing quality concrete at a rate commensurate with the requirements of the placements so that well bonded, homogenous concrete, free of cold joints, is assured. Ready mixed concrete shall be in accordance with ASTM C94.

B. Each and every concrete delivery shall be accompanied by a delivery ticket containing at least the following information:

1. Date and truck number
2. Ticket number
3. Mix designation of concrete
4. Cubic yards of concrete
5. Cement brand, type and weight in pounds
6. Weight in pounds of fine aggregate (sand)
7. Weight in pounds of coarse aggregate (stone)
8. Air entraining agent, brand, and weight in pounds and ounces
9. Other admixtures, brand, and weight in pounds and ounces
10. Water, in gallons, stored in attached tank
11. Water, in gallons, maximum that can be added without exceeding design water/cement ratio
12. Water, in gallons, actually used (by truck driver)
13. Time of loading
14. Time of delivery to job (by truck driver)

C. Any truck delivering concrete to the job site, which is not accompanied by a delivery ticket showing the above information will be rejected and such truck shall immediately depart from the job site.

## 3.02 CONCRETE PLACEMENT

A. No concrete shall be placed prior to approval of the concrete mix design. Concrete placement shall conform to the recommendations of ACI 304.

## 3.03 CONCRETE WORK IN COLD WEATHER

A. Cold weather concreting procedures shall conform to the requirements of ACI 306.

B. The Engineer may prohibit the placing of concrete at any time when air temperature is 40°F. or lower. If concrete work is permitted, the concrete shall have a minimum temperature, as placed, of 55°F. for placements less than 12" thick, 50°F. for placements 12" to 36" thick, and 45°F. for placements greater than 36" thick. The temperature of the concrete as placed shall not exceed the aforementioned minimum values by more than 20°F, unless otherwise approved by the Engineer.

C. The addition of admixtures to the concrete to prevent freezing is not permitted. All reinforcement, forms, and concrete accessories with which the concrete is to come in contact shall be defrosted by an approved method. No concrete shall be placed on frozen ground.

## 3.04 CONCRETE WORK IN HOT WEATHER

A. Hot weather concreting procedures shall conform to the requirements of ACI 305.

B. When air temperatures exceed 85°F, or when extremely dry conditions exist even at lower temperatures, particularly if accompanied by high winds, the Contractor and his concrete supplier shall exercise special and precautionary measures in preparing, delivering, placing, finishing, curing and protecting the concrete mix. The Contractor shall consult with the Engineer regarding such measures prior to each day's placing operation and the Engineer reserves the right to modify the proposed measures consistent with the requirements of this Section of the Specifications. All necessary materials and equipment shall be on hand an in position prior to each placing operation.

C. Preparatory work at the job site shall include thorough wetting of all forms, reinforcing steel and, in the case of slab pours on ground or subgrade, spraying the ground surface on the preceding evening and again just prior to placing. No standing puddles of water shall be permitted in those areas which are to receive the concrete.

D. The temperature of the concrete mix when placed shall not exceed 90°F.

E. Delivery schedules shall be carefully planned in advance so that concrete is placed as soon as practical after it is properly mixed. For hot weather concrete work (air temperature greater than 85°F), discharge of the concrete to its point of deposit shall be completed within 60 minutes from the time the concrete is batched.

F. The Contractor shall arrange for an ample work force to be on hand to accomplish transporting, vibrating, finishing, and covering of the fresh concrete as rapidly as possible.

## 3.05 QUALITY CONTROL

A. Field Testing of Concrete

1. The Contractor shall coordinate with the Engineer's project representative the on-site scheduling of the testing firm's personnel as required for concrete testing.

2. Concrete for testing shall be supplied by the Contractor at no additional cost to the Owner, and the Contractor shall provide assistance to the testing laboratory in obtaining samples. The Contractor shall dispose of and clean up all excess material.

B. Consistency

1. The consistency of the concrete will be checked by the Contractor, and observed by Engineer, by standard slump cone tests. The Contractor shall make any necessary adjustments in the mix as the Engineer may direct and shall upon written order suspend all placing operations in the event the consistency does not meet the intent of the specifications. No payment shall be made for any delays, material or labor costs due to such eventualities.

2. Slump tests shall be made in accordance with ASTM C 143. Slump tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

C. Compressive Strength

1. Samples of freshly mixed concrete will be taken by the Contractor and tested for compressive strength in accordance with ASTM C 172, C 31 and C 39, except as modified herein.

2. In general, one sampling shall be taken for each placement in excess of five (5) cubic yards, with a minimum of one (1) sampling for each day of concrete placement operations.

3. Each sampling shall consist of at least five (5) 6x12 cylinders. Each cylinder shall be identified by a tag, which shall be hooked or wired to the side of the container. The Contractor will fill out the required information on the tag, and the Contractor shall satisfy himself that such information shown is correct.

4. Concrete cylinders shall be stored in same environment as poured concrete.

5. When transported, the cylinders shall not be thrown, dropped, allowed to roll, or be damaged in any way.

6. Compression tests shall be performed in accordance with ASTM C 39. For 6x12 cylinders, two test cylinders will be tested at seven days and two at 28 days. The remaining cylinders will be held to verify test results, if needed.

D. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 214, ACI 318, and ACI 350.

2. The strength level of concrete will be considered satisfactory if all of the following conditions are satisfied.

   a. Every arithmetic average of any three consecutive strength tests equals or exceeds the minimum specified 28-day compressive strength for the mix (see Article 2.08).

   b. No individual compressive strength test results falls below the minimum specified strength by more than 500 psi.

   c. No more than 10% of the compressive tests have strengths greater than the maximum strength specified.

3. In the event any of the conditions listed above are not met, the mix proportions shall be corrected for the next concrete placing operation.

4. In the event that concrete strength is not achieved, additional tests shall be performed as noted herein this Section.

5. When a ratio between 7-day and 28-day strengths has been established by these tests, the 7-day strengths shall subsequently be taken as a preliminary indication of the 28-day strengths. Should the 7-day test strength from any sampling be more than 10% below the established minimum strength, the Contractor shall:

    a. Immediately provide additional periods of curing in the affected area from which the deficient test cylinders were taken.

    b. Maintain or add temporary structural support as required.

    c. Correct the mix for the next concrete placement operation, if required to remedy the situation.

6. All concrete which fails to meet the ACI requirements and these specifications is subject to removal and replacement at no additional cost to the Owner.

E. When non-compliant concrete is identified, test reports shall be sent immediately to the Engineer for review.

F. Additional Tests

1. When ordered by the Engineer, additional tests on in-place concrete shall be provided and paid for by the Contractor.

2. In the event the 28-day test cylinders fail to meet the minimum strength, the Contractor shall have concrete core specimens obtained and tested from the affected area immediately.

    a. Three cores shall be taken for each sample in which the strength requirements were not met.

    b. The drilled cores shall be obtained and tested in conformance with ASTM C 42. The tests shall be conducted by an independent testing laboratory to be selected by the Engineer.

    c. The location from which each core is taken shall be approved by the Engineer. Each core specimen shall be located, when possible, so its axis is perpendicular to the concrete surface and not near formed joints or obvious edges of a unit of deposit.

    d. The core specimens shall be taken, if possible, so no reinforcing steel is within the confines of the core.

    e. The diameter of core specimens should be at least 3 times the maximum nominal size of the course aggregate used in the concrete, but must be at least 2-inches in diameter.

    f. The length of specimen, when capped, shall be at least twice the diameter of the specimen.

    g. The core specimens shall be taken to the laboratory and when transported, shall not be thrown, dropped, allowed to roll, or damaged in any way.

    h. Two (2) copies of test results shall be mailed directly to the Engineer. The concrete in question will be considered acceptable if the average compressive strength of a minimum of three test core specimens taken from a given area equal or exceed 85%

of the specified 28-day strength and if the lowest core strength is greater than 75% of the specified 28-day strength.

3. In the event that concrete placed by the Contractor is suspected of not having proper air content, the Contractor shall engage an independent test laboratory to be selected by the Engineer, to obtain and test samples for air content in accordance with ASTM Specification C 457.

## 3.06 CARE AND REPAIR OF CONCRETE

A. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Care shall be exercised to avoid jarring forms or placing any strain on the ends of projecting reinforcing bars. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at no additional cost to the Owner.

B. Areas of honeycomb shall be chipped back to sound concrete and repaired as directed by the Engineer.

C. Concrete formwork blowouts or unacceptable deviations in tolerances for formed surfaces due to improperly constructed or misaligned formwork shall be repaired as directed by the Engineer. Bulging or protruding areas, which result from slipping or deflecting forms shall be ground flush or chipped out and redressed as directed by the Engineer.

D. Areas of concrete in which cracking, spalling, or other signs of deterioration develop prior to final acceptance shall be removed and replaced, or repaired as directed by the Engineer. This stipulation includes concrete that has experienced cracking due to drying or thermal shrinkage of the concrete. Structural cracks shall be repaired using an epoxy injection system approved by the Engineer. Non-structural cracks shall be repaired using a hydrophilic resin pressure injected grout system approved by the Engineer, unless other means of repair are deemed necessary and approved by the Engineer. Extensive repair or replacement will be considered for concrete placed having compressive strengths greater than maximum strength specified. All repair work shall be performed at no additional cost to the Owner.

END OF SECTION

## SECTION 03600 - GROUT

## PART 1 - GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all grout used in concrete work in accordance with the Contract Documents.

### 1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

| | | |
|---|---|---|
| 1. | CRD-C 621 | Corps of Engineers Specification for Non-shrink Grout |
| 2. | ASTM C 109 | Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch or 50 mm cube Specimens) |
| 3. | ASTM C 531 | Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings |
| 4. | ASTM C 579 | Test Method for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings |
| 5. | ASTM C 827 | Standard Test Method for Early Volume Change of Cementitious Mixtures |
| 6. | ASTM C 144 | Standard Specification for Aggregate for Masonry Mortar |
| 7. | ASTM C 1107 | Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink) |

### 1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300 - Submittals.

1. Certified test results verifying the compressive strength and shrinkage and expansion requirements specified herein.

2. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

### 1.04 QUALITY ASSURANCE

A. Field Tests (required for pump station and storage tank projects)

1. Compression test specimens will be taken during construction from the first placement of each type of grout and at intervals thereafter as selected by the Engineer to insure continued compliance with these Specifications. The specimens will be made by the Contractor and observed by Engineer.

a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days, 28 days and any additional time period as appropriate.

b. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days and any other time period as appropriate.

2. The cost of all laboratory tests on grout will be borne by the Owner, but the Contractor shall assist the Engineer in obtaining specimens for testing. The Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The Contractor shall supply all materials necessary for fabricating the test specimens, at no additional cost to the Owner.

3. All grout, already placed, which fails to meet the requirements of these Specifications, is subject to removal and replacement at no additional cost to the Owner.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Non-Shrink Cement Grout (Applicable for projects with Gravity Sewers and Force Mains)

1. Non-shrink grout shall conform to CRD-C 621 and ASTM C 1107, Grade B or C when tested at a max. fluid consistency of 30 seconds per CDC 611/ASTM C939 at temperature extremes of 45°F and 90°F and an extended working time of 15 minutes. Grout shall be non-metallic, non-stain, and non-shrink and color similar to concrete. Grout shall have a min. 28-day strength of 7,000 psi. Non-shrink grout shall be, "Euco N-S" by the Euclid Chemical Company, "Sikagrout 212" by Sika Corporation, Conspec 100 Non-Shrink Non-Metallic Grout by Conspec, Masterflow 555 Grout by BASF Construction Chemicals.

B. Epoxy Grout (Applicable for projects with Structures)

1. Epoxy grout shall be "Sikadur 32 Hi-Mod" by Sika Corporation, "Duralcrete LV" by Tamms Industries, or "Euco #452 Series" by Euclid Chemical, Concresive 1090 by BASF Construction Chemicals.

2. Epoxy grout shall be modified as required for each particular application with aggregate per manufacturer's instructions.

C. Epoxy Base Plate Grout (Applicable for projects with Structures)

1. Epoxy base plate grout shall be Sikadur 42, Grout-Pak by Sika Corporation, or Masterflow MP by BASF Construction Chemicals.

## PART 3 - EXECUTION

### 3.01 GENERAL

A. Concrete surfaces shall be cleaned of all dirt, grease and oil-like films. Additionally, concrete surfaces shall be free of debris, including chipping or roughening the surface if a laitance or poor concrete is evident. The finish of the grout surface shall match that of the adjacent concrete.

B. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

C. The Contractor, through the manufacturer of a non-shrink grout and epoxy grout, shall provide on-site technical assistance upon request, at no additional cost to the Owner.

## 3.02 CONSISTENCY

A. The consistency of grouts shall such that it is able to completely fill the space to be grouted. Dry pack consistency is such that the grout is plastic and moldable but will not flow.

## 3.03 MEASUREMENT OF INGREDIENTS

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.

B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

## 3.04 GROUT INSTALLATION

A. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted and be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer. For grouting beneath base plates, grout shall be poured form one side only and thence flow across to the open side to avoid air-entrapment.

END OF SECTION

# APPENDIX A

# LFUCG STANDARD DRAWINGS 2008

Lexington Fayette Urban County
Government
Department of Public Works and Development

# Standard Drawings 2008

Marwan A. Rayan, P.E.
Urban County Engineer
May 2008

Mayor Jim Newberry

LEXINGTON - FAYETTE URBAN COUNTY GOVERNMENT

Division of Engineering

May 1, 2008

**Users of Lexington-Fayette Urban County Engineering Standard Drawings**

Re: Standard Drawings 2008

Attached is the latest edition of the LFUCG Standard Drawings for construction of storm sewers, sanitary sewers, streets and roads in Lexington-Fayette County. These drawings are to replace any and all other standard drawings previously issued by the Division of Engineering.

These drawings become effective as of May 1, 2008 and any project dedicated to public use after the above date must comply with or contain references to these Standard Drawings or revisions thereof where applicable.

Questions or comments should be directed to:

Urban County Engineer
Division of Engineering
Fourth Floor
101 E. Vine Street
Lexington, KY 40507
859-258-3410

Sincerely,

Marwan A. Rayan, P.E.
Urban County Engineer

MAR:RAB:AFG

C: File

08.1000.106.StandDrw

# LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
# STANDARD DRAWINGS 2008
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# LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
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# STANDARD DRAWINGS 2008
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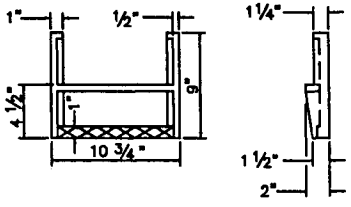


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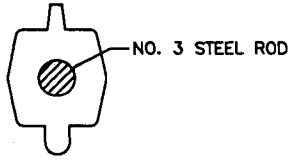
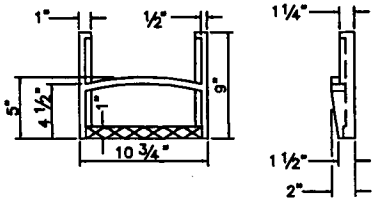



SECTION B–B

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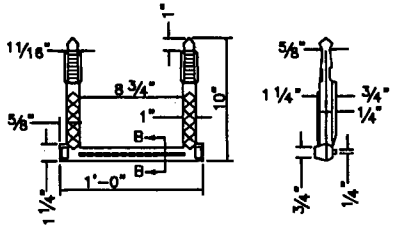


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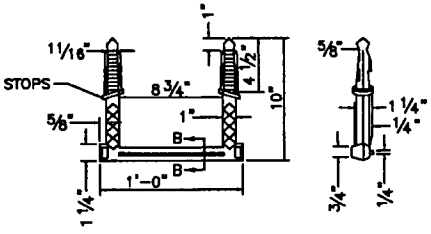


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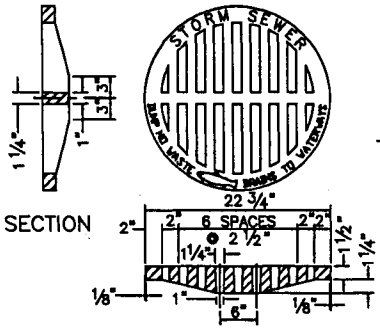
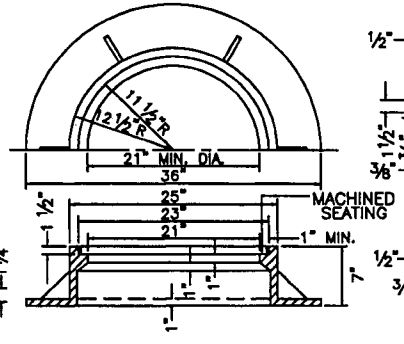
## MANHOLE STEPS




SECTION

GRATING COVER

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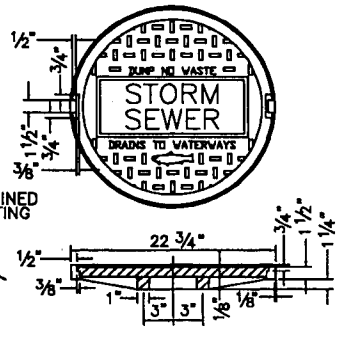



SOLID COVER

## MANHOLE FRAME AND COVERS

NOTES:

1. MINIMUM WEIGHT FOR THE 7" FRAME SHALL BE 185 LBS.
2. MINIMUM WEIGHT FOR THE SOLID COVER SHALL BE 120 LBS.
3. CASTINGS TO MEET ASTM A–48 CLASS 35.

NOTES:

1. STEPS SHALL BE ASPHALT COATED CAST IRON OR POLYPROPYLENE PLASTIC COATED STEEL ROD OR OF A TYPE AND SIZE APPROVED BY THE ENGINEER.
2. STEPS SHALL BE SPACED APPROXIMATELY 12" TO 16" O.C. VERTICALLY SO AS TO FORM A CONTINUOUS LADDER.
3. STEPS SHALL BE REQUIRED IN MANHOLES WHEN THE STRUCTURE IS 4 FEET AND GREATER IN DEPTH. (MEASURE FROM FLOWLINE OF LOWEST PIPE TO TOP OF STRUCTURE.)
4. THE TREADS OF ALL STEPS SHALL HAVE ANTI–SKID PROPERTIES FOR HAND AND FOOT GRIPS.
5. MANHOLE STEPS SHALL BE INSTALLED IN A VERTICAL LINE AND SHALL COMPLY WITH OSHA STANDARDS IN ALL RESPECTS.
6. FOR CAST–IN–PLACE OR PRECAST CIRCULAR AND NON–CIRCULAR MANHOLES.
7. FIRST STEP SHALL BE NO MORE THAN 18" FROM TOP OF RIM.

| NO. | DATE | REVISION DESCRIPTION | BY |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

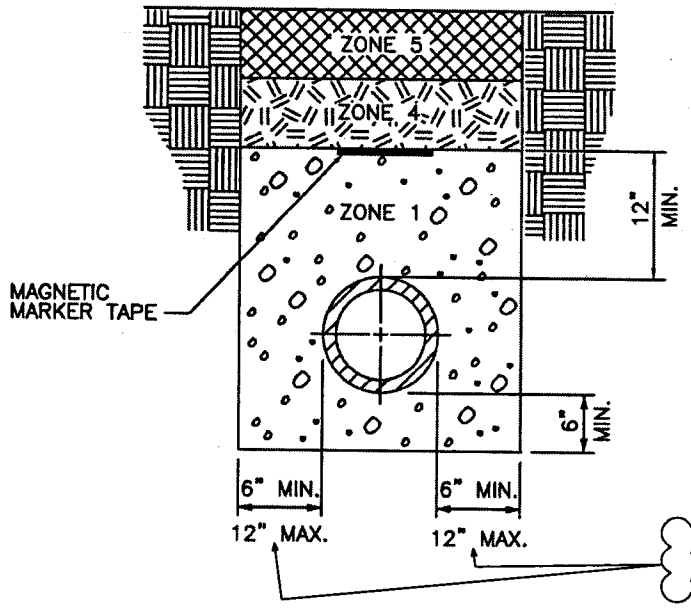
DIVISION OF ENGINEERING

MANHOLE FRAMES, COVERS, & STEPS

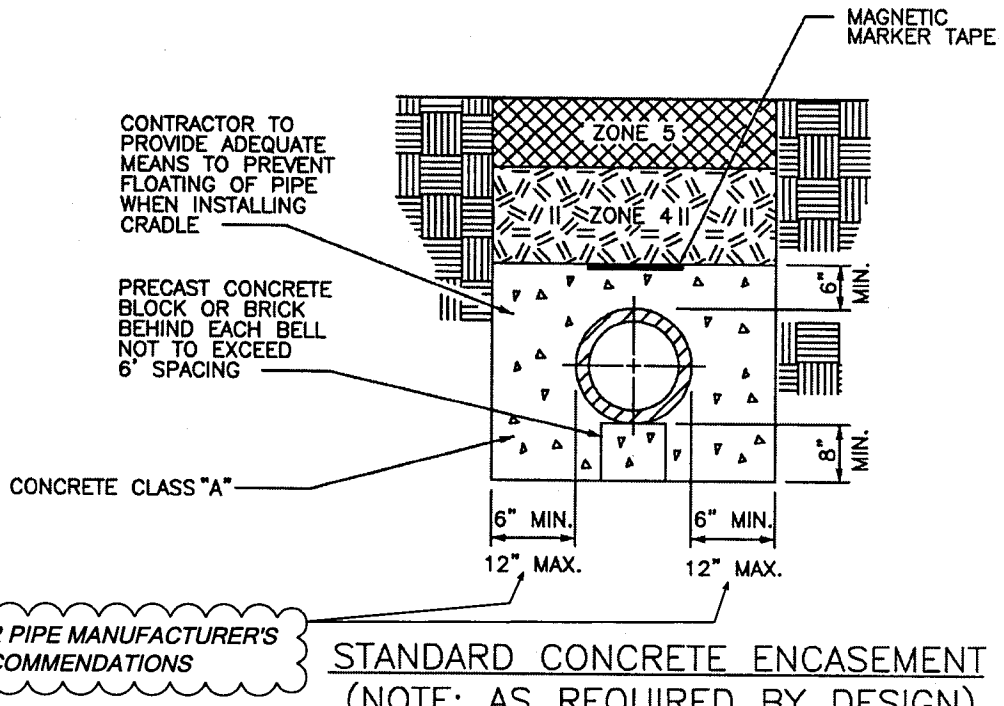
STANDARD DRAWING NO. 103

APPROVAL _____ 5/1/08
URBAN COUNTY ENGINEER — DATE

_____ 5/1/08
COMMISSIONER — DATE




PIPE LAID IN ROCK OR SOIL TRENCH




STANDARD CONCRETE ENCASEMENT (NOTE: AS REQUIRED BY DESIGN)

| PIPE BACKFILL DESCRIPTIONS | |
|---|---|
| ZONE 1 | NO. 9 STONE |
| ZONE 2 | NO. 9 OR NO. 57 STONE |
| ZONE 3 | COMPACTED DGA |
| ZONE 4 | CONSOLIDATED SOIL, (NO ROCK GREATER THAN 6" DIAMETER), NO. 9, OR NO. 57 STONE |
| ZONE 5 | 12" MAX. TOPSOIL, NO ROCK ALLOWED |

NOTES:

1. COVER, UP TO AND INCLUDING ZONE 4 SHALL BE ESTABLISHED BEFORE TRENCH EXCAVATION.
2. ALL SANITARY SEWER LINES CONSTRUCTED FROM NON-METALLIC MATERIALS SHALL HAVE MAGNETIC MARKER TAPE INSTALLED IN THE TRENCH ABOVE THE SANITARY SEWER LINE.
3. MAGNETIC MARKER TAPE FOR SANITARY SEWER ONLY.

(FORCE MAINS)

(FORCE MAINS)

| NO. | DATE | REVISION DESCRIPTION | BY |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

DIVISION OF ENGINEERING

TRENCHING, LAYING, BACKFILLING AND BEDDING OUTSIDE R/W LIMITS

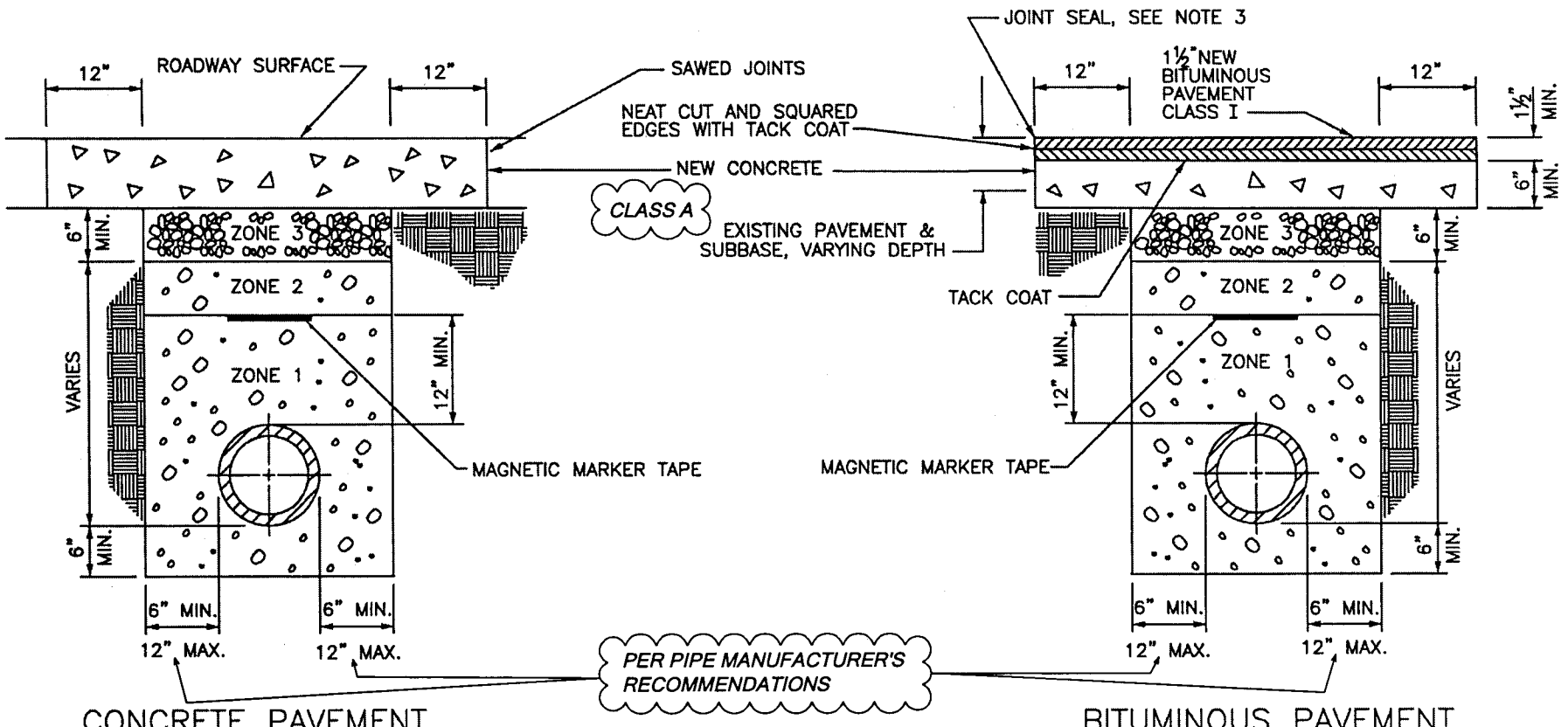
STANDARD DRAWING NO. 200

APPROVAL — DATE 5/1/08

URBAN COUNTY ENGINEER — DATE

COMMISSIONER — DATE

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




CONCRETE PAVEMENT

BITUMINOUS PAVEMENT

NOTES:

1. REPLACE CONCRETE PAVEMENT WITH NEW CONCRETE PAVEMENT, 6"MINIMUM OR EXISTING THICKNESS, WHICHEVER IS GREATER.
2. JOINT SEAL PERIMETER OF CUT PAVEMENT WITH FLEXMASTER POURABLE CRACK SEALANT 1109 OR APPROVED EQUAL.
3. MAGNETIC MARKER TAPE FOR SANITARY SEWER ONLY. *(FORCE MAINS)*

*4. #9 CRUSHED LIMESTONE IN ZONE 3 IS ACCEPTABLE ALTERNATIVE TO DGA*

| PIPE BACKFILL DESCRIPTIONS | |
|---|---|
| **ZONE 1** | **NO. 9 STONE** |
| **ZONE 2** | **NO. 9 OR NO. 57 STONE** |
| **ZONE 3** | **COMPACTED DGA** |
| ZONE 4 | CONSOLIDATED SOIL, (NO ROCK GREATER THAN 6" DIAMETER), NO. 9, OR NO. 57 STONE |
| ZONE 5 | 12" MAX. TOPSOIL, NO ROCK ALLOWED |

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

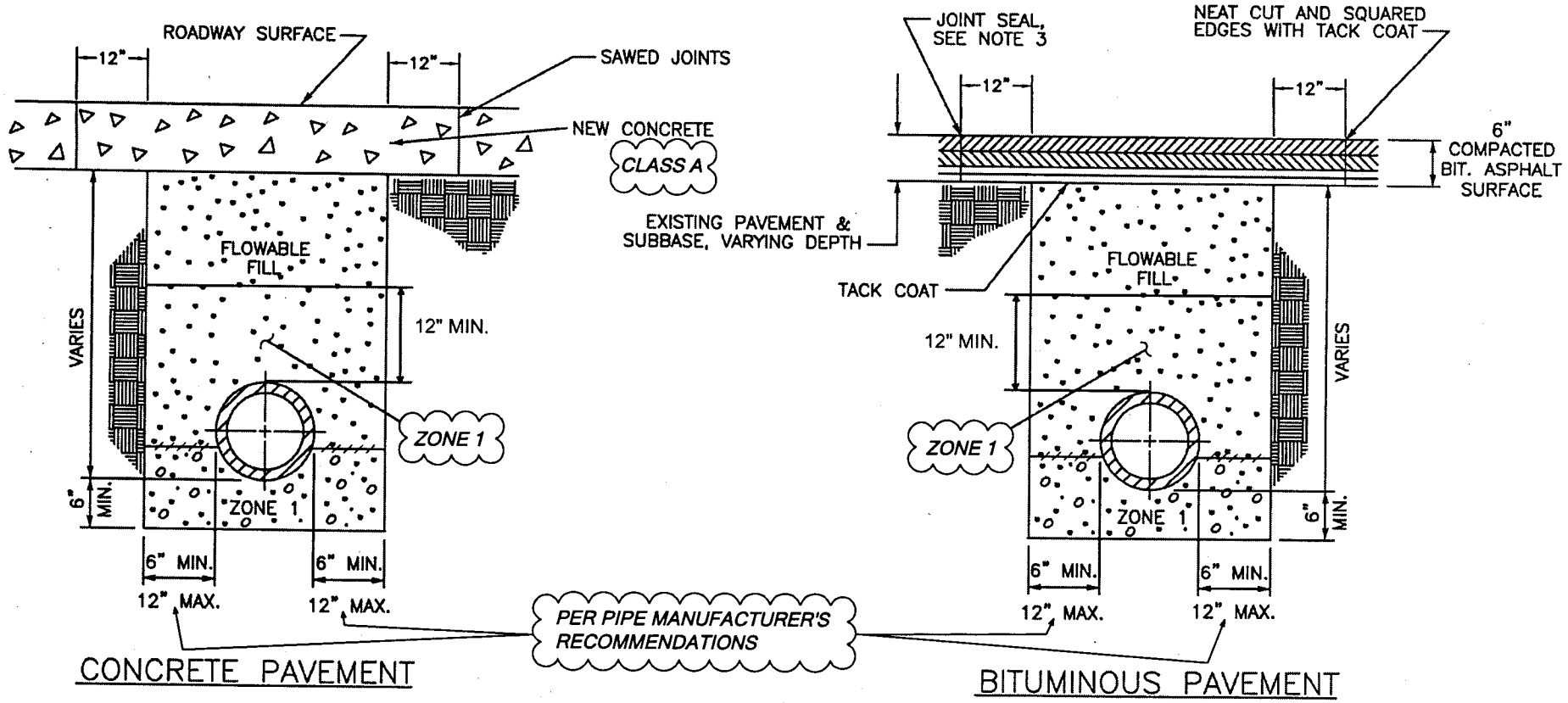
TRENCHING, LAYING, BACKFILLING AND BEDDING UNDER STREET PAVEMENT

STANDARD DRAWING NO. 201-1

APPROVED: URBAN COUNTY ENGINEER 5/1/08 DATE

COMMISSIONER 5/1/08 DATE

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




| PIPE BACKFILL DESCRIPTIONS | |
|---|---|
| **ZONE 1** | **NO. 9 STONE** |
| ZONE 2 | NO. 9 OR NO. 57 STONE |
| ZONE 3 | COMPACTED DGA |
| ZONE 4 | CONSOLIDATED SOIL, (NO ROCK GREATER THAN 6" DIAMETER), NO. 9, OR NO. 57 STONE |
| ZONE 5 | 12" MAX. TOPSOIL, NO ROCK ALLOWED |

NOTES:

1. PER KYTC SPECIFICATION 601.03.03 FROM STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION EDITION 2004, OR MOST RECENT.
2. REPLACE CONCRETE PAVEMENT WITH NEW CONCRETE PAVEMENT, 6" MINIMUM OR EXISTING THICKNESS, WHICHEVER IS GREATER.
3. JOINT SEAL PERIMETER OF CUT PAVEMENT WITH FLEXMASTER POURABLE CRACK SEALANT 1109 OR APPROVED EQUAL.

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DIVISION OF ENGINEERING

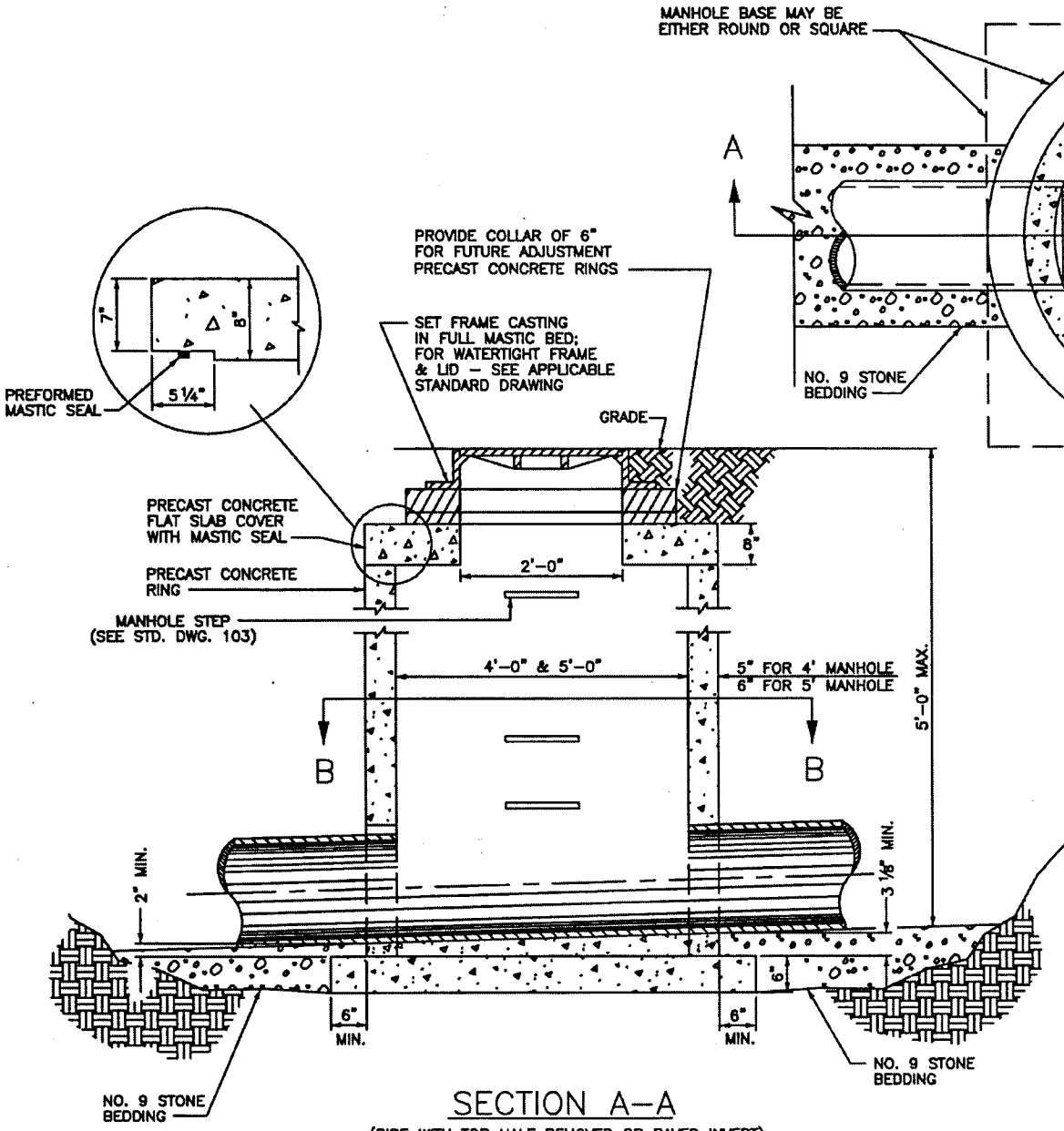
# TRENCHING, LAYING, BACKFILLING, AND BEDDING UNDER STREET PAVEMENT USING FLOWABLE FILL

STANDARD DRAWING NO. 201-2

APPROVED — URBAN COUNTY ENGINEER — DATE 5/1/08

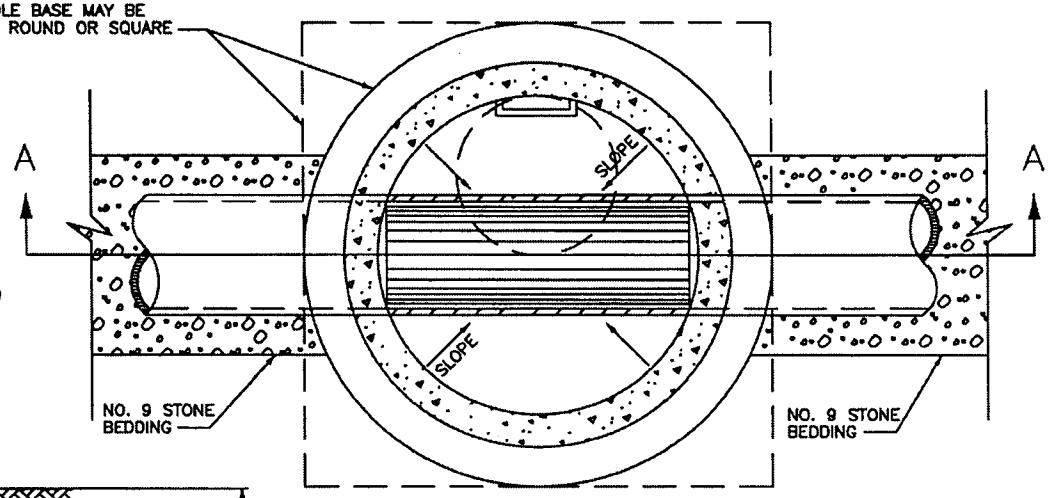
COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




## SECTION A–A

(PIPE WITH TOP HALF REMOVED OR PAVED INVERT)




## SECTION B–B

NOTES:

1. ALL BARREL JOINTS BETWEEN BASE AND BARREL, BETWEEN BARREL AND TOP, BETWEEN TOP AND ADJUSTING RINGS, BETWEEN ADJUSTING RINGS AND FRAME SHALL HAVE ONE OUTER MASTIC SEAL AND AN INNER SEAL OF NONSHRINK GROUT.
2. COAT OUTSIDE OF ADJUSTING RINGS WITH SEMI–FIBRATED ASPHALT DAMPROOFING COMPOUND APPLIED BY BRUSH OR SPRAY.
3. WATER STOPS SHOULD BE PROVIDED FOR INLETS AND OUTLETS OF EVERY MANHOLE, DESIGNED FOR TYPE OF PIPE USED AND WITH EXPANSIVE GROUT. SEE STD. DWG. 213 FOR WATER STOP DETAIL.
4. MANHOLES MUST PASS VACUUM TEST PER ASTM C–1244 PRIOR TO ACCEPTANCE.

*5. MANHOLES SHALL HAVE MONOLITHIC BASE.*

*6. MANHOLE SHALL BE MANUFACTURED WITH XYPEX PER SPECIFICATION SECTION 02608.*

*7. MANHOLE SHALL HAVE CONCRETE ADMIXTURE, CONSHIELD AT LOCATIONS SHOWN ON DRAWINGS AND AS SPECIFIED IN SPECIFICATION SECTION 02608.*

*8. MANHOLES LOCATED IN 100-YEAR FLOODPLAIN SHALL INCLUDE ANTI-FLOTATION COLLAR PER SPECIFICATION SECTION 02608.*

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DIVISION OF ENGINEERING

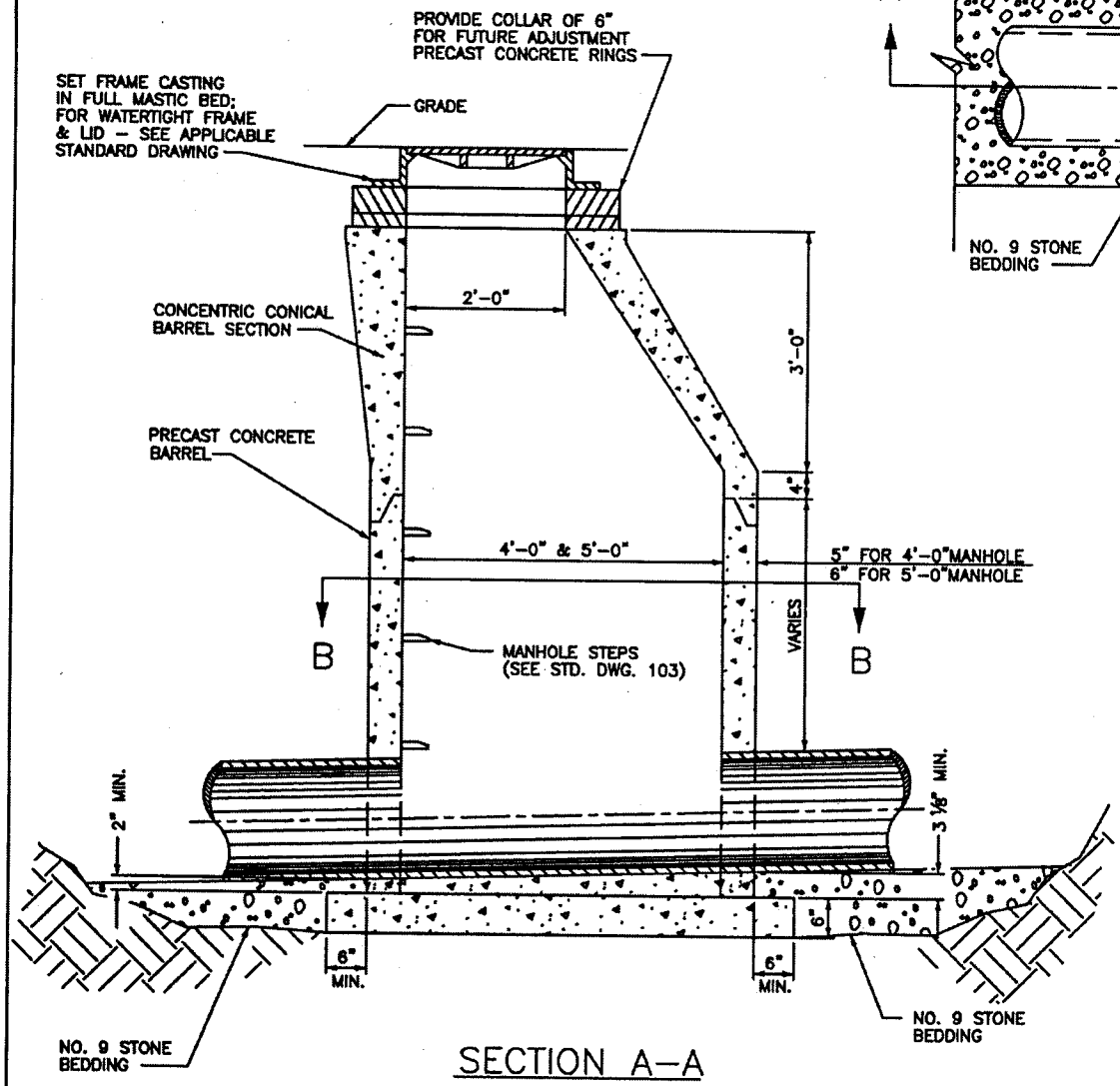
# TYPICAL PRECAST CONCRETE SHALLOW MANHOLE FOR PIPES 24" AND LARGER

STANDARD DRAWING NO. 210

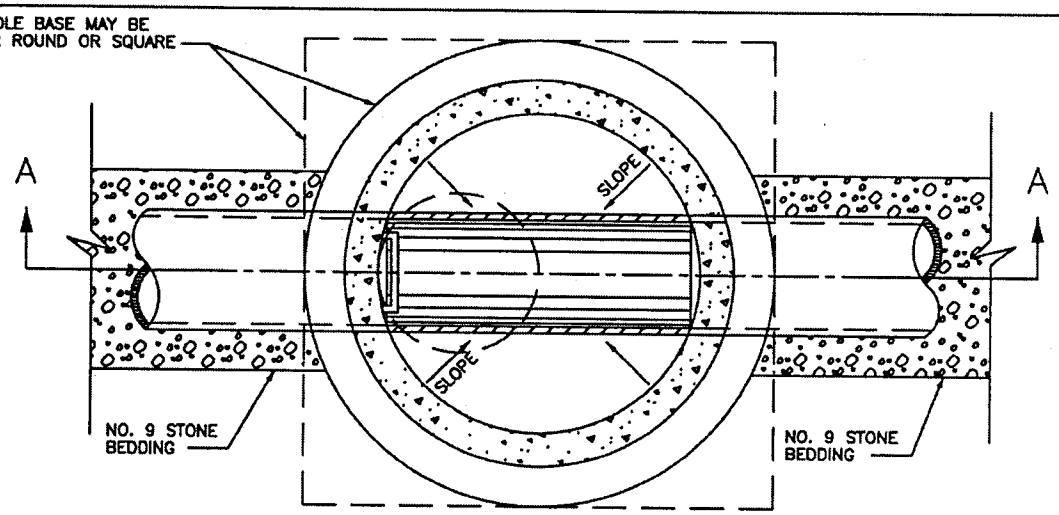
APPROVED: URBAN COUNTY ENGINEER — DATE 5/1/08

FOR THE COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




SECTION A–A




SECTION B–B

NOTES:

1. ALL BARREL JOINTS BETWEEN BASE AND BARREL, BETWEEN BARREL AND TOP, BETWEEN TOP AND ADJUSTING RINGS, BETWEEN ADJUSTING RINGS AND FRAME SHALL HAVE ONE OUTER MASTIC SEAL AND AN INNER SEAL OF NONSHRINK GROUT.
2. COAT OUTSIDE OF ADJUSTING RINGS WITH SEMI–FIBRATED ASPHALT DAMPROOFING COMPOUND APPLIED BY BRUSH OR SPRAY.
3. WATER STOPS SHOULD BE PROVIDED FOR INLETS AND OUTLETS OF EVERY MANHOLE, DESIGNED FOR TYPE OF PIPE USED AND WITH EXPANSIVE GROUT. SEE STD. DWG. 213 FOR WATER STOP DETAIL.
4. NO REINFORCEMENT NEEDED IN BOTTOM SLAB AT DEPTHS UP TO 12'. AT DEPTHS GREATER THAN 12' REINFORCE WITH NO. 4 BARS – 12" C–C.
5. A DIFFERENCE OF FLOW ELEVATION MORE THAN 24" REQUIRES AN OUTSIDE DROP. (SEE STD. DWG. 212)
6. MANHOLE STEPS SHALL BE ALIGNED WITH STRAIGHT SIDE OF CONCENTRIC CONE SECTION, AND ALIGNED OVER THE OUTLET PIPE.
7. PIPES SHALL NOT ENTER THE CONE SECTION.
8. MANHOLES MUST PASS VACUUM TEST PER ASTM C–1244 PRIOR TO ACCEPTANCE.
9. *ALL MANHOLES SHALL HAVE MONOLITHIC BASE.*
10. *MANHOLE SHALL BE MANUFACTURED WITH XYPEX PER SPECIFICATION SECTION 02608.*
11. *MANHOLE SHALL HAVE CONCRETE ADMIXTURE, CONSHIELD AT LOCATIONS SHOWN ON DRAWINGS AND AS SPECIFIED IN SPECIFICATION SECTION 02608.*
12. *MANHOLES LOCATED IN 100-YEAR FLOODPLAIN SHALL INCLUDE ANTI-FLOTATION COLLAR PER SPECIFICATION SECTION 02608.*

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DIVISION OF ENGINEERING

# TYPICAL STANDARD PRECAST CONCRETE MANHOLE FOR PIPES UP TO 24"

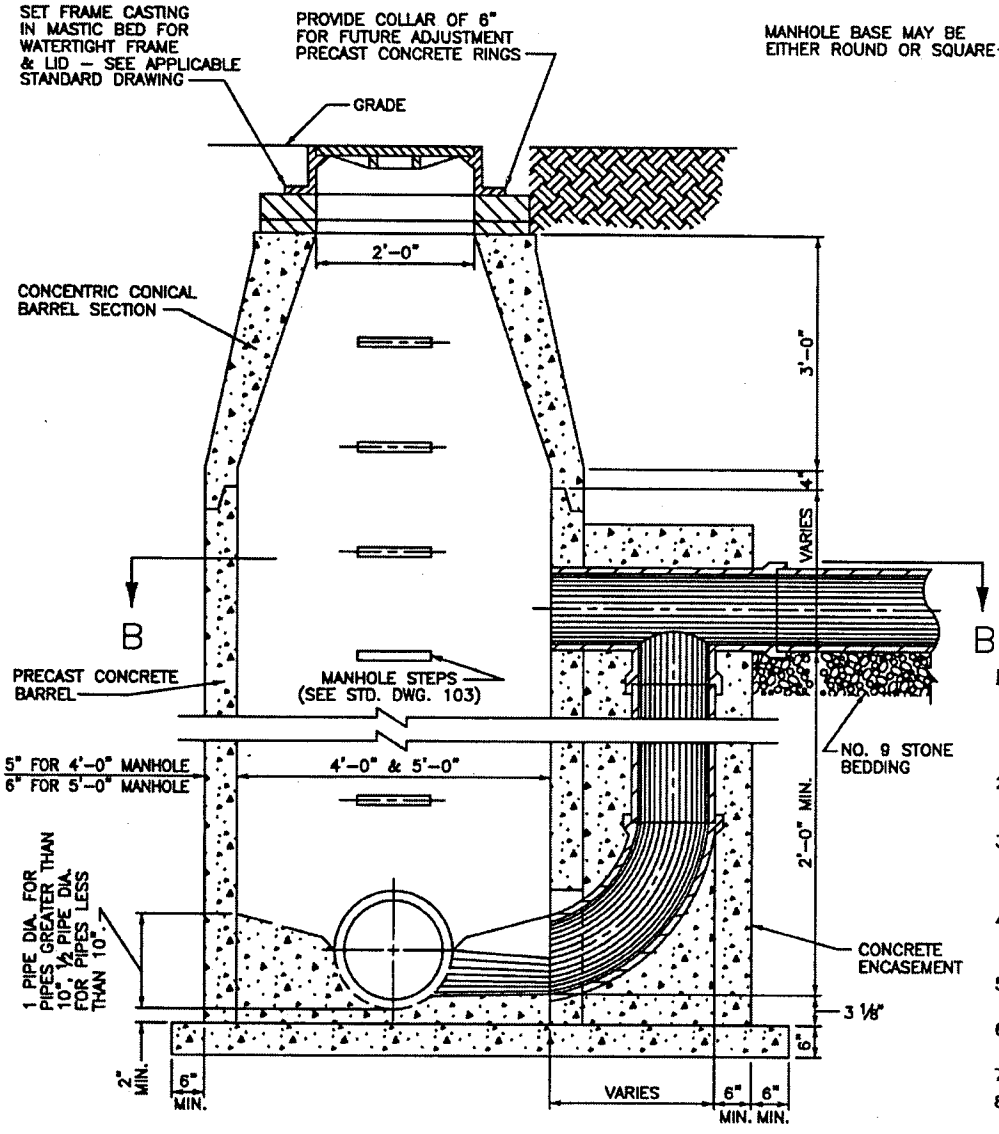
STANDARD DRAWING NO. 211

APPROVAL _____ 5/1/02

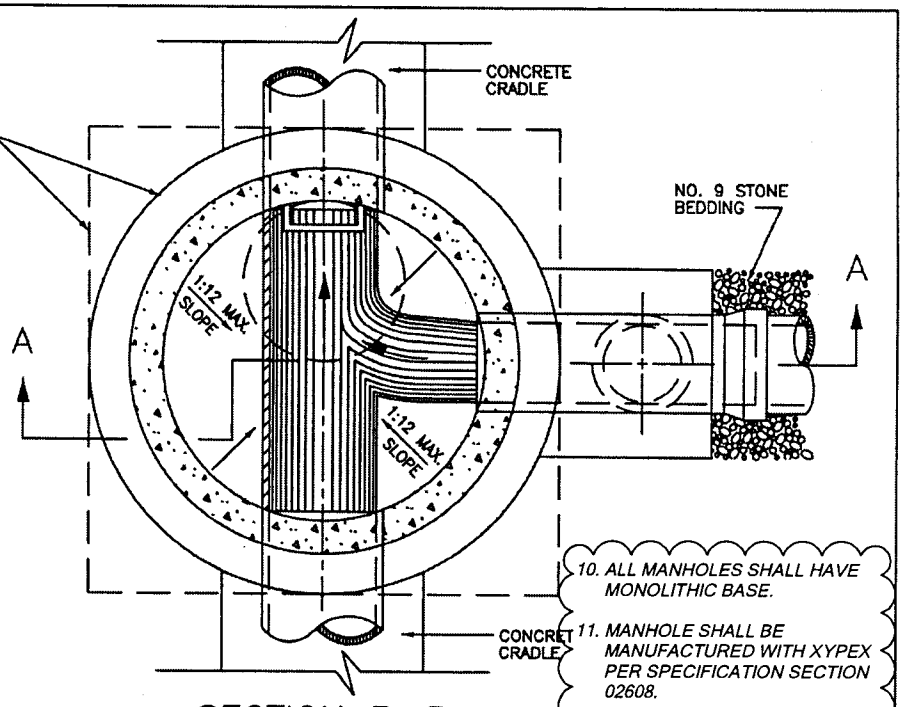
URBAN COUNTY ENGINEER

COMMISSIONER _____ 5/1/02 DATE

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




SECTION A–A




SECTION B–B

NOTES:

1. ALL BARREL JOINTS BETWEEN BASE AND BARREL, BETWEEN BARREL AND TOP, BETWEEN TOP AND ADJUSTING RINGS, BETWEEN ADJUSTING RINGS AND FRAME SHALL HAVE ONE OUTER MASTIC SEAL AND AN INNER SEAL OF NONSHRINK GROUT.
2. COAT OUTSIDE OF ADJUSTING RINGS WITH SEMI-FIBRATED ASPHALT DAMPROOFING COMPOUND APPLIED BY BRUSH OR SPRAY.
3. WATER STOPS SHOULD BE PROVIDED FOR INLETS AND OUTLETS OF EVERY MANHOLE, DESIGNED FOR TYPE OF PIPE USED AND WITH EXPANSIVE GROUT. SEE STD. DWG. 213 APPLICABLE FOR WATER STOP DETAIL.
4. NO REINFORCEMENT NEEDED IN BOTTOM SLAB AT DEPTHS UP TO 12'. AT DEPTHS GREATER THAN 12' REINFORCE WITH NO. 4 BARS – 12" C–C.
5. PROVIDE A MINIMUM FALL OF 0.1 FOOT FROM DROP TO MANHOLE OUTLET.
6. MANHOLES SHALL PASS VACUUM TEST PER ASTM C–1244 PRIOR TO ACCEPTANCE.
7. PIPE SHALL NOT ENTER CONE SECTION.
8. MANHOLE STEPS SHALL BE ALIGNED WITH STRAIGHT SIDE OF CONCENTRIC CONE SECTION, AND ALIGNED OVER OUT–LET PIPE.
9. DO NOT USE IN CASES WHERE THE DROP IS 2'–0" OR LESS.
10. *ALL MANHOLES SHALL HAVE MONOLITHIC BASE.*
11. *MANHOLE SHALL BE MANUFACTURED WITH XYPEX PER SPECIFICATION SECTION 02608.*
12. *MANHOLE SHALL HAVE CONRETE ADMIXTURE, CONSHIELD AT LOCATIONS SHOWN ON DRAWINGS AND AS SPECIFIED IN SPECIFICATION SECTION 02608.*
13. *MANHOLES LOCATED IN 100-YEAR FLOODPLAIN SHALL INCLUDE ANTI-FLOTATION COLLAR PER SPECIFICATION SECTION 02608.*

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DIVISION OF ENGINEERING

# TYPICAL PRECAST CONCRETE DROP MANHOLE FOR PIPES UP TO 36"

STANDARD DRAWING NO. 212

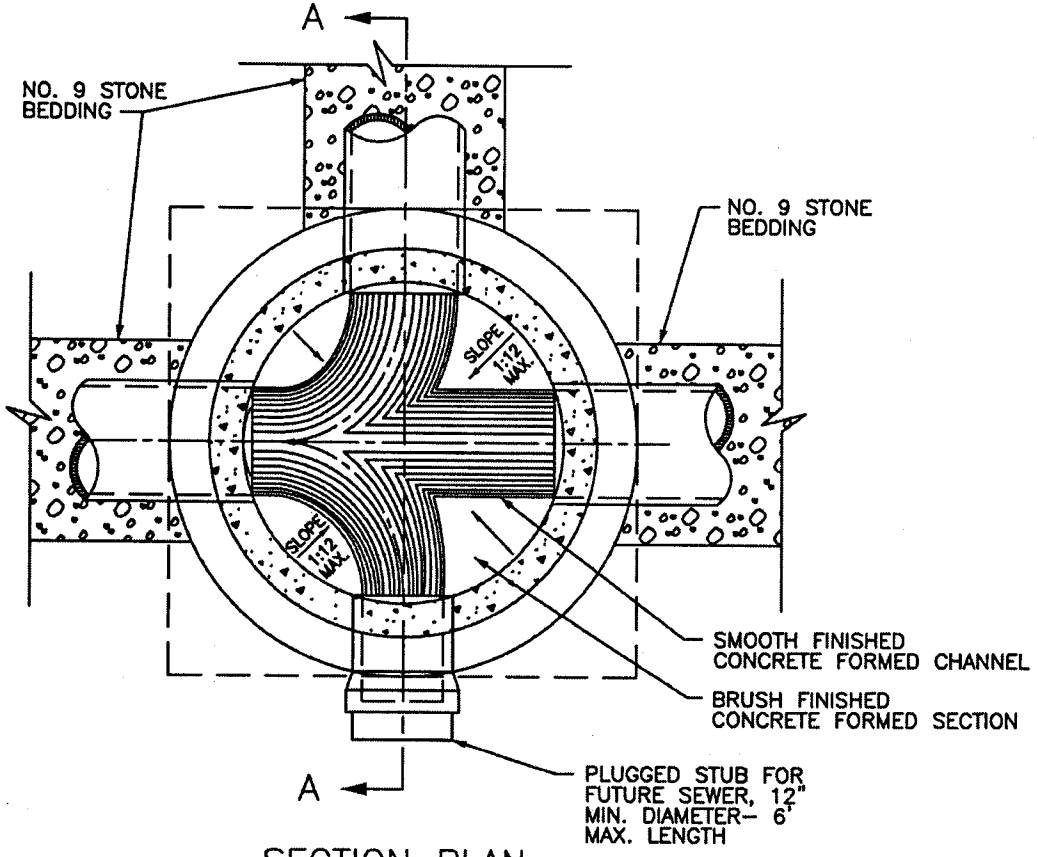
APPROVED: URBAN COUNTY ENGINEER — DATE 5/1/08

COMMISSIONER — DATE 5/1/08

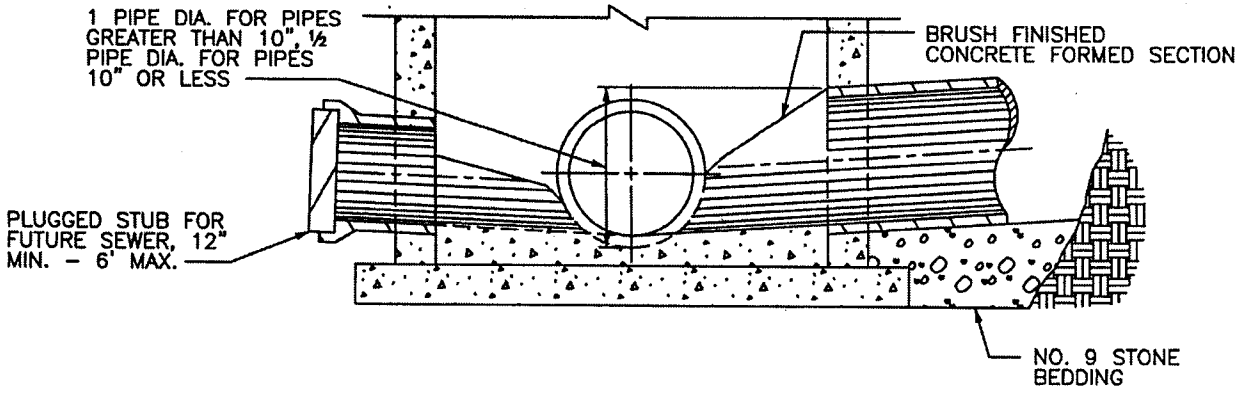
LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT

NOTES:

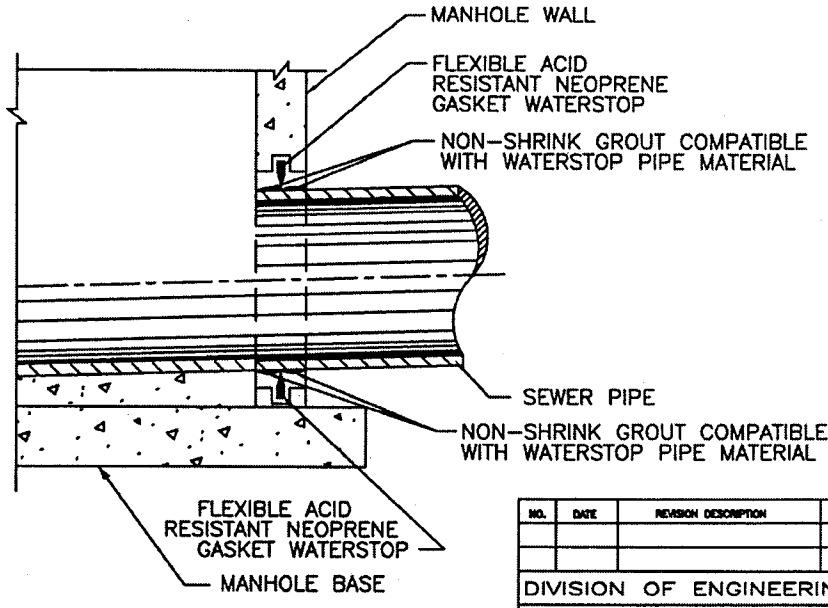
1. ALL MANHOLES SHALL HAVE MONOLITHIC BASE.
2. MANHOLE SHALL BE MANUFACTURED WITH XYPEX PER SPECIFICATION SECTION 02608.
3. MANHOLE SHALL HAVE ADMIXTURE, CONSHIELD AT LOCATIONS SHOWN ON DRAWINGS AND AS SPECIFIED IN SPECIFICATION SECTION 02608.
4. MANHOLES LOCATED IN 100-YEAR FLOODPLAIN SHALL INCLUDE ANTI-FLOTATION COLLAR PER SPECIFICATION SECTION 02608.




SECTION PLAN




SECTION A–A




WATER STOP DETAIL

NOTE:
MANHOLES SHALL PASS VACUUM TEST PER ASTM C-1244 PRIOR TO ACCEPTANCE.

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DIVISION OF ENGINEERING

STANDARD MANHOLE JUNCTION AND WATER STOP DETAILS

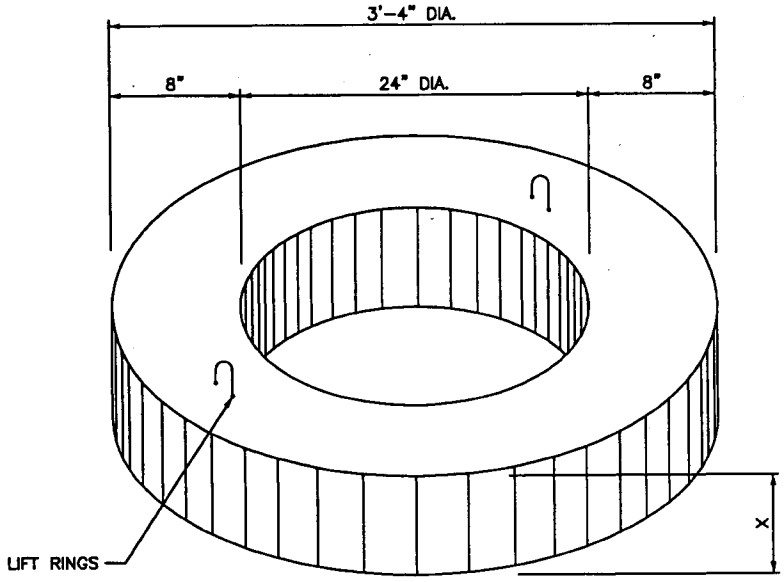
STANDARD DRAWING NO. 213

APPROVED: URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT

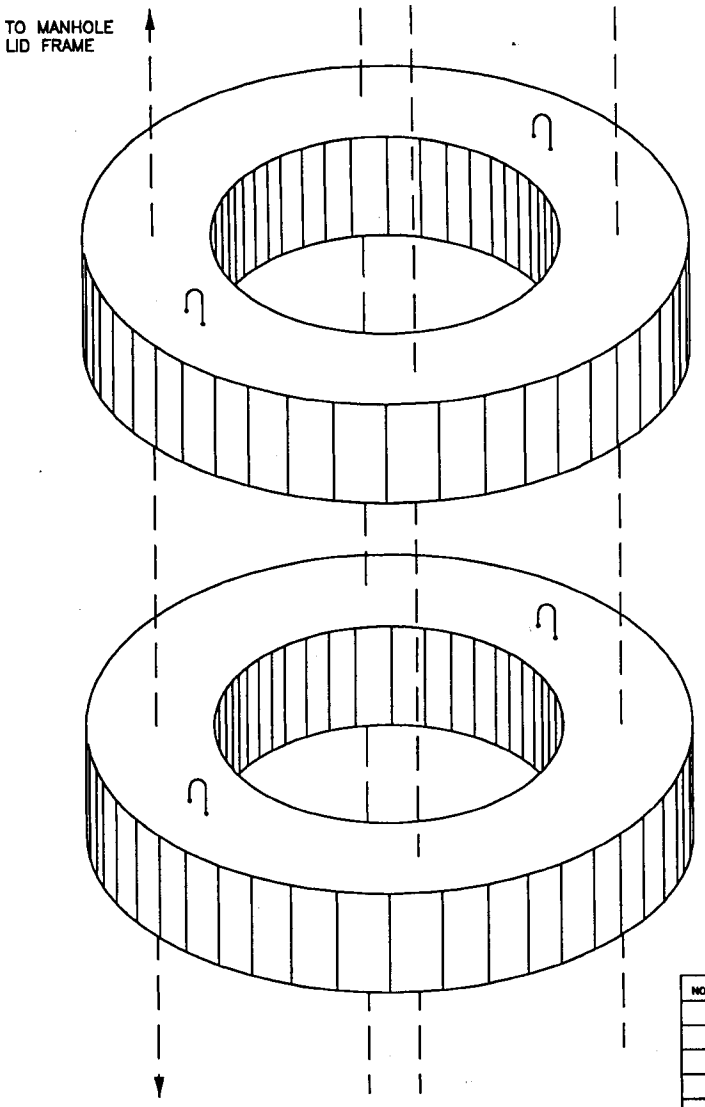
NOTES:

1. LIFT RINGS TO BE CUT BEFORE ADDING THE NEXT RING OR TOP.
2. COAT OUTSIDE AND IN BETWEEN ADJUSTING RINGS WITH SEMI-FIBRATED ASPHALT DAMPROOFING COMPOUND APPLIED BY BRUSH OR SPRAY.
3. GRADE RINGS WITH NON-PARALLEL SURFACES MAY BE USED TO ADJUST CASTING TO SLOPED SURFACE.
4. CONCRETE: CLASS "A" 3500 PSI AT 28 DAYS, AND IN ACCORDANCE WITH ASTM C-478, OR LATEST EDITION.
5. NO MORE THAN 2 GRADE RINGS MAY BE USED AT ONE LOCATION AND THE MAXIMUM HEIGHT OF ALL RINGS USED SHALL NOT EXCEED 12 INCHES.
6. APPLY MASTIC BETWEEN ALL JOINTS.




GRADE RING WIDTH CHART

| X | WEIGHT LBS. |
|---|---|
| 2" | 140 |
| 3" | 210 |
| 4" | 279 |
| 6" | 419 |
| 8" | 560 |
| 12" | 730 |

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DIVISION OF ENGINEERING

SEWER MANHOLE ADJUSTMENT GRADE RINGS

STANDARD DRAWING NO. 214

APPROVAL _____ 5/1/08
URBAN COUNTY ENGINEER DATE

_____ 5/1/08
COMMISSIONER DATE

## GENERAL NOTES

1. SHALLOW MANHOLE TYPE CONSTRUCTION SHOWN ON STD. DWG. 210 MAY BE USED FOR ALL MANHOLES UP TO 5' IN DEPTH.
2. ALL DIMENSIONS ARE BASED ON SIZE OF LARGEST PIPE IN MANHOLE.
3. MANHOLES FOR PIPE LARGER THAN 36" SHALL BE SPECIALLY DESIGNED.
4. BOTTOM SLAB OF MANHOLES SHALL BE SPECIALLY DESIGNED WITH REGARD TO AREA, THICKNESS, AND REINFORCING IN SITUATIONS WHERE HIGH WATER TABLE OR UNSTABLE SOIL CONDITIONS EXIST.
5. MANHOLE STEPS SHALL BE INSTALLED IN A VERTICAL LINE AND SHALL COMPLY WITH OSHA STANDARDS IN ALL RESPECTS.
6. ALL FLOORS OF MANHOLES SHALL SLOPE AT LEAST 1" PER FT. FROM WALL TO CHANNELS AND SHALL HAVE SMOOTH FLOAT AND BRUSH FINISH.
7. CHANNEL SURFACE OF MANHOLES FROM INLET TO OUTLET SHALL HAVE SMOOTH FLOAT FINISH.
8. ELEVATIONS OF PIPES IN MANHOLES SHALL BE SUCH THAT THE TOP OF ALL INFLUENT PIPES WILL BE AT AN EL-EVATION EQUAL TO OR GREATER THAN THE TOP OF THE EFFLUENT PIPE.
9. A MINIMUM FALL OF 0.10 FOOT SHALL BE PROVIDED.
10. BASE OF MANHOLES GREATER THAN 12' DEEP TO BE REINFORCED WITH NO. 4 BARS AT 12" BOTH WAYS.
11. ASPHALT DAMPROOFING COMPOUND IS REQUIRED ON PRECAST MANHOLES IN WET AREAS OR OTHERWISE AS DIRECTED BY THE ENGINEER. *DOES NOT APPLY*
12. LEAKS IN MANHOLES OBSERVED DURING CONSTRUCTION OR INSPECTION SHALL BE CORRECTED IMMEDIATELY.
13. MANHOLES SHALL PASS VACUUM TEST PER ASTM C-1244 PRIOR TO ACCEPTANCE.
14. ALL INLETS, INCLUDING LATERALS, MUST HAVE FLOW CHANNELS.
15. NEW CONNECTIONS TO EXISTING SANITARY SEWER MANHOLES MUST REPLACE EXISTING BRICK MANHOLES OR DAMAGED MANHOLES AT NO EXPENSE TO THE LFUCG.
16. FIELD POURED BASES (DOGHOUSE MANHOLES) SHALL ONLY BE ALLOWED WITH PRIOR APPROVAL OF THE LFUCG.

## SPECIFICATIONS

1. CASTINGS SHALL BE ASTM A-48, CLASS 35.
2. CONCRETE FOR MANHOLES, CRADLE ENCASEMENT, ETC. SHOWN IN THESE DETAILS SHALL BE CLASS "A".
3. CONCRETE MANHOLE BARREL CONSTRUCTION SHALL CONFORM TO ASTM C-478 OR ITS LATEST REVISION.

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DIVISION OF ENGINEERING

MANHOLE SIZE STANDARDS AND GENERAL NOTES FOR DEEP MANHOLES

STANDARD DRAWING NO. 216

APPROVED: [signature] DATE 5/1/08

URBAN COUNTY ENGINEER

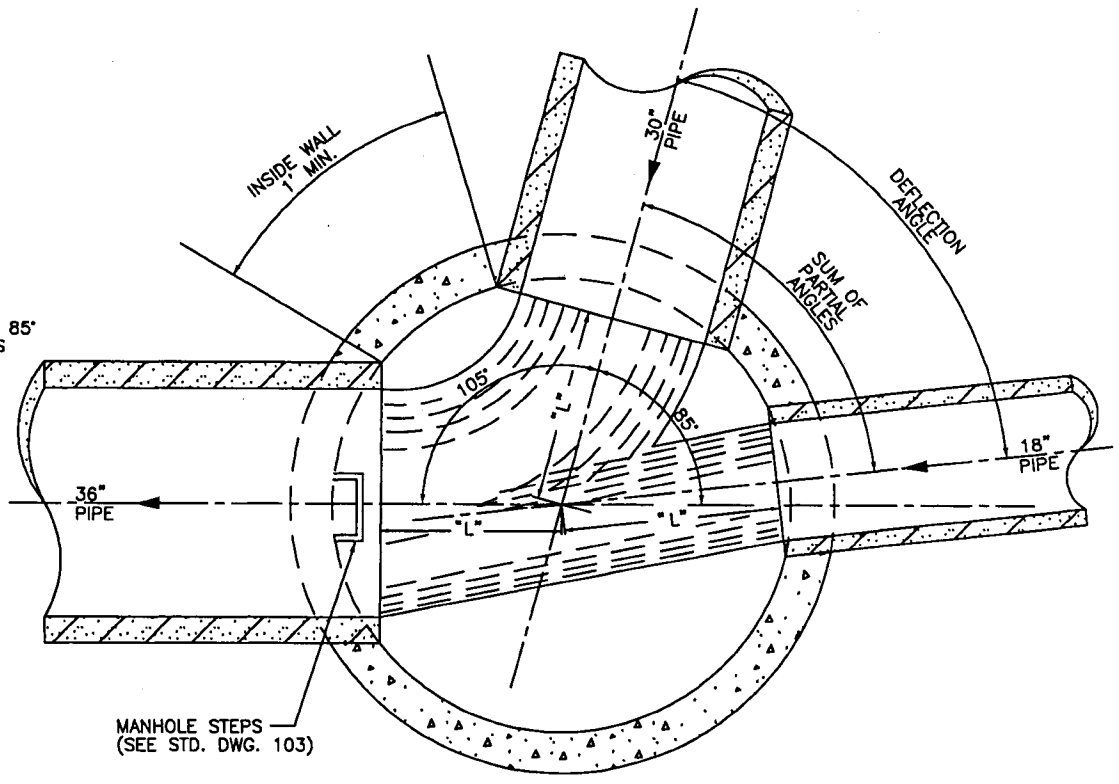
COMMISSIONER [signature] DATE 5/1/08

CIRCULAR MANHOLE NOTES:

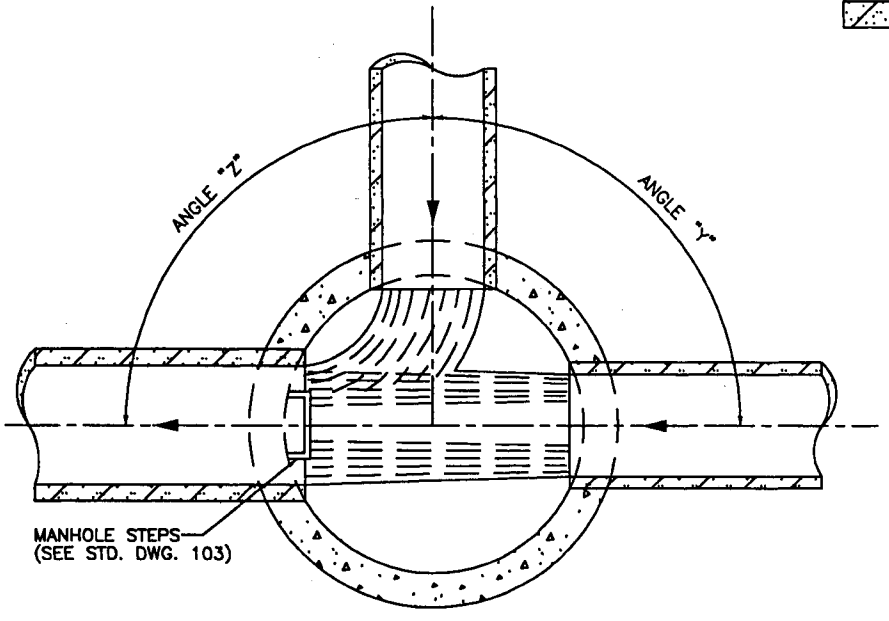
1. THE ANGLE BETWEEN ANY TWO PIPES (e.g. ANGLE "Y" OR "Z") MUST BE GREATER THAN THE SUM OF THE PARTIAL ANGLES. REFER TO SEPARATE STANDARD DRAWINGS FOR TABLE OF MINIMUM PARTIAL ANGLES. ANGLES SMALLER THAN LISTED ON TABLE SHALL REQUIRE LARGER MANHOLE SELECTION.
2. THE MAXIMUM DEFLECTION ANGLE BETWEEN ANY INCOMING PIPE AND THE CENTERLINE EXTENSION OF THE DISCHARGE PIPE SHALL BE NO MORE THAN 90° FOR PIPES UP TO 24" IN DIAMETER. THE MAXIMUM DEFLECTION ANGLE FOR 27" TO 36" PIPES SHALL BE 75°.

EXAMPLE FOR SANITARY MANHOLE SIZE SELECTION:

FOR MANHOLE SHOWN AT RIGHT, THE ANGLE BETWEEN THE 18" AND 30" PIPES IS 85° AND THE ANGLE BETWEEN THE 30" AND 36" PIPES IS 105°. THE TABLE INDICATES THAT FOR A 5'–0" DIAMETER MANHOLE THE MINIMUM PARTIAL ANGLE FOR AN 18" PIPE IS 34° AND FOR A 30" PIPE IS 50°. THE SUM OF THE PARTIAL ANGLES IS 84°, THIS SUM IS LESS THAN THE 85° THEREFORE, A 5'–0" MANHOLE DIAMETER IS ACCEPTABLE.




PLAN SECTION




PLAN SECTION

TABLE OF MINIMUM PARTIAL ANGLES FOR SANITARY MANHOLES

| PIPE SIZE | MANHOLE SIZE 4'–0" P. ANGLE | 4'–0" L. DIST. | 5'–0" P. ANGLE | 5'–0" L. DIST. |
|---|---|---|---|---|
| 15" | 38° | 1'–10" | 30° | 2'–3" |
| 18" | 43° | 1'–8" | 34° | 2'–3" |
| 24" | 53° | 1'–6" | 39° | 2'–2" |
| 27" | – | – | 45° | 2'–0" |
| 30" | – | – | 50° | 1'–11" |

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DIVISION OF ENGINEERING

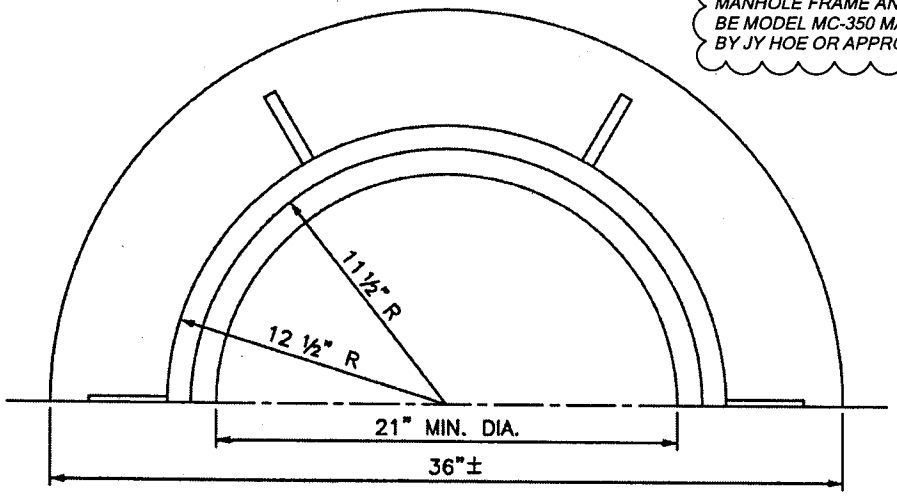
DEFLECTION ANGLE CRITERIA FOR SANITARY MANHOLES

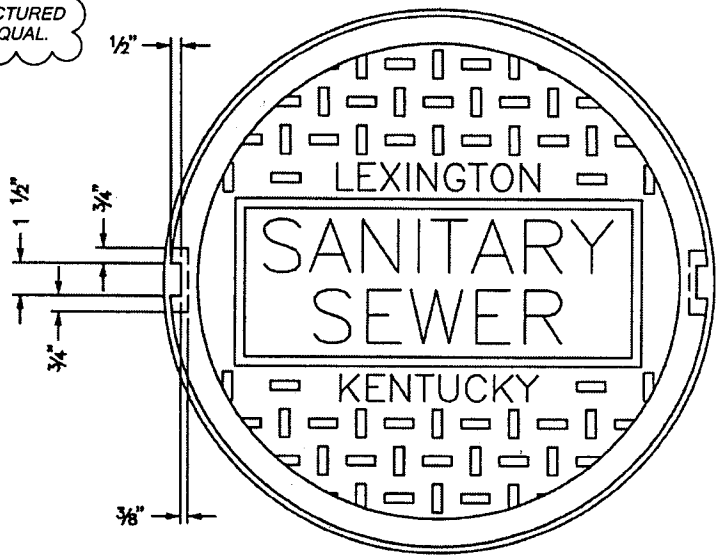
STANDARD DRAWING NO. 217

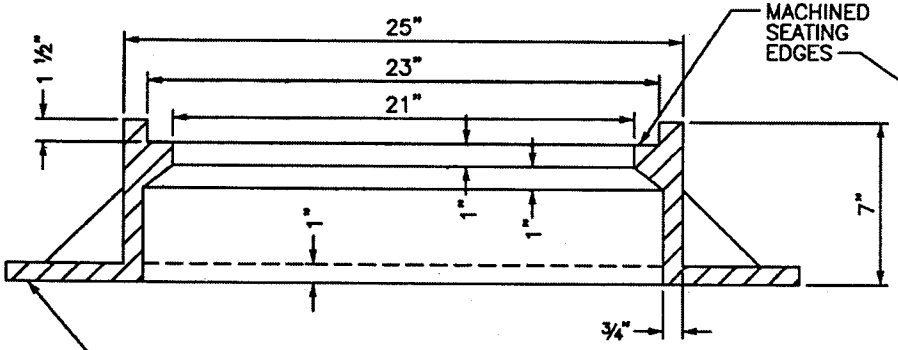
APPROVED: URBAN COUNTY ENGINEER — DATE 5/1/08

COMMISSIONER — DATE 5/1/08

MANHOLE FRAME AND LID SHALL BE MODEL MC-350 MANUFACTURED BY JY HOE OR APPROVED EQUAL.

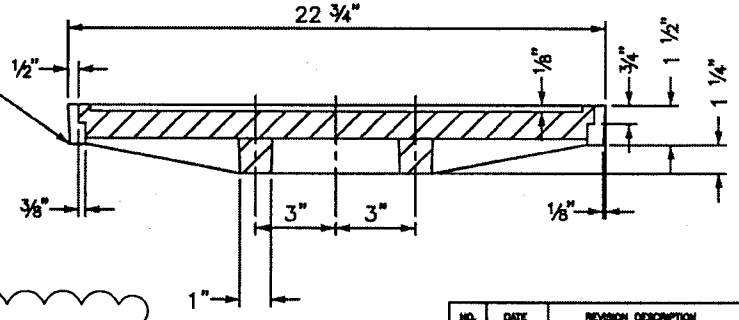



SET FRAME CASTING IN FULL MORTAR BED, FOR WATERTIGHT MANHOLE FRAME AND LID – SEE APPLICABLE STANDARD DRAWING

FRAME DETAIL




COVER DETAIL

NOTES:

1. MANHOLE FRAME & LID ASSEMBLY SHALL BE TRAFFIC H-20 RATED, HAVE A MINIMUM WEIGHT OF 125 LBS. AND A TOTAL MINIMUM FRAME AND LID WEIGHT OF 305 LBS. WITH ALL STEEL IN ACCORDANCE WITH ASTM A-48 CLASS 35 SPEC.
2. FRAME SHALL BE SET IN BEAD OF BUTYL MASTIC SEALANT THEN MORTARED AROUND FRAME LIP.
3. NON-TRAFFIC AREA MANHOLES SHALL BE BOLTED DOWN WITH FOUR (4) HILTI-TYPE S.S. ANCHOR BOLTS IN ACCORDANCE WITH SPECIFICATION SECTION 02608.

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DIVISION OF ENGINEERING

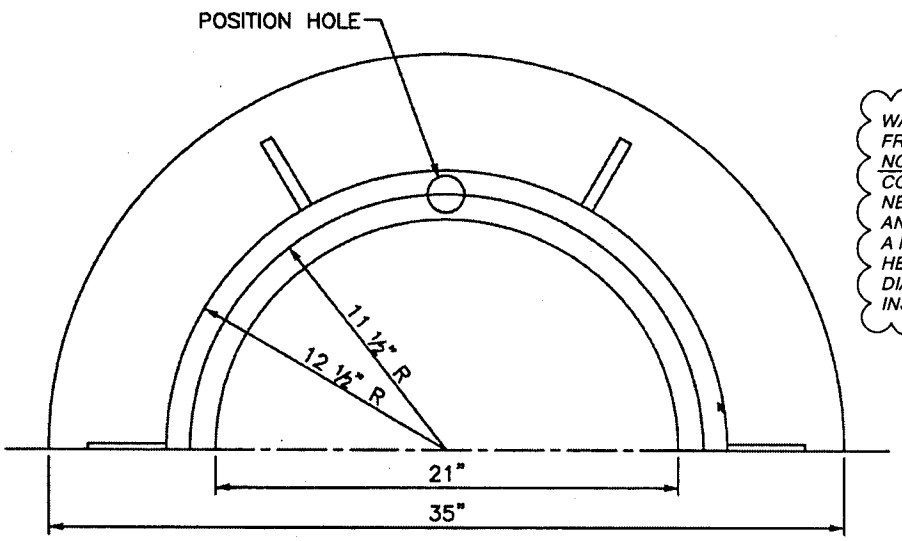
STANDARD CIRCULAR MANHOLE FRAME & COVER

STANDARD DRAWING NO. 220

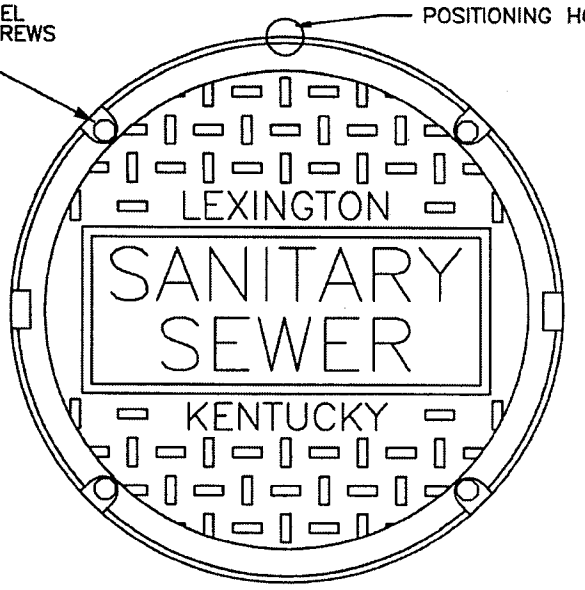
APPROVED: URBAN COUNTY ENGINEER — DATE 5/1/08

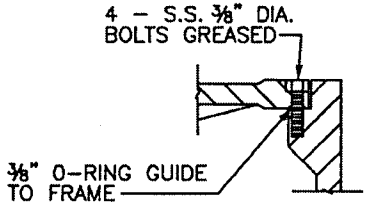
COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT

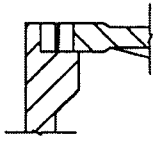



*WATERTIGHT MAHOLE FRAMES AND COVERS SHALL NOT BE BOLT DOWN TYPE. COVERS SHALL HAVE NEOPRENE T-GASKET SEAL AND CONCEALED PICKHOLE. A HIGH DENSITY ETHYLENE HEXENE-1 COPOLYMER DIAPHRAGM SHALL BE INSTALLED UNDER COVER.*



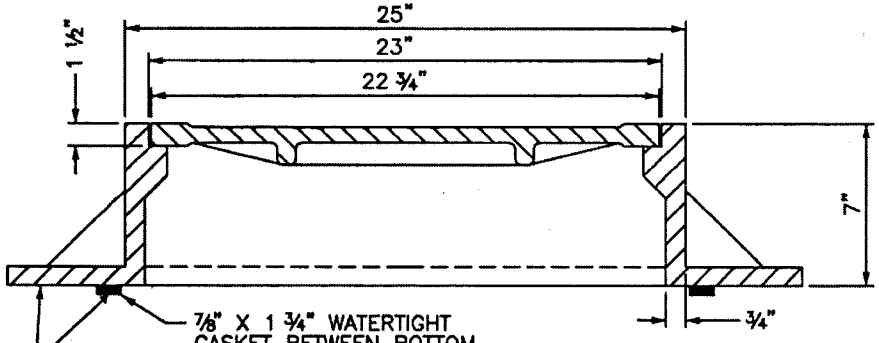




WATERTIGHT DETAIL



POSITIONING HOLE

COVER DETAIL




*1" BEAD BUTYL MASTIC SEALANT ROPE*

SET FRAME CASTING IN FULL MORTAR BED, FOR WATERTIGHT MANHOLE FRAME AND LID – SEE APPLICABLE STANDARD DRAWING.

FRAME DETAIL

*MANHOLE FRAME AND LID SHALL BE MODEL MC-350 MANUFACTURED BY JR HOE OR APPROVED EQUAL.*

NOTE:

MANHOLE FRAME & LID ASSEMBLY SHALL BE NEENAH #R–1916–D OR APPROVED EQUAL, HAVE A MINIMUM LID WEIGHT OF 150 LBS. AND A TOTAL MINIMUM FRAME & LID WEIGHT OF 335 LBS. WITH ALL STEEL IN ACCORDANCE WITH ASTM A–48 CLASS 35 SPEC. OR HIGHER.

*FRAME SHALL BE SET IN BEAD OF BUTYL MASTIC SEALANT, THEN MORTARED AROUND FRAME LIP.*

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

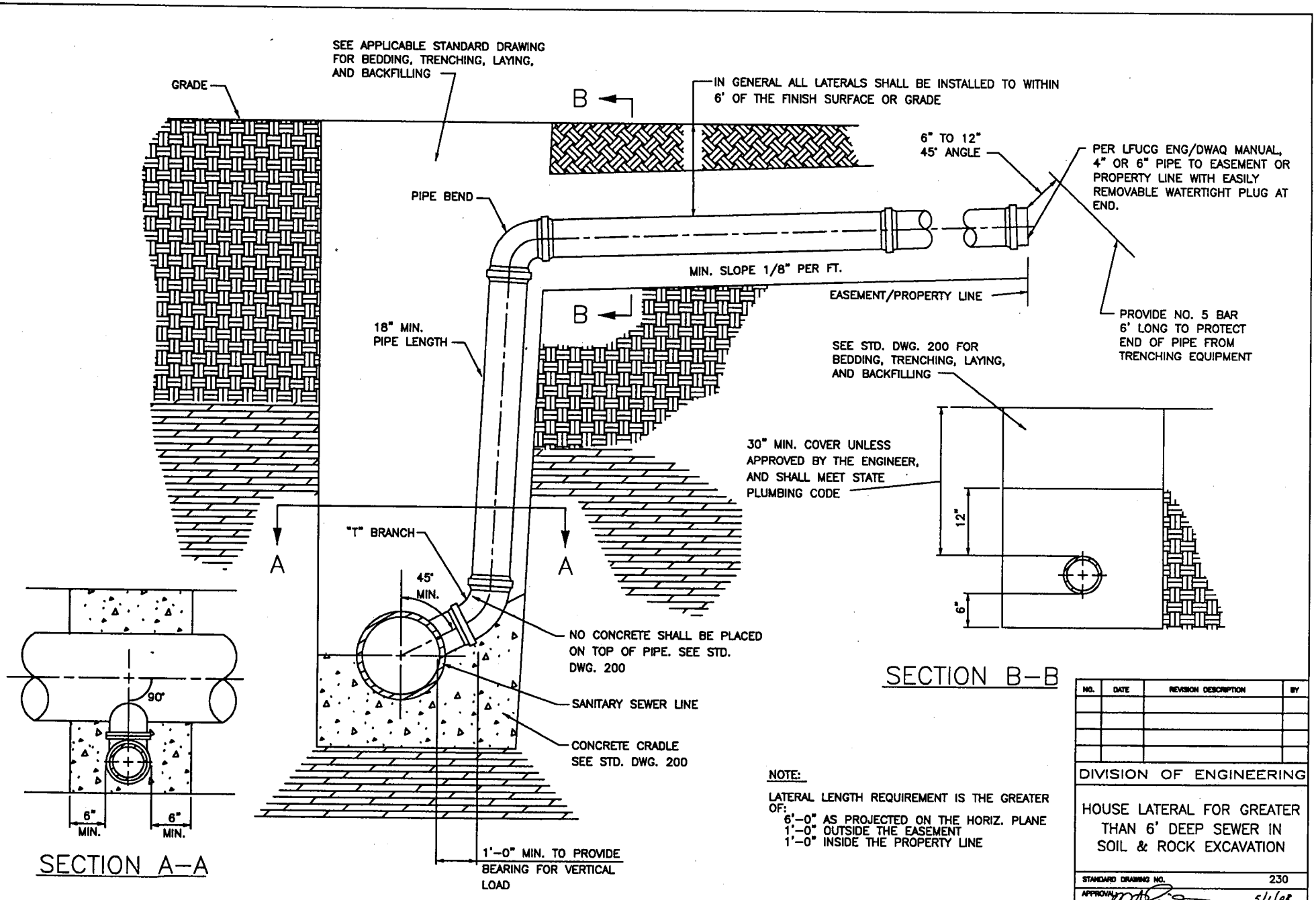
STANDARD WATERTIGHT MANHOLE FRAME & COVER

STANDARD DRAWING NO. 222

APPROVED: URBAN COUNTY ENGINEER — DATE 5/1/08

COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




SECTION A–A

SECTION B–B

NOTE:

LATERAL LENGTH REQUIREMENT IS THE GREATER OF:
- 6'-0" AS PROJECTED ON THE HORIZ. PLANE
- 1'-0" OUTSIDE THE EASEMENT
- 1'-0" INSIDE THE PROPERTY LINE

| NO. | DATE | REVISION DESCRIPTION | BY |
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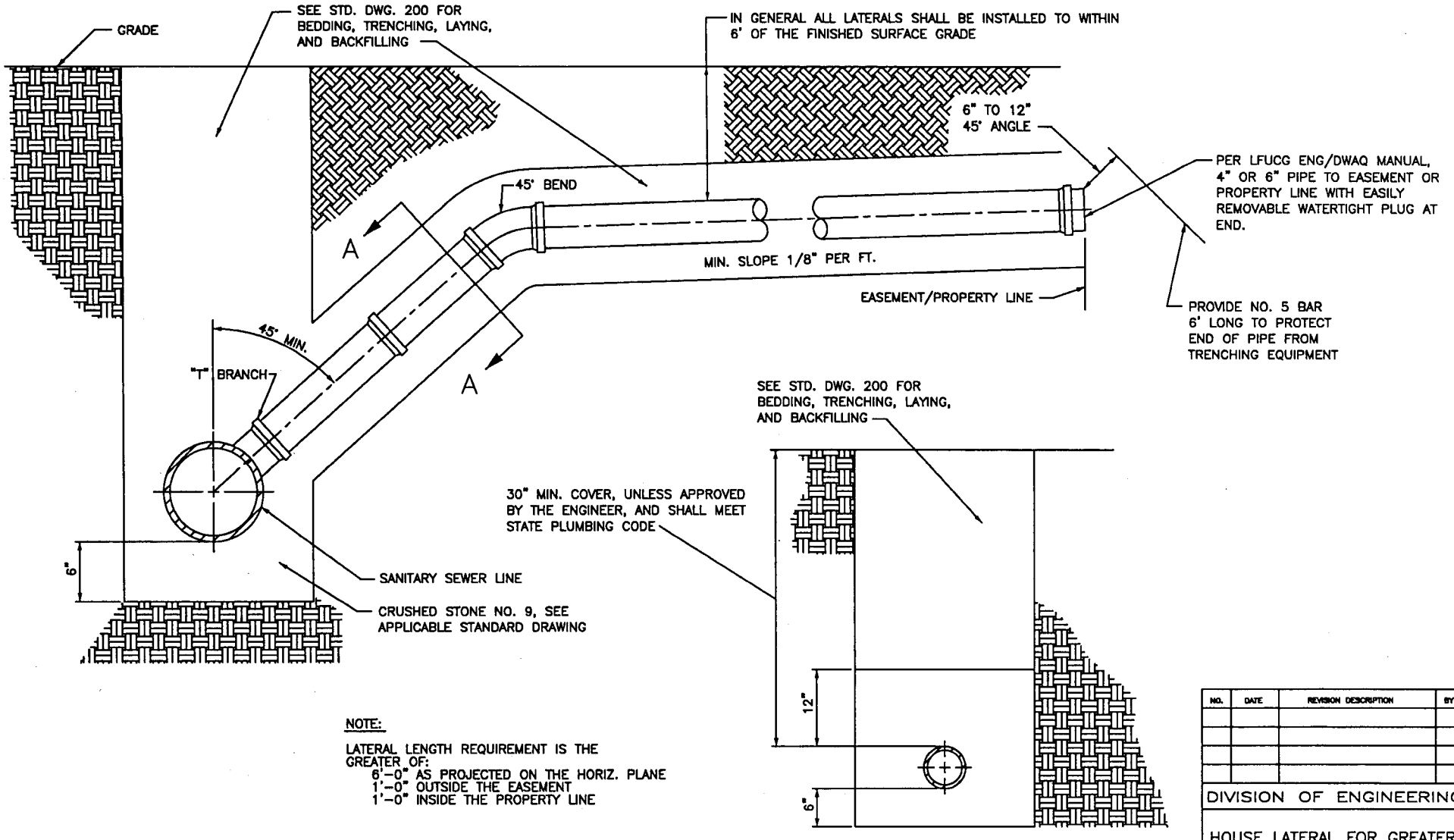
DIVISION OF ENGINEERING

# HOUSE LATERAL FOR GREATER THAN 6' DEEP SEWER IN SOIL & ROCK EXCAVATION

STANDARD DRAWING NO. 230

APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




NOTE:

LATERAL LENGTH REQUIREMENT IS THE GREATER OF:
- 6'-0" AS PROJECTED ON THE HORIZ. PLANE
- 1'-0" OUTSIDE THE EASEMENT
- 1'-0" INSIDE THE PROPERTY LINE

SECTION A–A

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

HOUSE LATERAL FOR GREATER THAN 6' DEEP SEWER IN SOIL

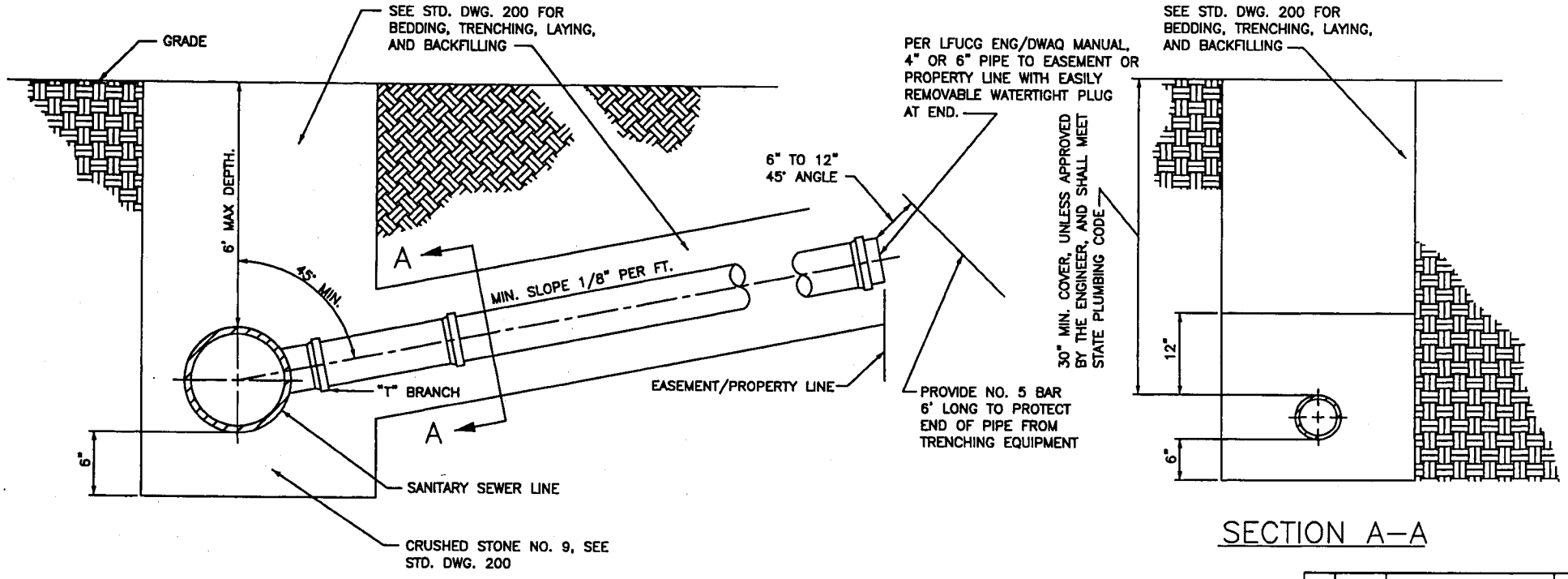
STANDARD DRAWING NO. 231

APPROVAL

URBAN COUNTY ENGINEER — DATE 5/1/08

COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




SECTION A–A

NOTE:

LATERAL LENGTH REQUIREMENT IS THE GREATER OF:
- 6'–0" AS PROJECTED ON THE HORIZ. PLANE
- 1'–0" OUTSIDE THE EASEMENT
- 1'–0" INSIDE THE PROPERTY LINE

| NO. | DATE | REVISION DESCRIPTION | BY |
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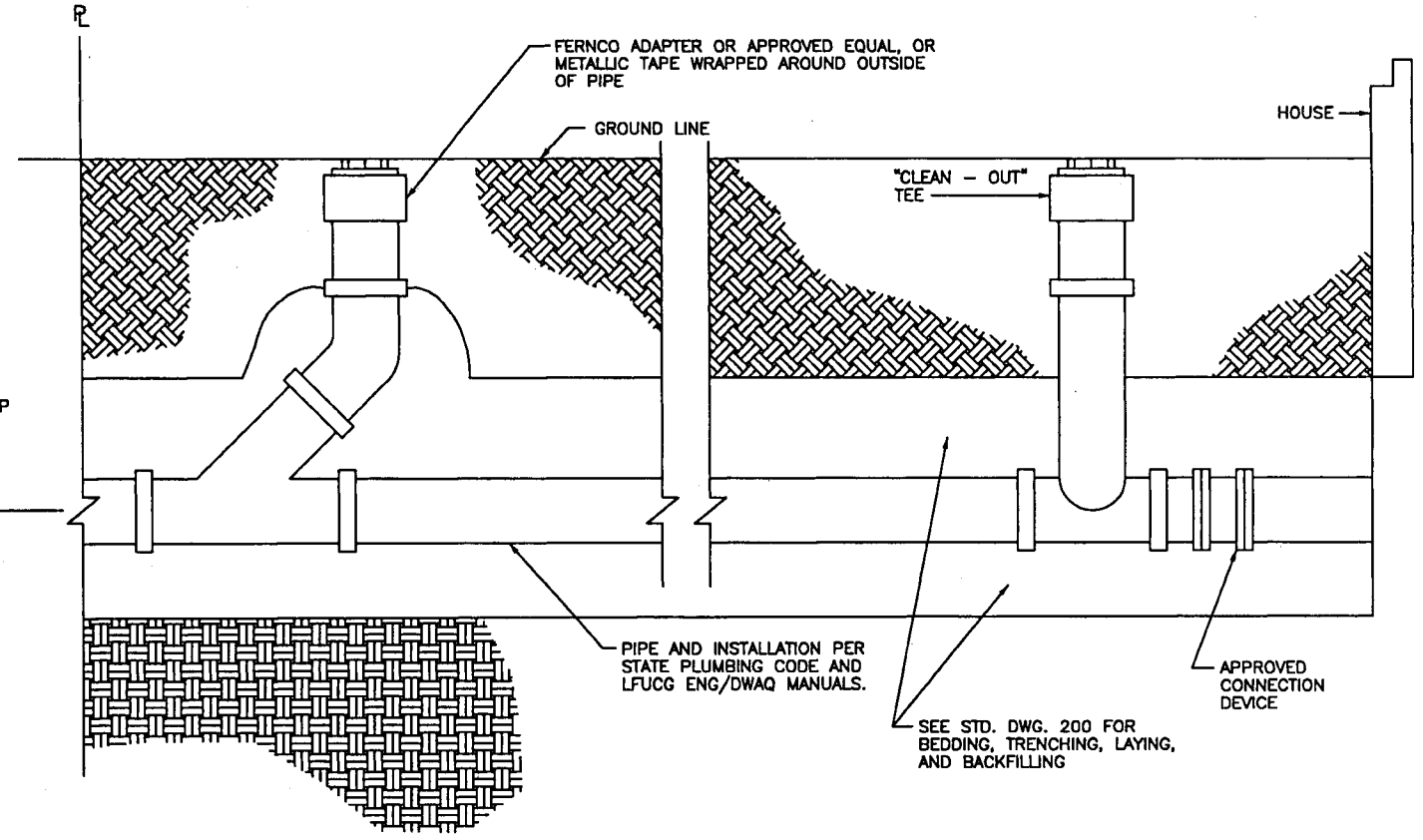
DIVISION OF ENGINEERING

HOUSE LATERAL
FOR SHALLOW SEWER
IN SOIL OR ROCK

STANDARD DRAWING NO. 232

APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




NOTE:

SEWER PIPE FROM HOUSE TO THE LONG SWEEP "L" MUST BE IN ACCORDANCE WITH STATE PLUMBING CODE AND LFUCG ENG/DWAG MANUALS.

| NO. | DATE | REVISION DESCRIPTION | BY |
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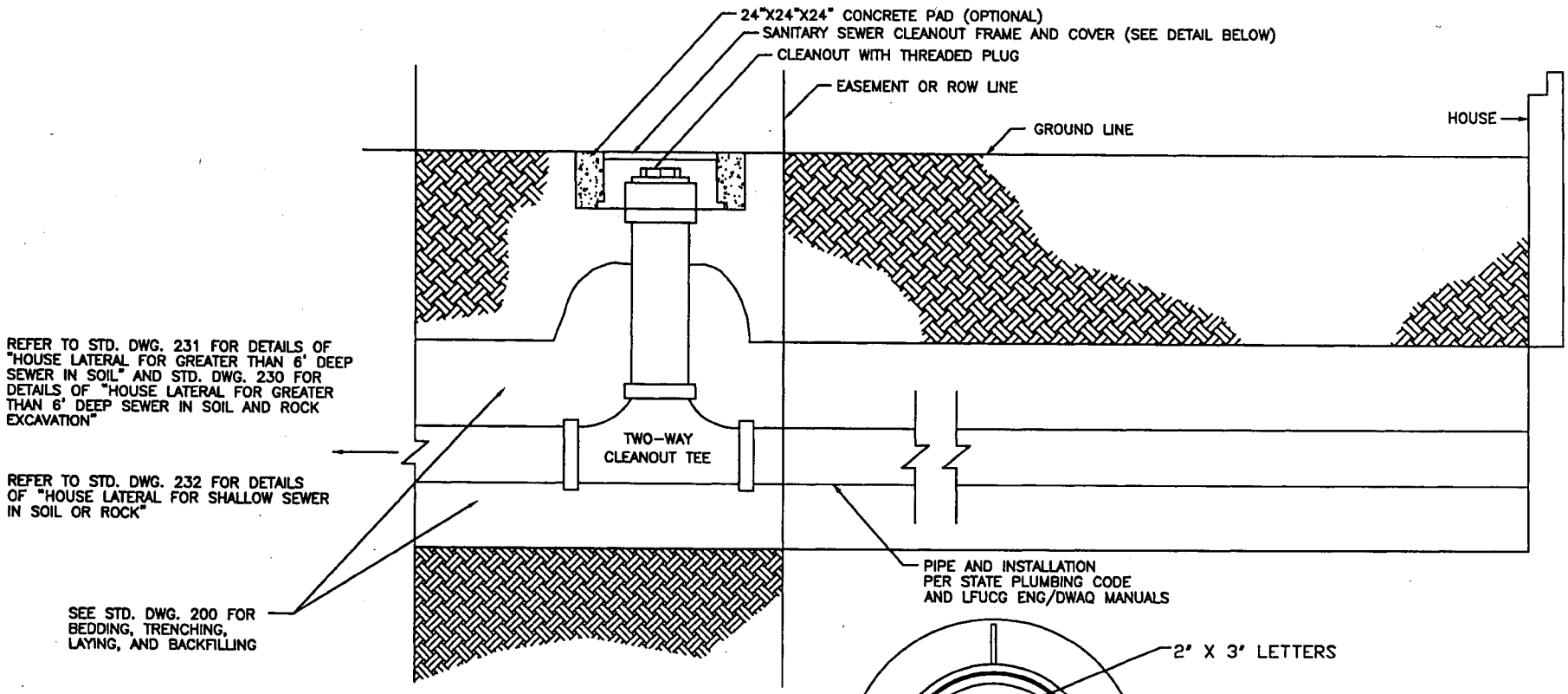
DIVISION OF ENGINEERING

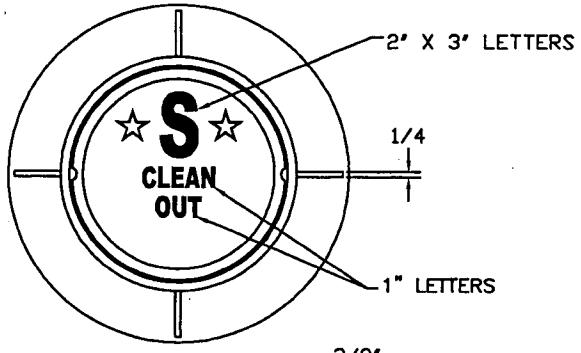
# LATERAL CLEANOUT IN NON–PAVED AREAS AND YARDS

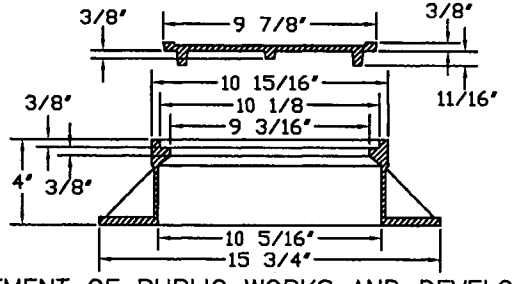
STANDARD DRAWING NO. 233

APPROVAL _____ 5/1/08
URBAN COUNTY ENGINEER — DATE

_____ 5/1/08
COMMISSIONER — DATE




NOTES:

SEWER PIPE FROM HOUSE TO CLEANOUT MUST BE IN ACCORDANCE WITH STATE PLUMBING CODE AND LFUCG ENG/DWAQ MANUALS.

TWO-WAY CLEANOUT TEE IS TO BE INSTALLED BY THE PLUMBER AND OR CONTRACTOR PRIOR TO CONNECTION OF THE LATERAL TO PUBLIC SANITARY SEWER LINE.

CLEANOUT TO BE INSTALLED AT THE END OF PUBLICLY MAINTAINED SEWER. POINT TO BE DETERMINED BY THE DIVISION OF ENGINEERING.

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DIVISION OF ENGINEERING

# RIGHT OF WAY OR EASEMENT LATERAL CLEANOUT IN NON-PAVED AREAS AND YARDS

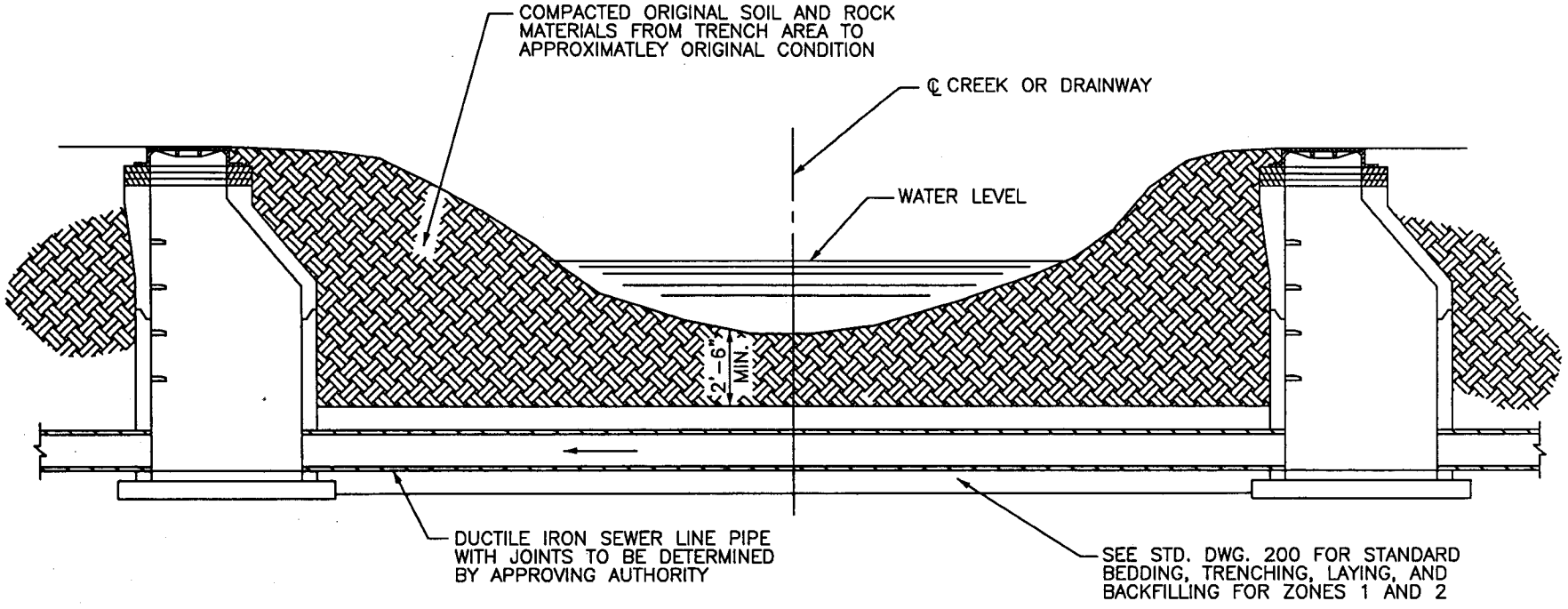
STANDARD DRAWING NO. 234

APPROVAL

URBAN COUNTY ENGINEER — DATE 5/1/08

COMMISSIONER — DATE 5/1/08

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




NOTES:

1. A WATERSTOP SHALL BE PROVIDED ON THE UPSTREAM SIDE OF THE DOWNSTREAM MANHOLE.
2. SPECIAL DESIGN REQUIRED WHEN COVER IS 30" OR LESS.

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

TYPICAL CREEK CROSSING FOR SANITARY SEWER LINE

STANDARD DRAWING NO. 240

APPROVAL _____ DATE 5/1/08

URBAN COUNTY ENGINEER

_____ DATE 5/1/08

COMMISSIONER

Mayor Jim Gray

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT

Division of Engineering

Date: February 2, 2012

Re: LFUCG **Standard Drawings 250 Revision**

The Lexington Fayette Urban County Government, Department of Environmental Quality and Public Works, has revised the Division of Engineering **Standard Drawings 250 – Schematic Example For Grease Interceptor**. This Standard Drawing became effective on January 16, 2012 and replaces any/all previous versions.

Attached is the revised Standard Drawing.

A paper copy of the **Standard Drawings 2008** edition is available for purchase from the Lexington Fayette Urban County Government, Division of Engineering, 101 East Vine Street 4th floor.

If you have questions please contact Mr. Andrew Grunwald, P.E. with the Division of Engineering at 258-3410.

Questions or Comments should be directed to:

Urban County Engineer
Division of Engineering
Fourth Floor
101 E. Vine Street
Lexington, KY 40507
859-258-3410

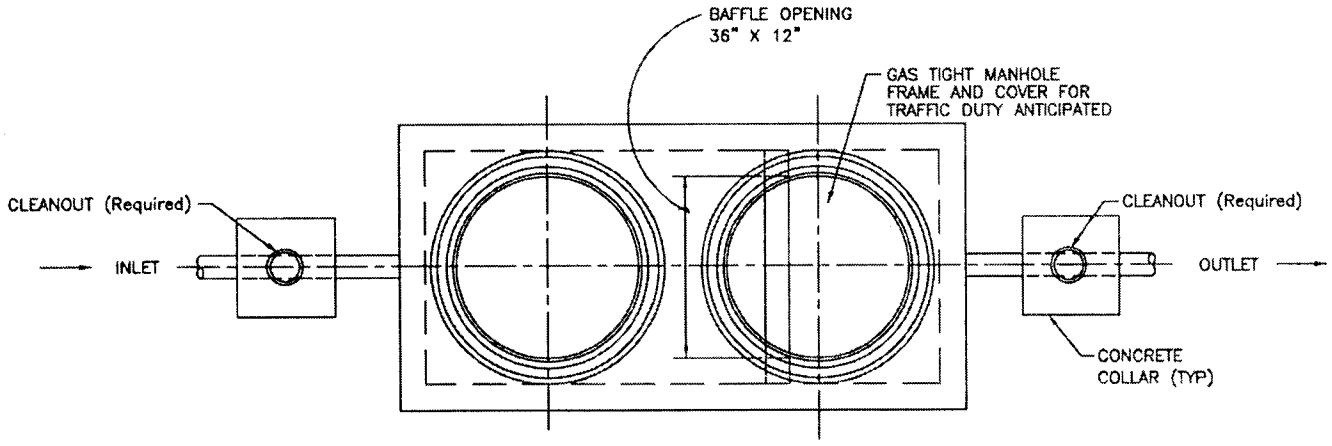
Sincerely,

Marwan A. Rayan, P.E.
Urban County Engineer

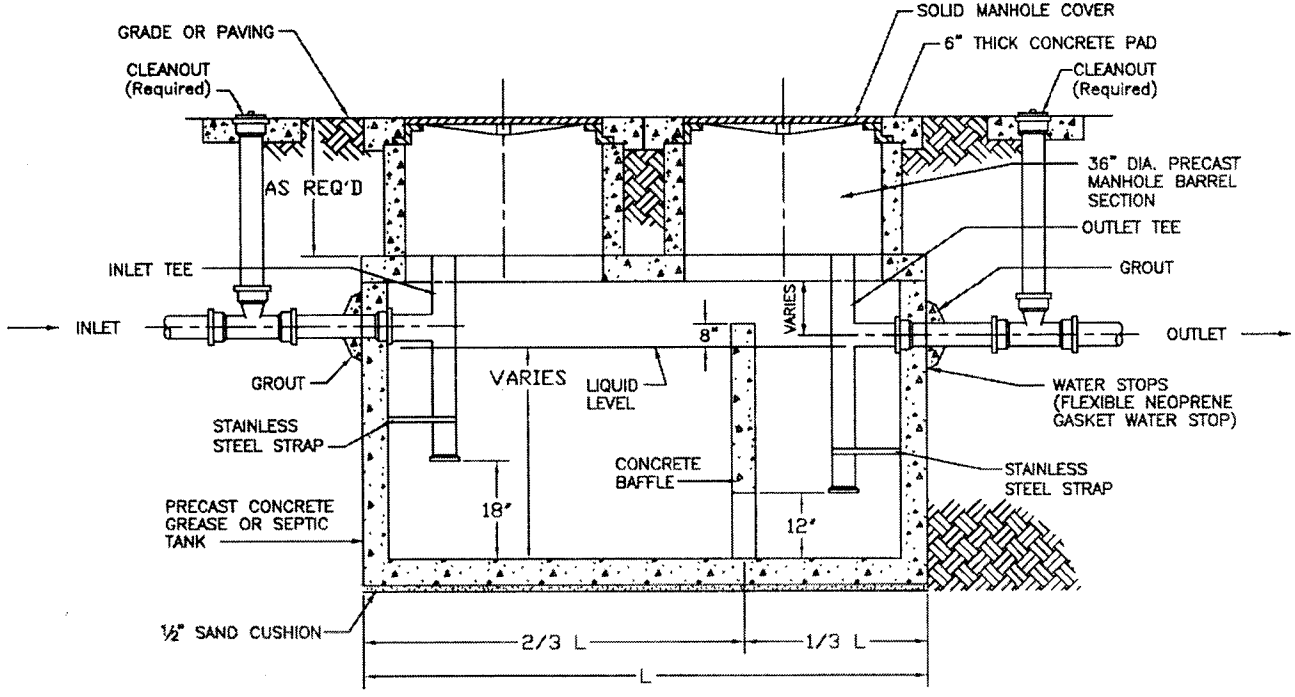
MAR:RAB:AFG

C: File

12 1000.106.Letter for Amended STD#250.doc




TOP VIEW




SECTION

GENERAL NOTES:

1. THIS STRUCTURE IS TO BE ACCESSIBLE FOR MAINTENANCE OR INSPECTION WITH COVERS AND CLEANOUTS BROUGHT TO GRADE.
2. DESIGN CRITERIA SHALL BE HS--20 LOADING.
3. FLOW TO THE INTERCEPTOR SHALL EXCLUDE SANITARY SEWAGE AND SURFACE DRAINAGE.
4. DESIGN AND CAPACITY OF GREASE INTERCEPTOR TO BE CERTIFIED BY ENGINEER IN ACCORD WITH KENTUCKY STATE PLUMBING CODE AND REVIEWED FOR CAPACITY BY THE DIVISION OF ENGINEERING PRIOR TO CONSTRUCTION.
5. MULTIPLE COMPARTMENT INTERCEPTORS ARE REQUIRED.
6. PIPE CLEANOUT TEE SHALL BE THE SAME SIZE AS THE PIPE AND BE WITHIN 6' OF THE GREASE INTERCEPTOR ON THE OUTLET LINE.
7. MANUFACTURER WILL PROVIDE GREASE TRAP WITH TWO(2) ACCESS POINTS AS SHOWN. PLUMBING CONTRACTOR TO INSTALL FIXTURES AS SHOWN.
8. THE MINIMUM CAPACITY OF INTERCEPTORS IS 1000 GALLONS.

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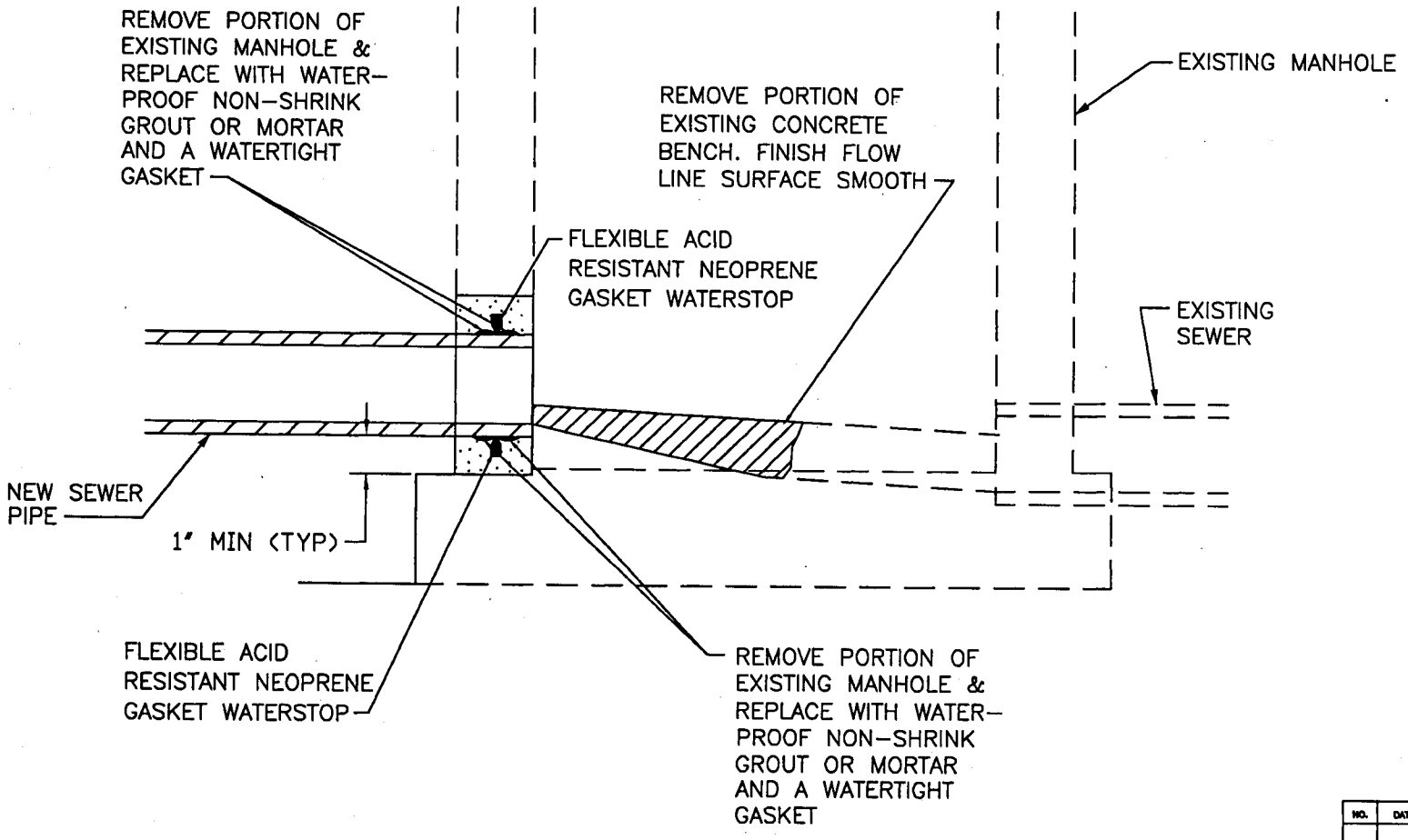
DIVISION OF ENGINEERING

GREASE INTERCEPTOR
TYPICAL
CONFIGURATION

STANDARD DRAWING NO. 250

APPROVAL:
URBAN COUNTY ENGINEER — DATE 1/13/12
COMMISSIONER — DATE 1/16/12

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




ALL HOLES CUT INTO SEWER MANHOLES SHALL BE CORE DRILLED.

## SEWER CONNECTION TO EXISTING MANHOLE

| NO. | DATE | REVISION DESCRIPTION | BY |
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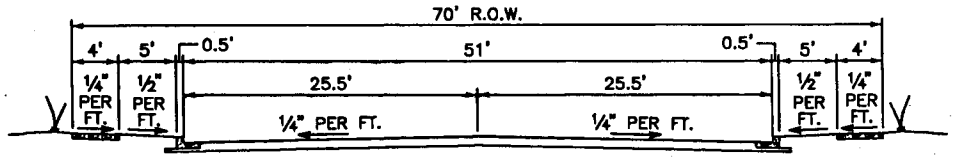
DIVISION OF ENGINEERING

SEWER CONNECTION TO EXISTING CONCRETE MANHOLE

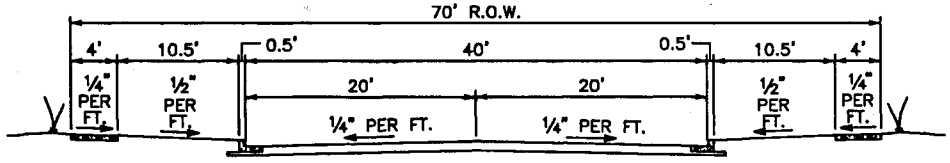
STANDARD DRAWING NO. 260

APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08

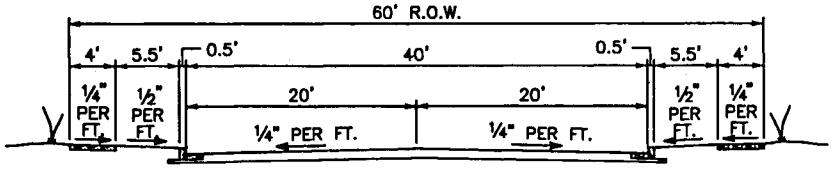
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT



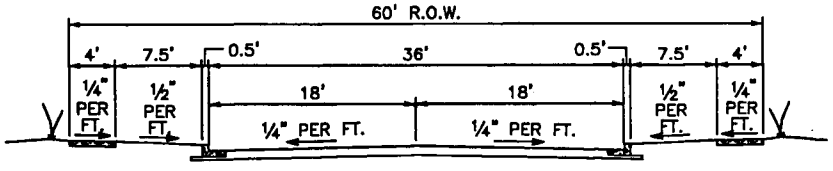

NON–RESIDENTIAL COLLECTOR




NON–RESIDENTIAL AND INDUSTRIAL COLLECTORS

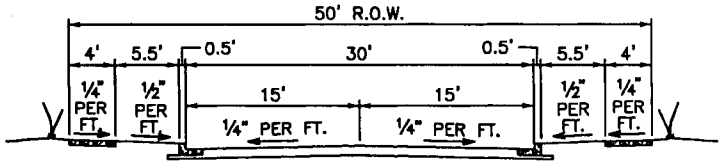



RESIDENTIAL COLLECTOR AND INDUSTRIAL LOCALS

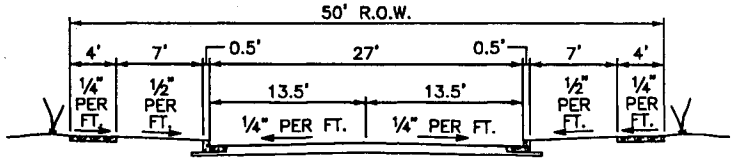



RESIDENTIAL COLLECTOR

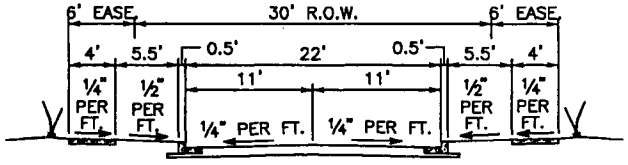
(OBSOLETE) – USED TO COMPLETE EXISTING STREETS



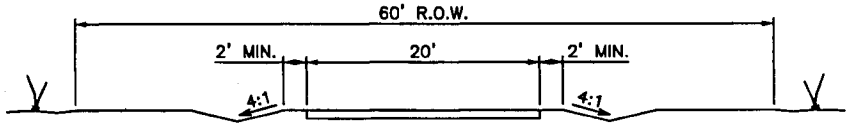

RESIDENTIAL LOCAL




RESIDENTIAL CUL–DE–SAC




URBAN RESIDENTIAL LOCAL




RURAL RESIDENTIAL LOCAL

NOTES:

1. SLOPES AND DRAINAGE DITCHES OUTSIDE THE R.O.W. SHALL BE APPROVED BY THE ENGINEER.
2. THE APPLICATIONS AND USES OF THE ABOVE TYPICAL SECTIONS SHALL BE IN ACCORDANCE WITH THE L.F.U.C.G. LAND SUBDIVISION REGULATIONS, ARTICLE 6.

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DIVISION OF ENGINEERING

TYPICAL STREET SECTIONS

STANDARD DRAWING NO. 300

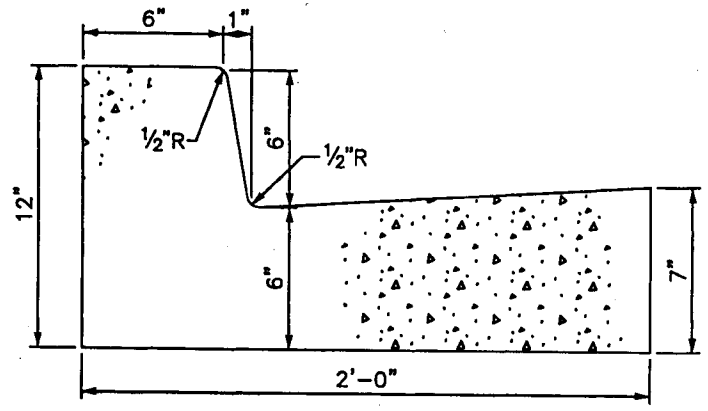
APPROVAL _____ 5/1/08 DATE

URBAN COUNTY ENGINEER

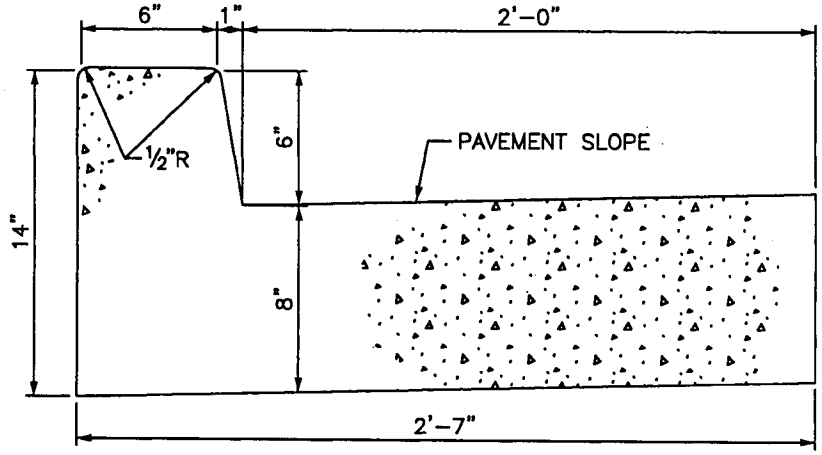
_____ 5/1/08 DATE

COMMISSIONER

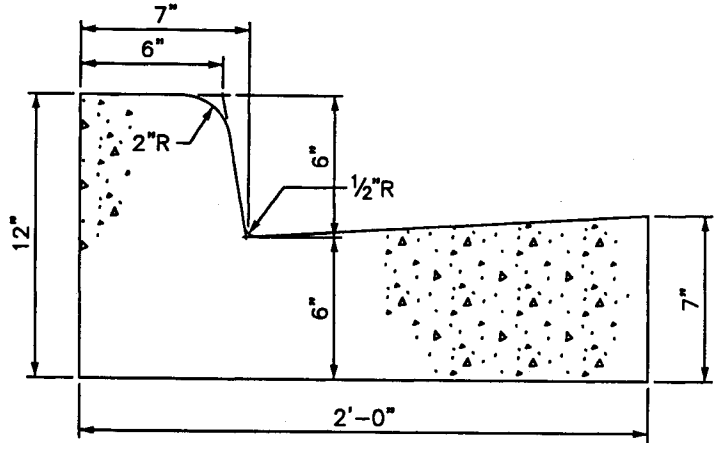
LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT



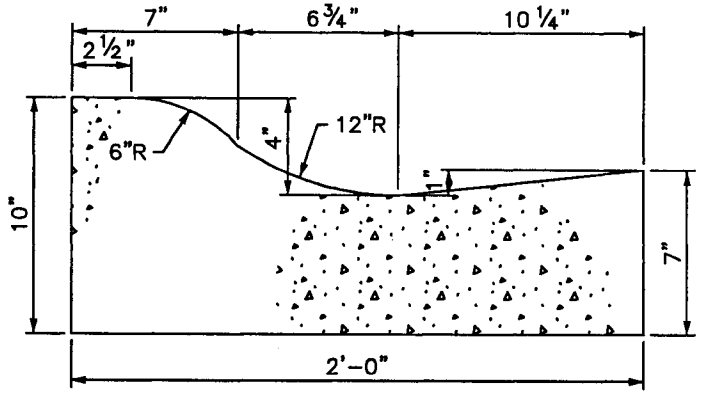

TYPE 1




TYPE 2




TYPE 3




TYPE 4
(RESIDENTIAL LOCAL STREETS ONLY)

NOTES:

1. CONCRETE SHALL BE KDOT CLASS "A".
2. SAWED CONTRACTION JOINTS SHALL BE CONSTRUCTED EVERY 20 FEET, WITH A MIN. DEPTH OF 3", IN ACCORDANCE WITH KDOT STANDARD SPECIFICATION.
3. EXPANSION JOINTS SHALL BE CONSTRUCTED AT ALL BREAKS IN ALIGNMENT, AT CONTACT WITH NEW OR EXISTING CONCRETE, AT ALL DRAINAGE INLETS, AT THE BEGINING AND ENDING POINTS OF CURVES, AND NOT TO EXCEED 200' MAXIMUM SPACING FOR SLIP FORM APPLICATION AND 30' MAXIMUM SPACING FOR HAND PLACED.
4. ALL CONCRETE SHALL BE CURED WITH WHITE PIGMENTED MEMBRANE FORMING COMPOUND (AASHTO M 148, TYPE 2).

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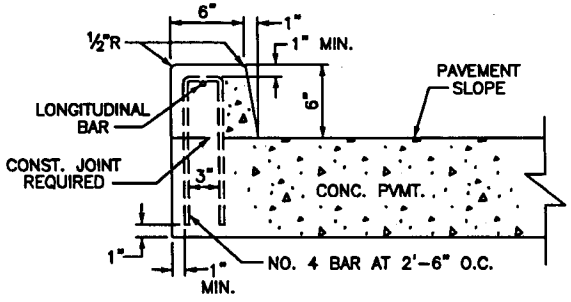
DIVISION OF ENGINEERING

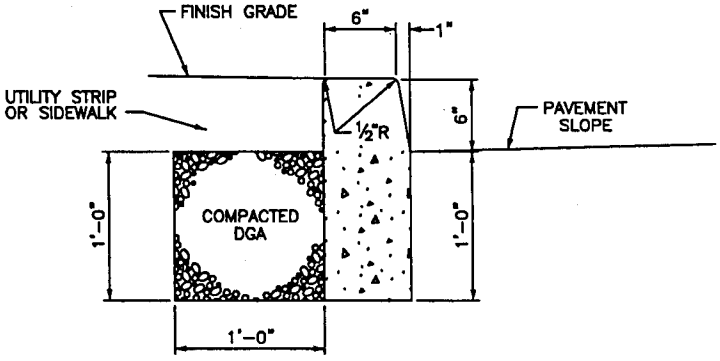
CURB & GUTTER

STANDARD DRAWING NO. 301

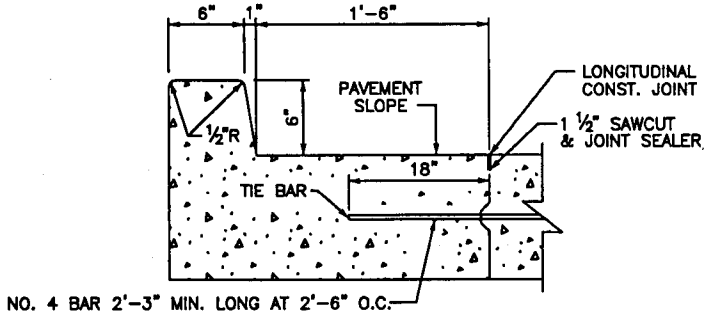
APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08



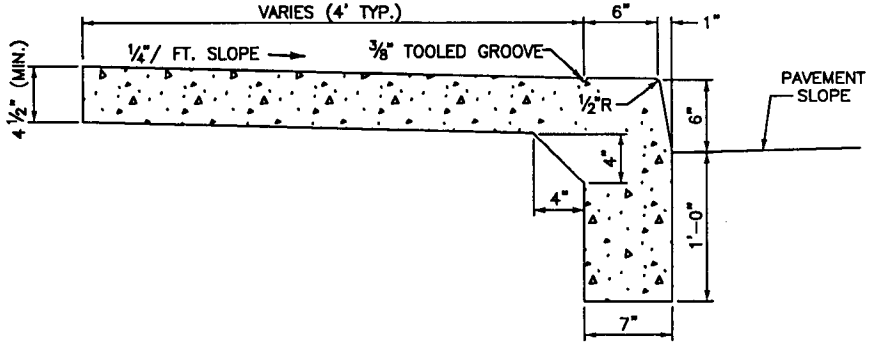

INTEGRAL CURB, TYPE 1




HEADER CURB




INTEGRAL CURB, TYPE 2




MONOLITHIC CURB AND SIDEWALK

NOTES:

1. CONCRETE SHALL BE KDOT CLASS "A".
2. SAWED CONTRACTION JOINTS SHALL BE CONSTRUCTED EVERY 20 FEET, 3" MINIMUM DEPTH.
3. THE CONTRACTOR HAS THE OPTION OF CONSTRUCTING THE STANDARD INTEGRAL CURB AS DETAILED IN EITHER TYPE 1 OR 2. IF TYPE 2 IS CHOSEN A LONGITUDINAL CONSTRUCTION JOINT SHALL BE REQUIRED AND THE REMAINING PAVEMENT AND CURB SHALL BE CONSTRUCTED MONOLITHIC WITHOUT A HORIZONTAL CONSTRUCTION JOINT AND ACCOMPANYING REINFORCING STEEL (TYPE 1).
4. EXPANSION JOINTS SHALL BE CONSTRUCTED AT ALL BREAKS IN ALIGNMENT, AT ALL DRAINAGE INLETS AND AT THE BEGINNING AND ENDING POINTS OF CURVES.
5. ALL CONCRETE, EXCEPT BONDING SURFACES, SHALL BE CURED WITH WHITE PIGMENTED MEMBRANE FORMING COMPOUND (AASHTO M 148, TYPE 2).

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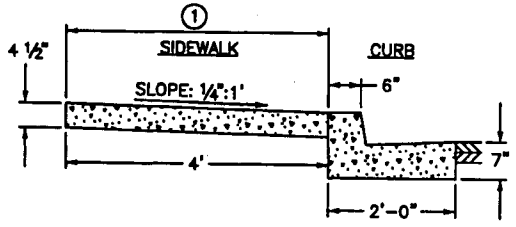
DIVISION OF ENGINEERING

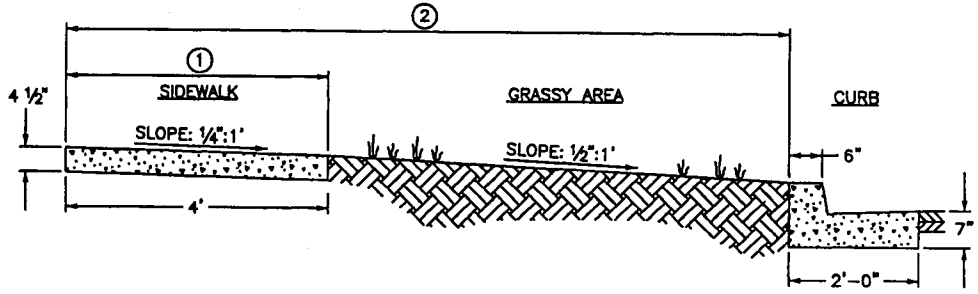
INTEGRAL CURB, HEADER CURB, MONOLITHIC CURB & SIDEWALK

STANDARD DRAWING NO. 302

APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08




SIDEWALK/CURB AND GUTTER




SIDEWALK/CURB AND GUTTER WITH GRASS UTILITY STRIP

NOTES:

1. CONCRETE SIDEWALKS AND WALKWAYS SHALL BE CONSTRUCTED ON A THOROUGHLY COMPACTED SUB-GRADE AND SHALL BE FOUR AND ONE HALF (4 ½ ) INCHES IN THICKNESS AND A MINIMUM WIDTH OF FOUR (4) FEET. CONCRETE SHALL HAVE SPECIFICATIONS FOR CLASS "A", KENTUCKY DEPARTMENT OF HIGHWAYS, STANDARD SPECIFICATIONS, CURRENT EDITION. WHITE PIGMENTED (TYPE 2, CLASS "A" OR "B") CURING COMPOUND IS REQUIRED (ALSO KENTUCKY DEPARTMENT OF HIGHWAYS, STANDARD SPECIFICATIONS, CURRENT EDITION).
2. EXPANSION JOINTS SHALL BE PLACED AT THIRTY-TWO (32) FOOT INTERVALS. IN EXISTING NEIGHBORHOODS, EXPANSION MATERIAL SHALL BE PLACED AT THE BEGINNING AND END OF NEWLY CONSTRUCTED AREAS.
3. THE SIDEWALKS SHALL BE PLACED ADJACENT TO THE STREET RIGHT-OF-WAY LINE. SLOPE TOWARD CURB SHALL BE ONE QUARTER (¼) OF AN INCH TO THE FOOT. CONSTRUCTION IN EXISTING NEIGHBORHOODS SHALL REQUIRE THE CONTRACTOR TO MATCH EXISTING GRADE AND SIDEWALK WIDTH UNLESS SPECIFIED OTHERWISE BY THE DIVISION OF ENGINEERING.

SHEET NOTES:

① NORMAL SIDEWALK WIDTH SHALL BE 4' UNLESS CHANGE IS AUTHORIZED BY URBAN COUNTY ENGINEER'S OFFICE.

② DISTANCE WILL VARY WITH ROAD CROSS-SECTION.

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

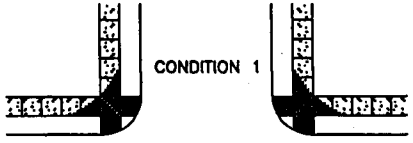
SIDEWALK CONSTRUCTION SPECIFICATIONS

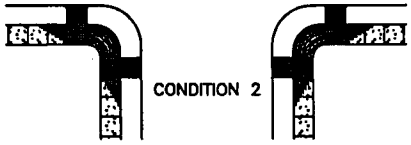
STANDARD DRAWING NO. 303

APPROVAL

URBAN COUNTY ENGINEER — DATE 5/1/08

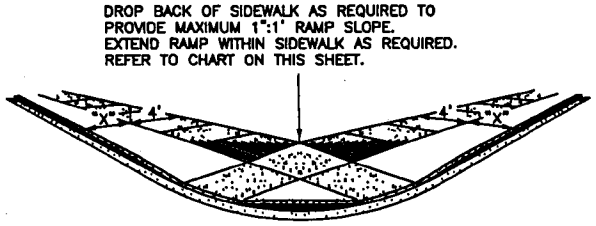
COMMISSIONER — DATE 5/1/08



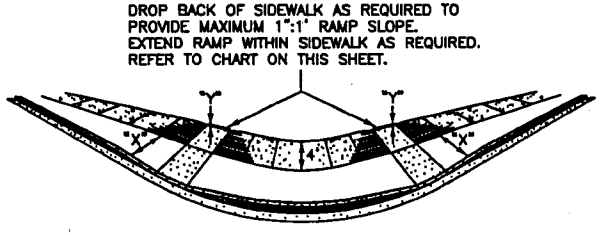




## RAMP TYPE 1

NORMAL TREATMENT FOR ARTERIALS AND SIGNALIZED INTERSECTIONS




## RAMP TYPE 1 CONDITION 1

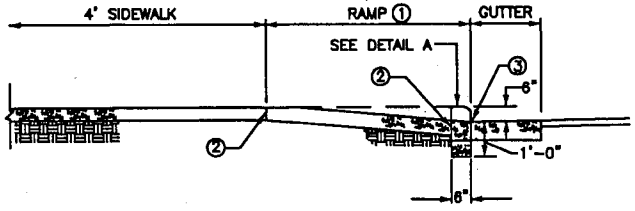



## RAMP TYPE 1 CONDITION 2

NOTE:
FOR USE WITH 6" HEADER CURB OR 6" CURB AND GUTTER

| ① UTILITY STRIP WIDTH "X" | ② BACK OF 4' SIDEWALK DROP FROM NORMAL "Y"• |
|---|---|
| 0 | 3" |
| 1 | 2½" |
| 2 | 2" |
| 3 | 1½" |
| 4 | 1" |
| 5 | ½" |
| ≥6 | 0 |

① ½":1' CROSS SLOPE ② ¼":1' CROSS SLOPE
• WHERE ROLL CURB IS USED, "Y" DOES NOT APPLY.



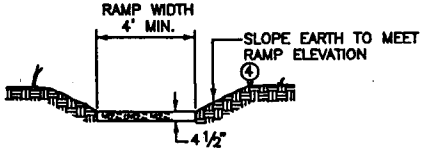

## PROFILE RAMP TYPE 1

NOTES:

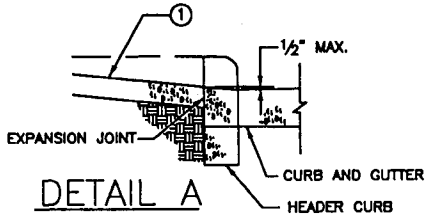
1. INLET LOCATIONS WILL VARY, DEPENDENT ON CROSSWALK AND RAMP LOCATION.
2. THE RAMP SHALL BE CONSTRUCTED OF CLASS "A" CONCRETE. STEP-SAFE• TRANSPO INDUSTRIES TILE OR ENGINEER APPROVED EQUIVALENT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
3. THE NORMAL GUTTER LINE SHOULD BE MAINTAINED THROUGH THE RAMP.
4. RAMPS SHOULD BE LOCATED WITHIN MARKED LIMITS OF CROSSWALKS.
5. WHERE NO CURB EXISTS, STREET EDGE SHALL BE SAW CUT, OR AS DIRECTED BY L.F.U.C.G. ENGINEER.

SHEET NOTES:

① MAXIMUM RAMP SLOPE 1":1'.
② ½" EXPANSION JOINT AT BACK OF CURBLINE AND SIDEWALK LINE.
③ NO BUMP PERMITTED.
④ SLOPE VARIES UNIFORMLY TO A MAXIMUM OF 1":1' AT GUTTER LINE.




## CROSS SECTION RAMP TYPE 1




## DETAIL A

| NO. | DATE | REVISION DESCRIPTION | BY |
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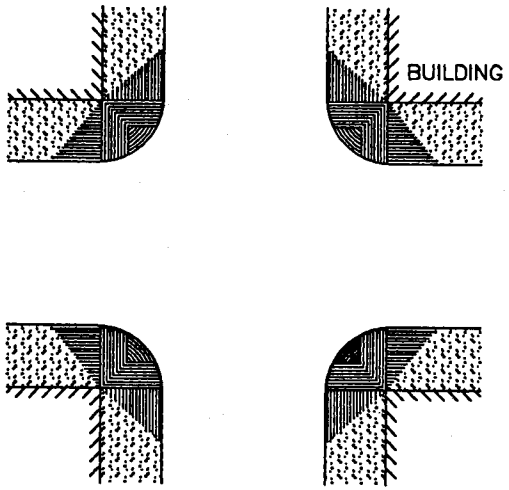
DIVISION OF ENGINEERING

SIDEWALK
RAMP TYPE 1

STANDARD DRAWING NO. 304

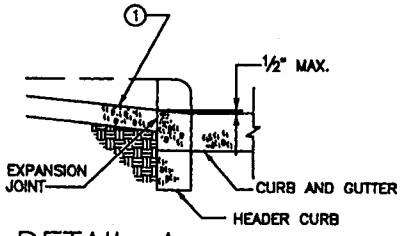
APPROVAL _____ 5/1/08
URBAN COUNTY ENGINEER DATE

_____ 5/1/08
COMMISSIONER DATE

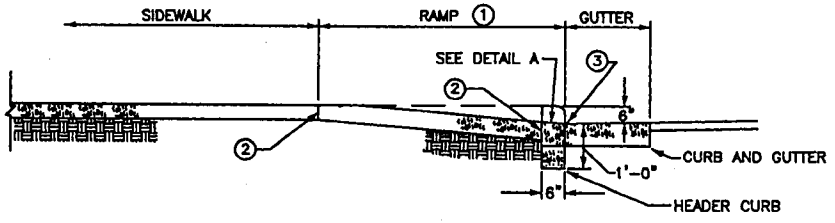



## RAMP TYPE 3

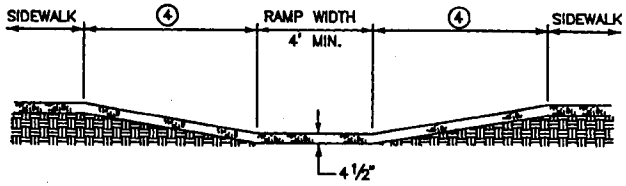
NORMAL TREATMENT FOR SIDEWALK ADJACENT TO CURB




## DETAIL A




## PROFILE RAMP TYPE 3



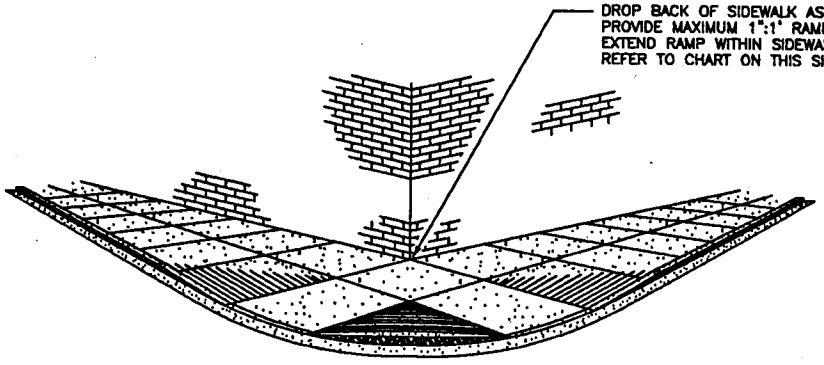

## CROSS SECTION RAMP TYPE 3

NOTES:

1. INLET LOCATIONS WILL VARY, DEPENDENT ON CROSSWALK AND RAMP LOCATION.
2. THE RAMP SHALL BE CONSTRUCTED OF CLASS "A" CONCRETE. STEP-SAFE® TRANSPO INDUSTRIES TILE OR ENGINEER APPROVED EQUIVALENT SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
3. THE NORMAL GUTTER LINE SHOULD BE MAINTAINED THROUGH THE RAMP.
4. RAMPS SHOULD BE LOCATED WITHIN MARKED LIMITS OF CROSSWALKS.

SHEET NOTES:

① MAXIMUM RAMP SLOPE 1":1'.
② ½" EXPANSION JOINT AT BACK OF CURBLINE AND SIDEWALK LINE.
③ NO BUMP PERMITTED.
④ SLOPE VARIES UNIFORMLY TO A MAXIMUM OF 1":1'. AT GUTTER LINE.




## RAMP TYPE 3

NOTE:
FOR USE WITH 6" HEADER CURB OR 6" CURB AND GUTTER

| SIDEWALK WIDTH ① "X" | BACK OF SIDEWALK DROP FROM NORMAL "Y"* |
|---|---|
| 4' | 3" |
| 5' | 2¼" |
| 6' | 1½" |
| 7' | ¾" |
| ≥ 8' | 0 |

① ¼":1' CROSS SLOPE
* WHERE ROLL CURB IS USED, "Y" DOES NOT APPLY.

| NO. | DATE | REVISION DESCRIPTION | BY |
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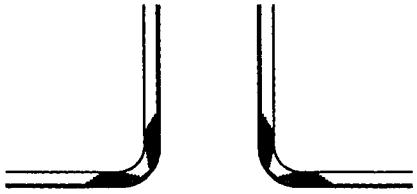
DIVISION OF ENGINEERING

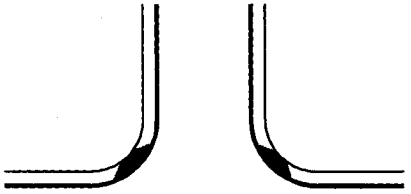
SIDEWALK
RAMP TYPE 2

STANDARD DRAWING NO. 305

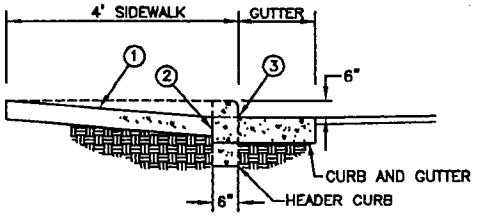
APPROVED 5/1/08
URBAN COUNTY ENGINEER DATE



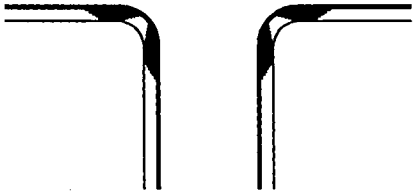
CONDITION 1



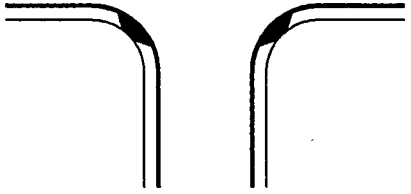
CONDITION 2



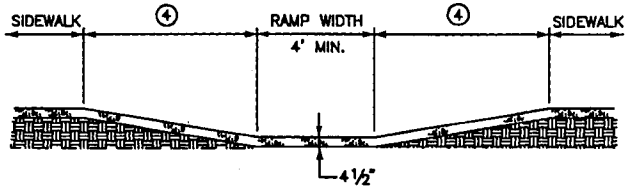

RAMP PROFILE



4' SIDEWALK ADJACENT TO CURB



4' SIDEWALK ADJACENT TO CURB



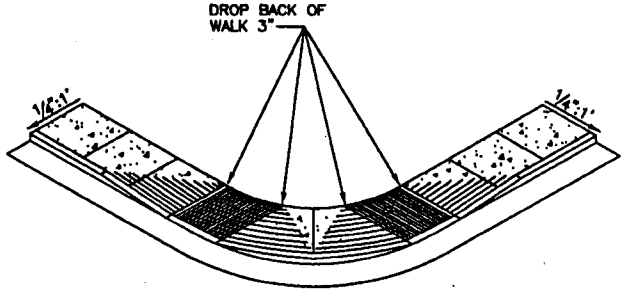

RAMP CROSS-SECTION

NOTES:

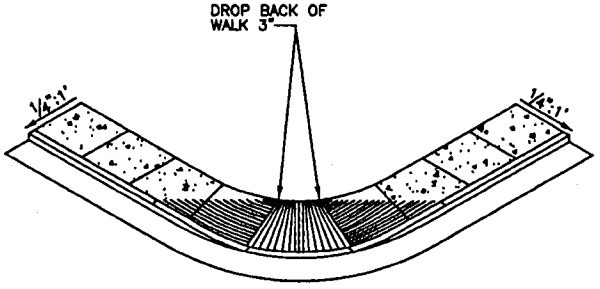
1. INLET LOCATIONS WILL VARY, DEPENDENT ON CROSSWALK AND RAMP LOCATION
2. THE RAMP SHALL BE CONSTRUCTED OF CLASS "A" CONCRETE. STEP-SAFE® TRANSPO INDUSTRIES TILE OR ENGINNEERS APPROVED EQUIVALENT SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
3. THE NORMAL GUTTER LINE SHOULD BE MAINTAINED THROUGH THE RAMP.
4. RAMPS SHOULD BE LOCATED WITHIN MARKED LIMITS OF CROSSWALKS.

SHEET NOTES:

1. MAXIMUM RAMP SLOPE 1":1'.
2. ½" EXPANSION JOINT AT BACK OF CURBLINE AND SIDEWALK LINE.
3. NO BUMP PERMITTED.
4. SLOPE VARIES UNIFORMLY TO A MAXIMUM OF 1":1' AT GUTTER LINE.




CONDITION 1




CONDITION 2

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

SIDEWALK RAMP
TYPE 3

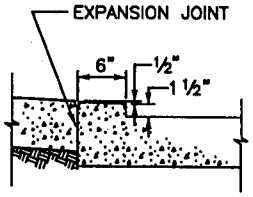
STANDARD DRAWING NO. 306

APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08

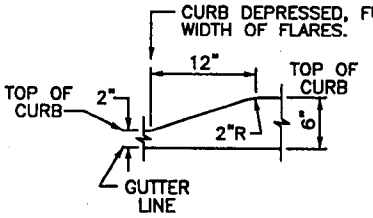
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT

## MAXIMUM ALLOWABLE APRON AND DRIVEWAY WIDTHS

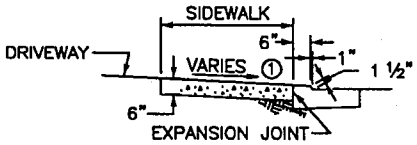
| CLASSIFICATION | DRIVEWAY | APRON |
|---|---|---|
| SINGLE RESIDENTIAL | 12' | 18' |
| DOUBLE OR JOINT RESIDENTIAL | 20' | 26' |



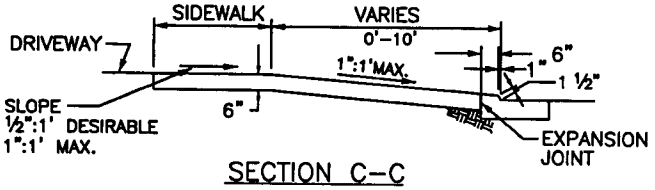

SECTION A–A



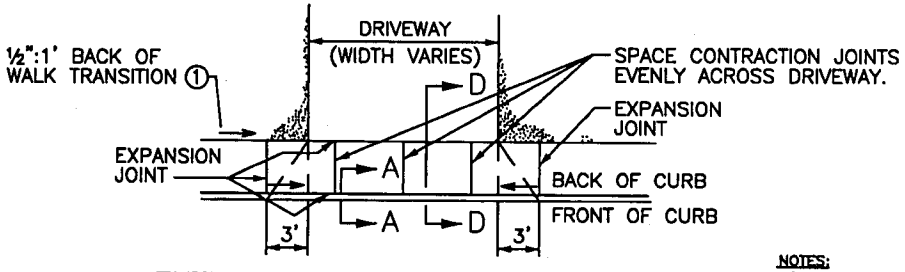

SECTION B–B




SECTION D–D




SECTION C–C

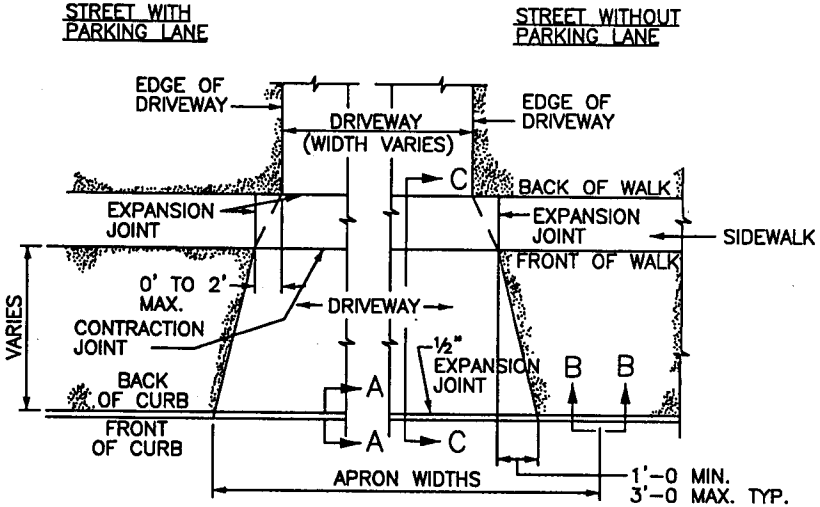



ENTRANCE WITHOUT UTILITY STRIP

NOTES:

① DROP BACK OF SIDEWALK GRADE 1 ½" OVER 3' TO PROVIDE A MAXIMUM SLOPE OF 1":1'.

2. PROVIDE A SAWED JOINT ALONG CENTER LINE OF APRON.
3. MAXIMUM DROP AT BACK OF SIDEWALK SHALL NOT EXCEED 1 ½".
4. MAXIMUM CROSS SLOPE ON SIDEWALK SHALL NOT EXCEED 1":1' (8.3%).
5. MAXIMUM SLOPE ON APRON SHALL NOT EXCEED 1":1' (8.3%).
6. ENTIRE APRON FROM BACK OF CURB TO BACK OF SIDEWALK SHALL BE CONSTRUCTED WITH A SINGLE POUR.




ENTRANCE WITH UTILITY STRIP

NOTE:
FOR USE WITH 6" HEADER CURB OR 6" CURB AND GUTTER

BASED ON UTILITY STRIP WITH ½":1' CROSS SLOPE

| UTILITY STRIP WIDTH | DROP BACK OF 4' SIDEWALK | SIDEWALK SLOPE | SLOPE ON APRON |
|---|---|---|---|
| 0' | 1 ½" | 7.29% | N/A |
| 2' | 1 ½" | 5.21% | 8.33% |
| 4' | 1 ½" | 3.12% | 8.33% |
| 5' | 1 ½" | 2.08% | 8.33% |
| 6' | 1" | 2.08% | 8.33% |
| 8' | 0" | 2.08% | 8.33% |
| 10' | 0" | 2.08% | 7.50% |

BASED ON UTILITY STRIP WITH ¼":1' CROSS SLOPE

| UTILITY STRIP WIDTH | DROP BACK OF 4' SIDEWALK | SIDEWALK SLOPE | SLOPE ON APRON |
|---|---|---|---|
| 0' | 1 ½" | 7.29% | N/A |
| 2' | 1 ½" | 4.17% | 8.33% |
| 3' | 1 ½" | 2.60% | 8.33% |
| 4' | 1" | 2.08% | 8.33% |
| 6' | 0" | 2.08% | 7.64% |
| 8' | 0" | 2.08% | 6.25% |
| 10' | 0" | 2.08% | 5.42% |

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DIVISION OF ENGINEERING

RESIDENTIAL ENTRANCE DETAILS

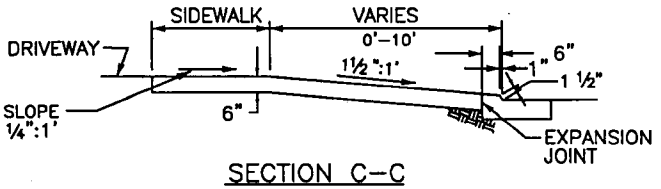
STANDARD DRAWING NO. 307

APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT

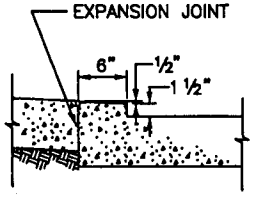
## MAXIMUM ALLOWABLE APRON AND DRIVEWAY WIDTHS

| CLASSIFICATION | DRIVEWAY | STANDARD APRON | ALTERNATE APRON |
|---|---|---|---|
| NON–RESIDENTIAL | 30' | 5' STRAIGHT FLARE=40' CURB CUT | 10' RADIAL FLARE=50' CURB CUT |
| COMMERCIAL LOADING | 30' | 15' STRAIGHT FLARE=60' CURB CUT | 20' RADIAL FLARE=70' CURB CUT |
| INDUSTRIAL | 40' | 20' STRAIGHT FLARE=80' CURB CUT | 25' RADIAL FLARE=90' CURB CUT |

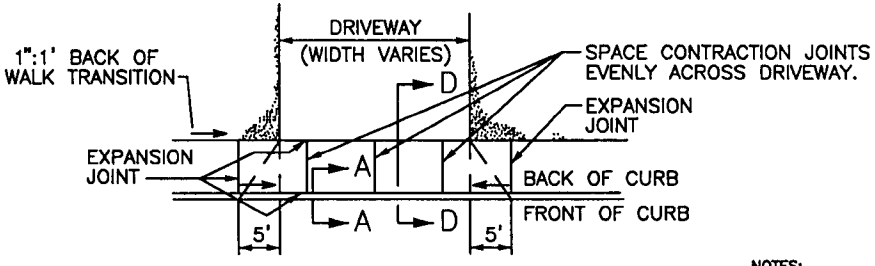



SECTION C–C

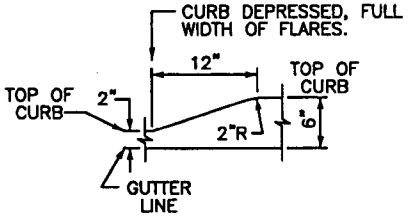
FRONT OF SIDEWALK ELEVATION DETERMINED BY ADDING ½ ": 1' ACROSS UTILITY STRIP FROM TOP OF CURB. IF COMING OFF 1½ " LIP ADD ANOTHER 4½ " TO DETERMINE ELEVATION AT FRONT OF SIDEWALK.



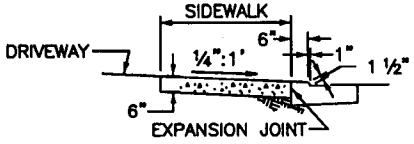

SECTION A–A



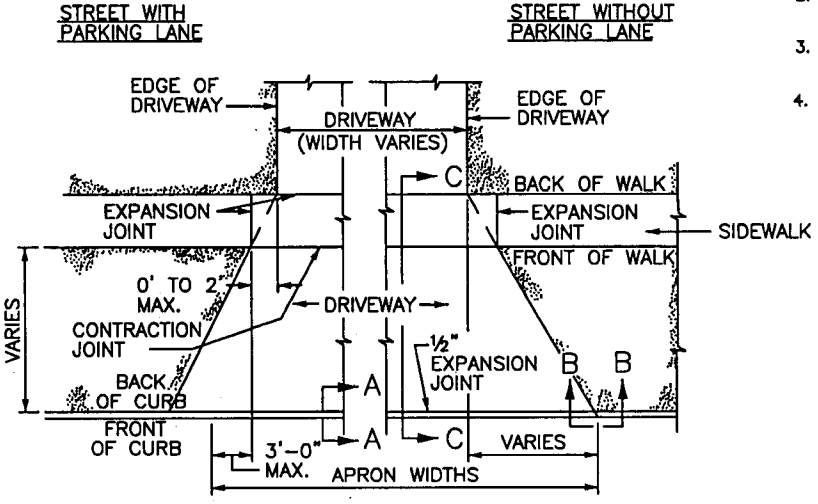

ENTRANCE WITHOUT UTILITY STRIP




SECTION B–B




SECTION D–D




ENTRANCE WITH UTILITY STRIP

NOTES:

1. PROVIDE A SAWED JOINT ALONG CENTER LINE OF APRON.
2. MAXIMUM CROSS SLOPE ON SIDEWALK SHALL NOT EXCEED ¼":1'.
3. MAXIMUM SLOPE ON APRON SHALL NOT EXCEED 1½":1'.
4. NO CATCH BASINS WILL BE PUT IN APRONS.

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

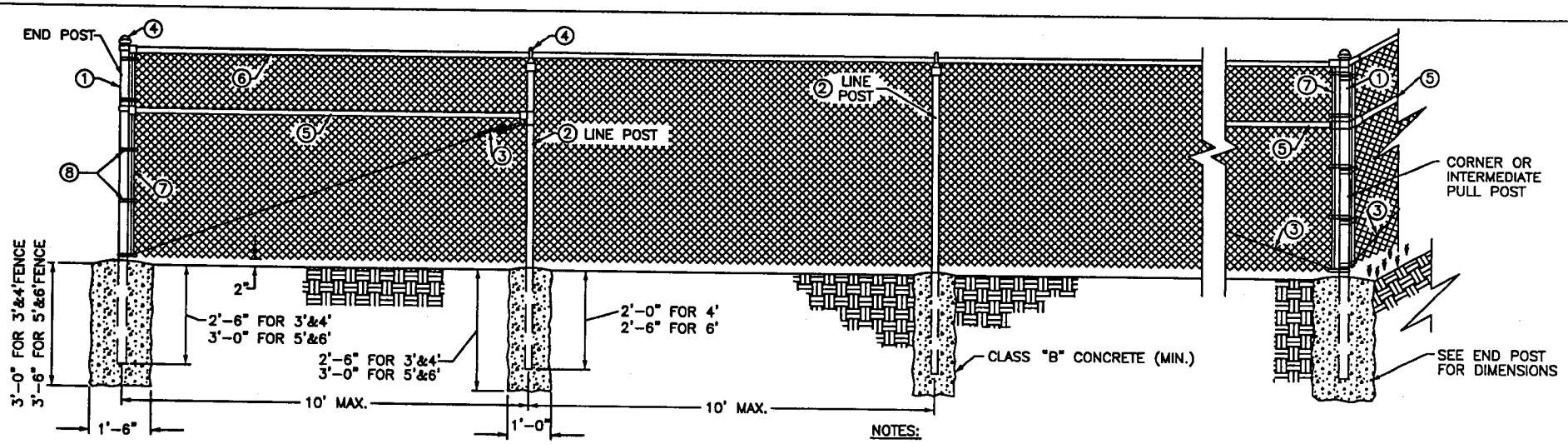
COMMERCIAL ENTRANCE DETAILS

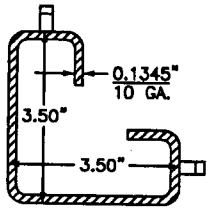
STANDARD DRAWING NO. 307–1

APPROVED 5/1/08
URBAN COUNTY ENGINEER DATE

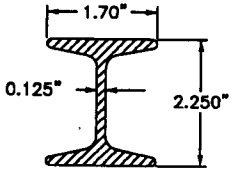
5/1/08
COMMISSIONER DATE

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT

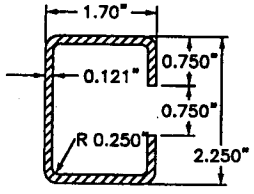


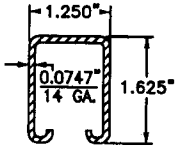

TERMINAL POST & CORNER POST




LINE POST H-COLUMN




LINE POST HEAVY "C" ROLL FORM



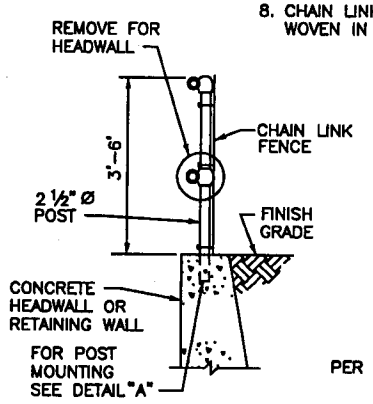

TOP & BRACE RAIL

LEGEND-(ALTERNATES)

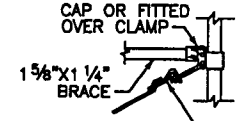
| | TUBULAR | ROLL FORMED |
|---|---|---|
| ① | 2 ½" O.D. ● 3.65#/L.F. | 3.5"X3.5" ● 5.14#/L.F. |
| ② | 2" O.D. ● 2.72#/L.F. | 2.250" H-COL.● 3.26#/L.F. OR 2.250" C-COL.● 2.64#/L.F. |
| ③ | ⅜" Ø TRUSS ROD & TIGHTENER | 0.375"Ø TRUSS ROD & TIGHTENER |
| ④ | APPROVED CAPS | NOT REQUIRED |
| ⑤ | 1⅝" BRACE ● 2.27#/L.F. | 1.250"X1.625" ● 1.35#/L.F. |
| ⑥ | 1⅝" O.D. ● 2.27#/L.F. | 1.250"X1.625" ● 1.35#/L.F. |
| ⑦ | 3/16"X¾" FLAT STRETCHER BAR | NOT REQUIRED |
| ⑧ | BRACE BAND & TENSION BAND | NOT REQUIRED |

NOTES:

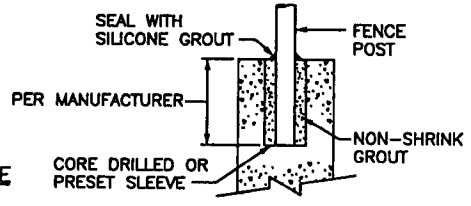
1. ALL POSTS SHALL BE SET IN CONCRETE TO THE DIMENSIONS AS INDICATED ON THIS DRAWING.
2. 3' HIGH FENCE SHALL HAVE 3' FABRIC HEIGHT. 4' HIGH FENCE SHALL HAVE 4' FABRIC HEIGHT. 5' HIGH FENCE SHALL HAVE 5' FABRIC HEIGHT. 6' HIGH FENCE SHALL HAVE 6' FABRIC HEIGHT.
3. BRACE BANDS SHALL BE ⅞"X⅛" GALVANIZED STEEL 5/16"X1 ¼" CARRIAGE BOLT.
4. POST CAPS AND SOCKET TYPE BRACE END CONNECTIONS SHALL BE GALVANIZED MALLEABLE IRON OR OTHER TYPE AS APPROVED BY THE ENGINEER. THEY SHALL BE DESIGNED IN A MANNER TO EXCLUDE MOISTURE FROM INSIDE POSTS AND RAILS.
5. O.D. DEPICTED FOR TUBULAR POSTS IS NOMINAL-ASTM A-120 SHALL GOVERN.
6. STRUCTURAL SHAPES SHALL CONFORM TO STD. SPEC. 816.07.01 EXCEPT YIELD SHALL BE A MIN. 45,000 P.S.I.
7. INDISCRIMINATE MIXING OF POSTS WILL NOT BE PERMITTED.
8. CHAIN LINK FENCE FABRIC SHALL BE 0.148 INCH NOMINAL DIAMETER (NO. 9 GAGE) WIRE WOVEN IN 2 INCH MESH.




CHAIN LINK FENCE MOUNTED TO CONCRETE HEADWALL OR RETAINING WALL




BRACE & TRUSS CONNECTION




DETAIL "A"

| NO. | DATE | REVISION DESCRIPTION | BY |
|---|---|---|---|
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DIVISION OF ENGINEERING

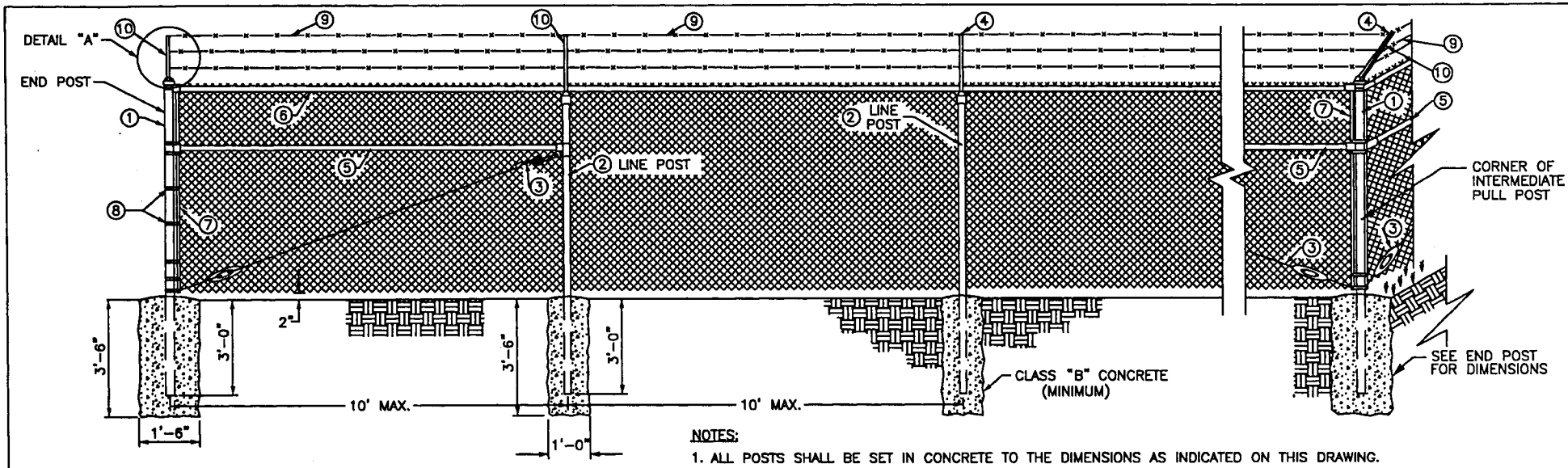
CHAIN LINK FENCE
3'-6"

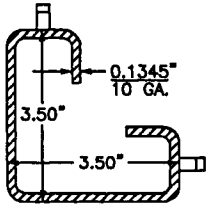
STANDARD DRAWING NO. 308

APPROVED _____ DATE 5/1/08
URBAN COUNTY ENGINEER

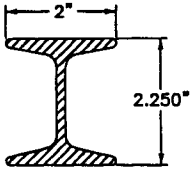
_____ DATE 5/1/08
COMMISSIONER

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT

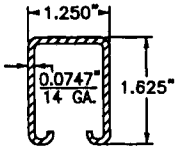



TERMINAL POST & CORNER POST




LINE POST



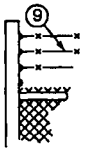

TOP & BRACE RAIL

LEGEND–(ALTERNATES)

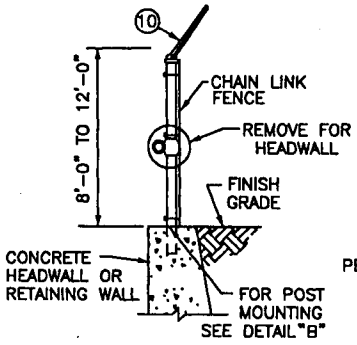
| | TUBULAR | ROLL FORMED |
|---|---|---|
| ① | 2 ½" O.D. @ 3.65#/L.F. | 3.5"X3.5" @ 5.14#/L.F. |
| ② | 2" O.D. @ 2.72#/L.F. | 2.250" H–COL. @ 3.26#/L.F. OR 2.250" C–COL. @ 2.64#/L.F. |
| ③ | ⅜" Ø TRUSS ROD & TIGHTENER | 0.375" Ø TRUSS ROD & TIGHTENER |
| ④ | APPROVED CAPS | NOT REQUIRED |
| ⑤ | 1 ⅝" BRACE @ 2.27#/L.F. | 1.250"X1.625" @ 1.35#/L.F. |
| ⑥ | 1 ⅝" O.D. @ 2.27#/L.F. | 1.250"X1.625" @ 1.35#/L.F. |
| ⑦ | 3/16"X ¾" FLAT STRETCHER BAR | NOT REQUIRED |
| ⑧ | BRACE BAND & TENSION BAND | NOT REQUIRED |
| ⑨ | BARBED WIRE | BARBED WIRE |
| ⑩ | BARBED WIRE ARMS | BARBED WIRE ARMS |

NOTES:

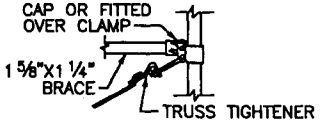
1. ALL POSTS SHALL BE SET IN CONCRETE TO THE DIMENSIONS AS INDICATED ON THIS DRAWING.
2. A 1 ⅝" O.D. AT 2.27 LB. PER L.F. OR 1 ¼"X1 ⅝" ROLL FORMED SECTION AT 1.35 LB. PER L.F. BOTTOM RAIL SHALL BE REQUIRED AROUND ALL UTILITY INSTALLATIONS AND AT OTHER LOCATIONS DESIGNATED BY THE ENGINEER.
3. 8' HIGH FENCE SHALL HAVE 7' FABRIC HEIGHT. 9' HIGH FENCE SHALL HAVE 8' FABRIC HEIGHT. 10' HIGH FENCE SHALL 9' FABRIC HEIGHT. 11' HIGH FENCE SHALL HAVE 10' FABRIC HEIGHT. 12' HIGH FENCE SHALL HAVE 11' FABRIC HEIGHT.
4. BRACE BAND SHALL BE ⅞"X⅛" GALVANIZED STEEL WITH 5/16"X1 ¼" CARRIAGE BOLTS. POST CAPS AND SOCKET TYPE BRACE END CONNECTION SHALL BE GALVANIZED MALLEABLE IRON OR OTHER TYPE AS APPROVED BY THE ENGINEER. THEY SHALL BE DESIGNED IN A MANNER TO EXCLUDE MOISTURE FROM INSIDE POSTS AND RAILS.
5. O.D. DEPICTED FOR TUBULAR POSTS IS NOMINAL – ASTM A–120 SHALL GOVERN.
6. CHAIN LINK FENCE FABRIC SHALL BE 0.148 INCH NOMINAL DIAMETER (NO.9 GAGE) WIRE WOVEN IN 2 INCH MESH.



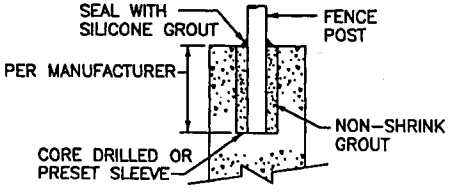

DETAIL "A" ROLL FORMED




CHAIN LINK FENCE MOUNTED TO CONCRETE HEADWALL OR RETAINING WALL




BRACE & TRUSS CONNECTION




DETAIL "B"

| NO. | DATE | REVISION DESCRIPTION | BY |
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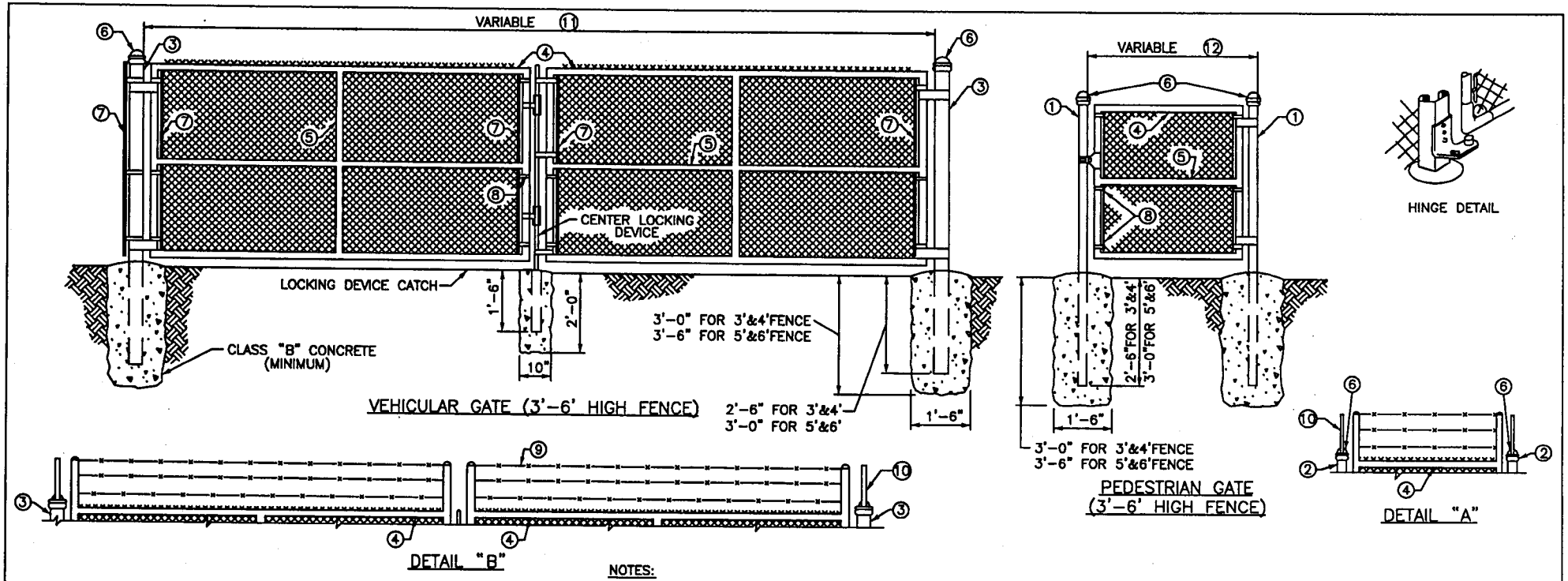
DIVISION OF ENGINEERING

CHAIN LINK FENCE
8'–12'

STANDARD DRAWING NO. 309

APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




LEGEND – (ALTERNATES)

| | TUBULAR | ROLL FORMED |
|---|---|---|
| ① | END POST 2½" O.D. @ 3.65#/L.F. | 3½"X3½" @ 5.14#/L.F. |
| ② | END POST 3" O.D. @ 3.65#/L.F. | 3½"X3½" @ 5.14#/L.F. |
| ③ | 4" O.D. @ 9.1#/L.F. GATE POST | NO ALTERNATE |
| ④ | 2" O.D. @ 2.72#/L.F. GATE FRAME | NO ALTERNATE |
| ⑤ | 1⅝" O.D. @ 2.27#/L.F. | NO ALTERNATE |
| ⑥ | APPROVED CAPS | NOT REQUIRED |
| ⑦ | 3/16"X⅝" FLAT STRETCHER BAR | NOT REQUIRED |
| ⑧ | BRACE BAND & TENSION BAND | NOT REQUIRED |
| ⑨ | BARBED WIRE | BARBED WIRE |
| ⑩ | BARBED WIRE ARMS | BARBED WIRE ARMS |

NOTES:

1. ALL POSTS SHALL BE SET IN CONCRETE TO THE DIMENSIONS AS INDICATED ON THIS DRAWING.
2. VEHICULAR AND PEDESTRIAN GATES SHALL HAVE HEAVY PRESSED STEEL CORNERS SECURELY RIVETED OR SHALL BE MACHINE NOTCHED, AND ELECTRICALLY WELDED SO AS TO BE RIGID AND WATER TIGHT; AND EQUIPPED WITH PADLOCKING DEVICE AND GROUND STOP.
3. ALL WELDED JOINTS SHALL BE CLEANED AND PAINTED WITH TWO (2) COATS OF ALUMINUM PAINT.
4. 3' HIGH GATES SHALL HAVE 3' FABRIC HEIGHT. 4' HIGH GATES SHALL HAVE 4' FABRIC HEIGHT. 5' HIGH GATES SHALL HAVE 5' FABRIC HEIGHT. 6' HIGH GATES SHALL HAVE 6' FABRIC HEIGHT. 8' HIGH GATES SHALL HAVE 7' FABRIC HEIGHT. 9' HIGH GATES SHALL HAVE 8' FABRIC HEIGHT. 10' HIGH GATES SHALL HAVE 9' FABRIC HEIGHT. 11' HIGH GATES SHALL HAVE 10' FABRIC HEIGHT. 12' HIGH GATES SHALL HAVE 11' FABRIC HEIGHT.
5. SEE DETAIL "A" FOR BARBED WIRE INSTALLATION ON 8' TO 12' HIGH PEDESTRIAN GATES.
6. SEE DETAIL "B" FOR BARBED WIRE INSTALLATION ON 8' TO 12' HIGH VEHICULAR GATES.
7. THE CONTRACTOR IS NOT TO ORDER GATES UNTIL THEIR NECESSITY AND LOCATION HAVE BEEN CERTIFIED BY THE ENGINEER.
8. O.D. DEPICTED FOR TUBULAR POSTS IS NOMINAL – ASTM A-120 SHALL GOVERN.
9. CHAIN LINK FENCE FABRIC SHALL BE 0.148 INCH NOMINAL DIAMETER (NO.9 GAGE) WIRE WOVEN 2 INCH MESH.

⑪ 6' TO 13' WIDTH FOR SINGLE GATE OR 12' TO 26' WIDTH FOR DOUBLE GATE.

⑫ 4' TO 6' WIDTH

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

# CHAIN LINK GATE

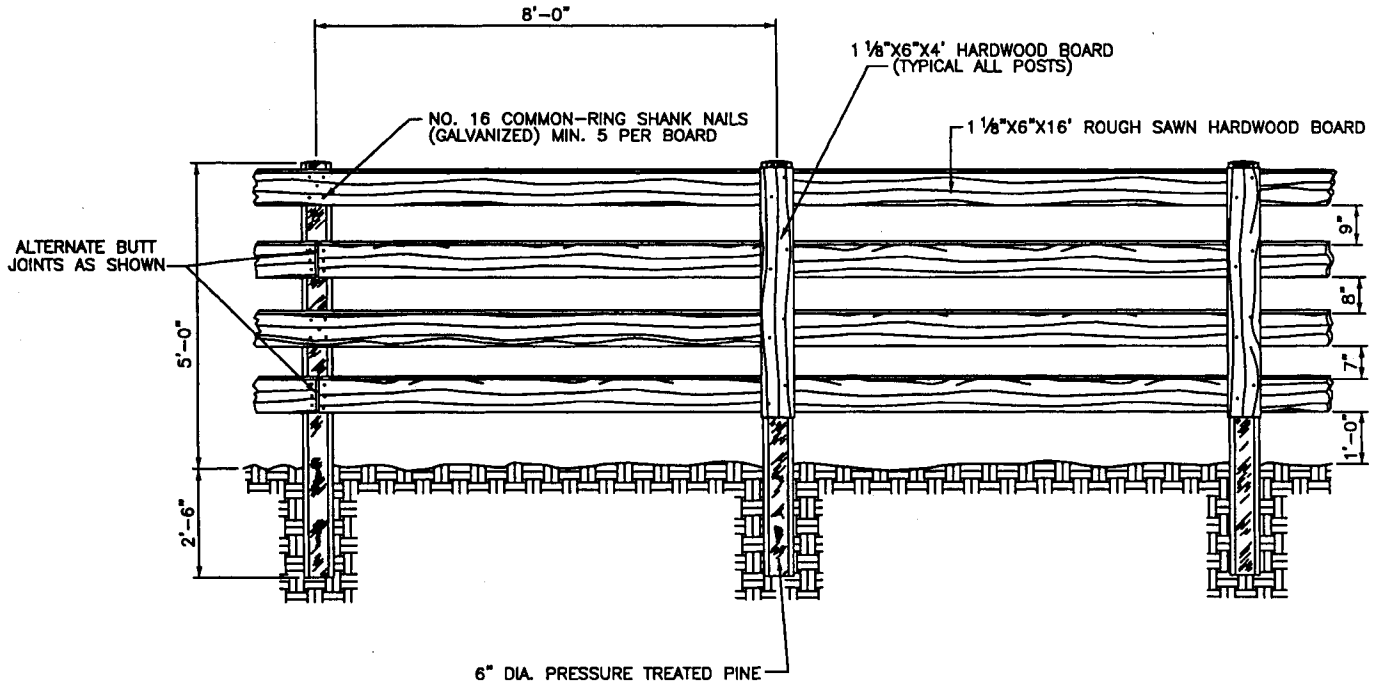
STANDARD DRAWING NO. 310

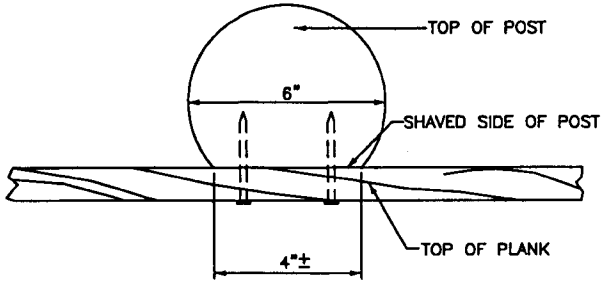
APPROVAL

URBAN COUNTY ENGINEER — DATE 5/1/08

COMMISSIONER — DATE 5/1/08

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




NOTES:

1. POSTS ARE TO BE DRIVEN 2'-6" INTO GROUND AND TOPS CUT AT AN ANGLE TO DRAIN WATER.
2. FENCE SHALL BE PAINTED BLACK OR WHITE WITH PAINT AND APPLICATION RATE AS APPROVED BY THE ENGINEER.
3. HARDWOODS APPROVED ARE RED OAK, WHITE OAK, AND POPLAR.

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

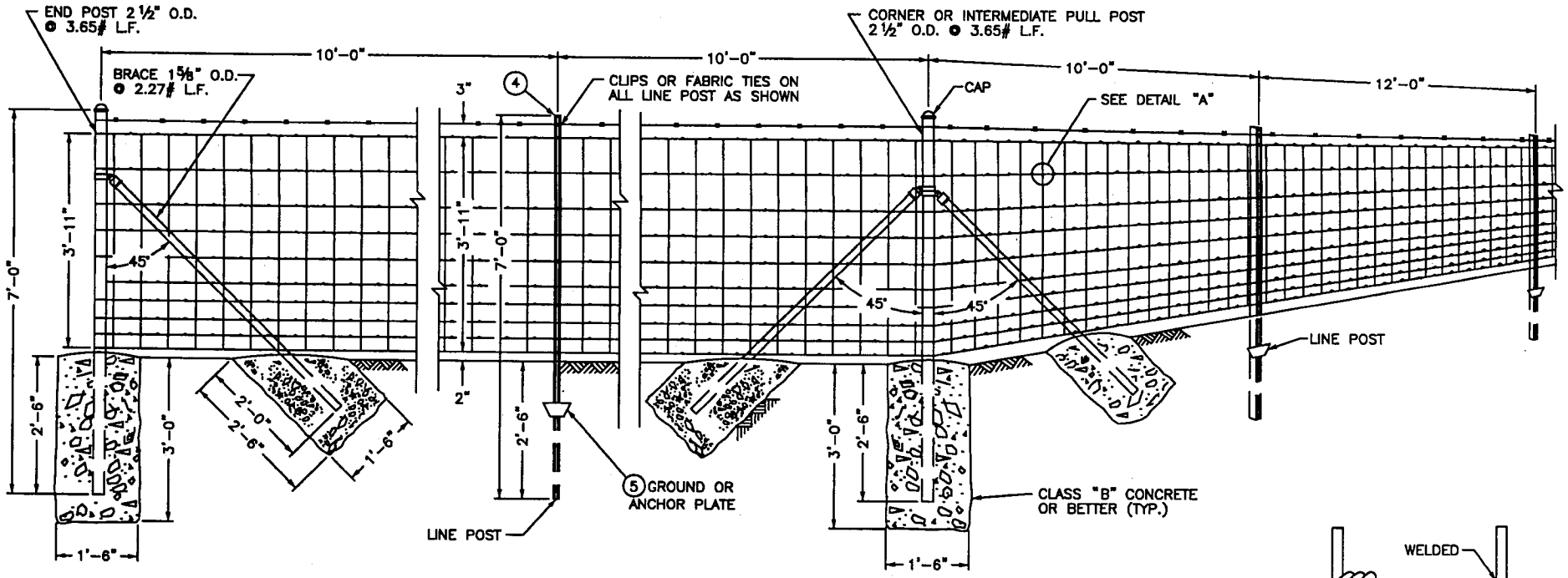
PLANK FENCE

STANDARD DRAWING NO. 311

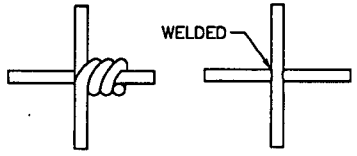
APPROVED _____ DATE 5/1/08
URBAN COUNTY ENGINEER

_____ DATE 5/1/08
COMMISSIONER

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




RIGHT-OF-WAY FENCE




ALTERNATE METHODS OF SECURING VERTICAL STAY WIRE TO THE HORIZONTAL WIRE OF THE FABRIC.

DETAIL "A"

NOTES:

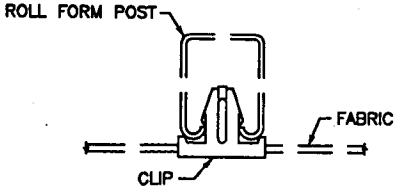
1. WOVEN-WIRE USED FABRIC IN RIGHT-OF-WAY FENCE SHALL BE EITHER ALUMINUM-COATED STEEL NO. 1047-6-9 OR ZINC-COATED STEEL NO. 1047-6-9.
2. ALL FENCE FITTINGS SHALL COMPLY WITH ASTM F 626.
3. O.D. DEPICTED FOR TUBULAR POSTS IS NOMINAL – ASTM F 1083 SHALL GOVERN.

(4) STUDDED "T" POST AT 1.33 LBS. PER FOOT.

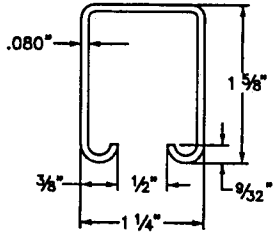
– OR –

ROLL FORM POST AT 1.35 LBS. PER FOOT. (SEE DETAIL)

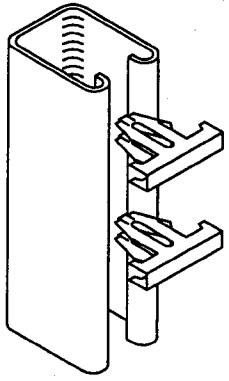
(5) NOT REQUIRED FOR ROLL FORM POST.




PLAN VIEW OF CLIP
INSTALLED IN ROLL FORM POST




PLAN VIEW OF
ROLL FORM POST



ISOMETRIC EXPLODED VIEW
OF ROLL FORM POST AND CLIPS

CLIPS SHALL BE SPRING STEEL ALUMINUM – FINISHED

| NO. | DATE | REVISION DESCRIPTION | BY |
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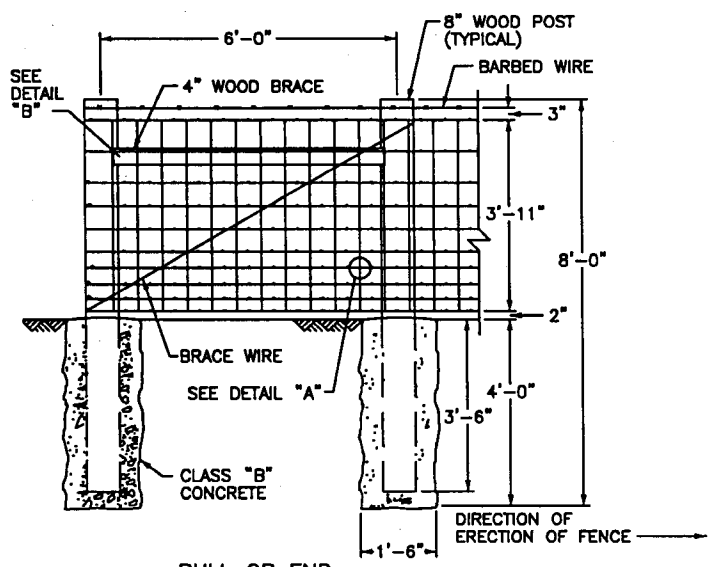
DIVISION OF ENGINEERING

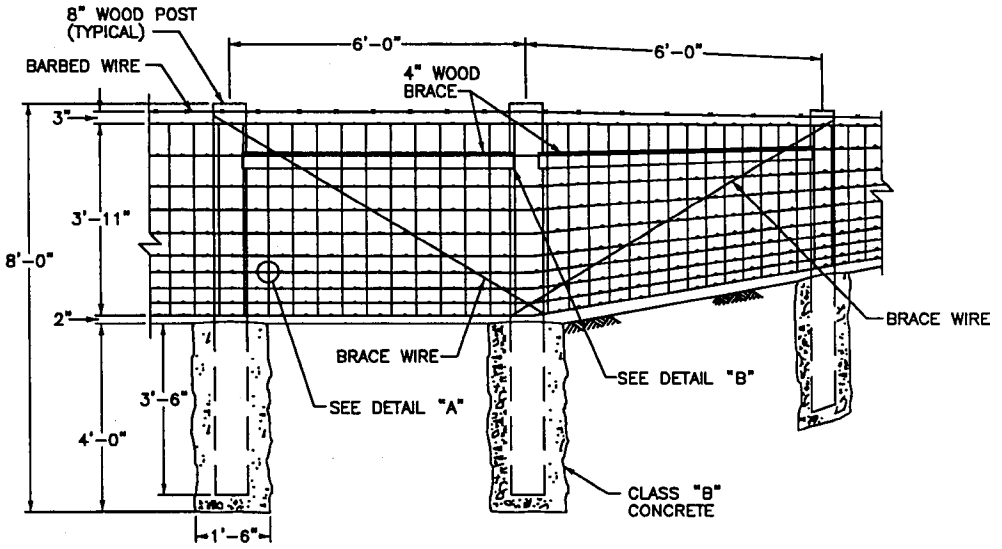
WOVEN WIRE
RIGHT-OF-WAY FENCE
TYPE 1

| | |
|---|---|
| STANDARD DRAWING NO. | 312 |
| APPROVED: URBAN COUNTY ENGINEER | DATE 5/1/08 |
| COMMISSIONER | DATE 5/1/08 |

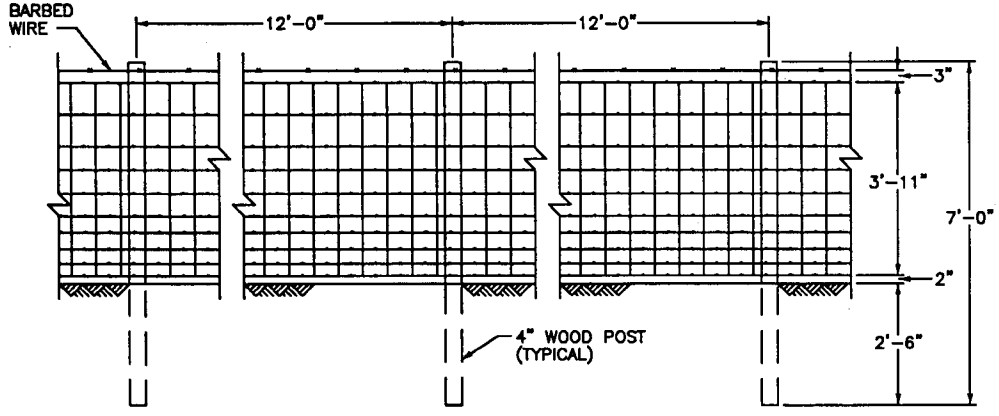
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT



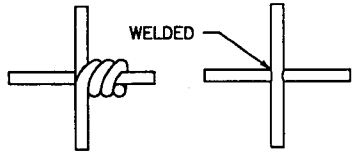

PULL OR END POST ASSEMBLY




CORNER POST ASSEMBLY

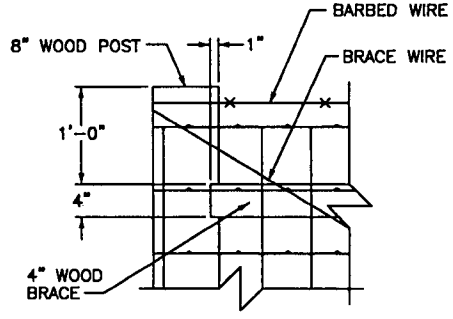



LINE POST




ALTERNATE METHODS OF SECURING VERTICAL STAY WIRE TO THE HORIZONTAL WIRE OF THE FABRIC.

DETAIL "A"




DETAIL "B"

NOTES:

1. ON INTERMEDIATE PULL POST ASSEMBLIES, BRACE WIRES SHALL BE REQUIRED FOR BOTH DIRECTIONS.
2. WOVEN-WIRE FABRIC USED IN RIGHT-OF-WAY FENCE SHALL BE EITHER ALUMINUM-COATED STEEL NO. 1047-6-9 OR ZINC-COATED STEEL NO. 1047-6-9.

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

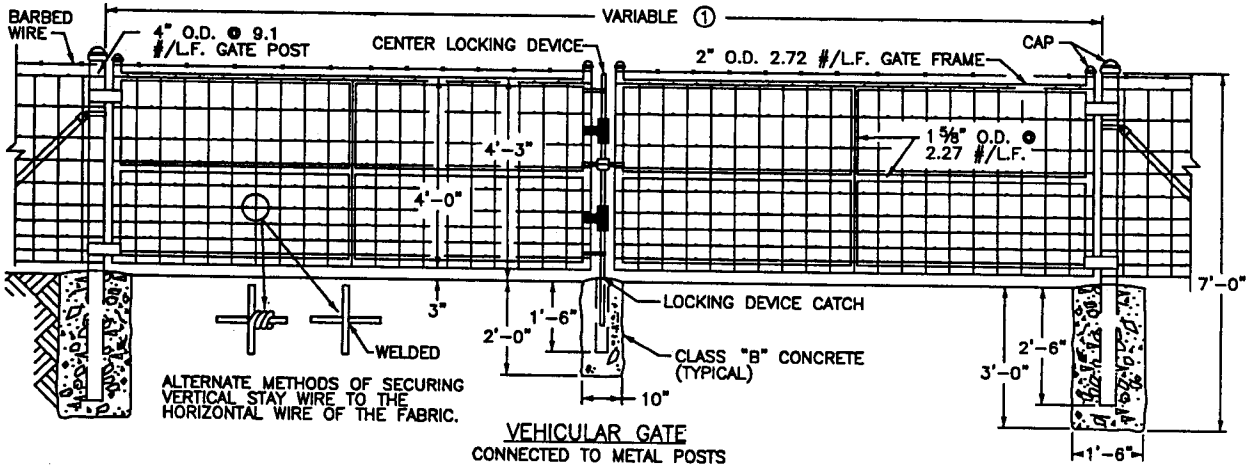
WOVEN WIRE
RIGHT-OF-WAY FENCE
TYPE 2

STANDARD DRAWING NO. 313

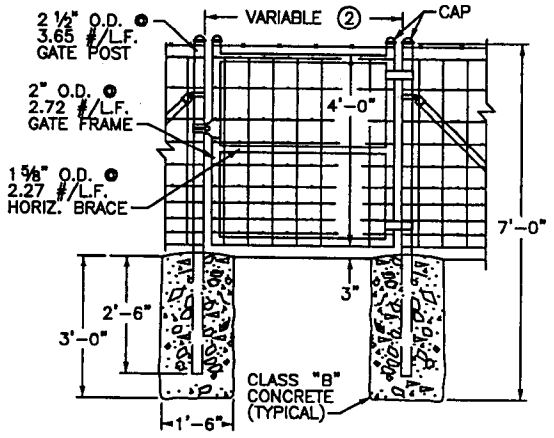
APPROVED: 5/1/08
URBAN COUNTY ENGINEER — DATE

5/1/08
COMMISSIONER — DATE

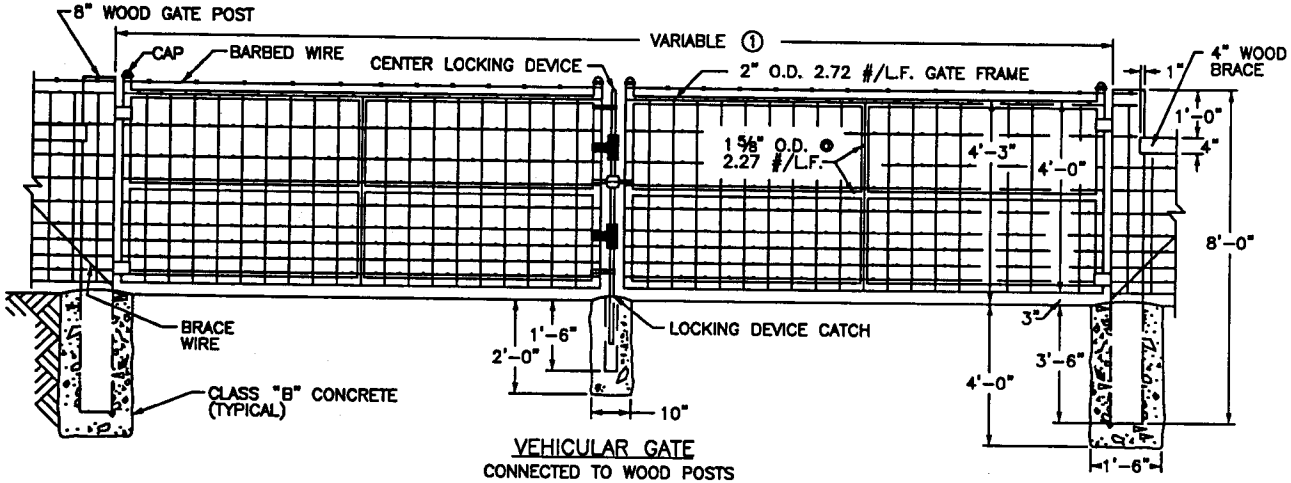
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT



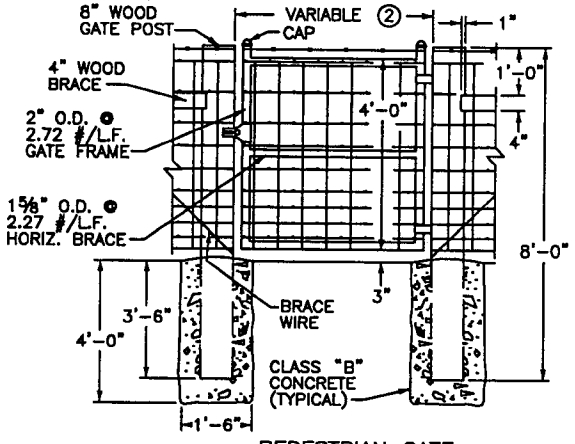

VEHICULAR GATE
CONNECTED TO METAL POSTS




PEDESTRIAN GATE
CONNECTED TO METAL POSTS




VEHICULAR GATE
CONNECTED TO WOOD POSTS




PEDESTRIAN GATE
CONNECTED TO WOOD POSTS

NOTES:

**BASIS OF PAYMENT:**

THE CONTRACT UNIT PRICE FOR WOVEN WIRE GATES SHALL BE:

① FEET WIDE SINGLE VEHICULAR WOVEN WIRE GATE
① FEET WIDE DOUBLE VEHICULAR WOVEN WIRE GATE
② FEET WIDE PEDESTRIAN WOVEN WIRE GATE
① – ② AS SHOWN ON PLANS

**CONSTRUCTION REQUIREMENTS:**

FABRIC TIE WIRES SHALL BE SPACED 12 INCHES ON CENTERS. THE CONTRACTOR IS NOT TO ORDER GATES UNTIL THEIR NECESSITY AND LOCATION HAVE BEEN CERTIFIED BY THE ENGINEER.

**MATERIALS:**

WOVEN-WIRE FABRIC USED IN THE GATES SHALL EITHER BE ALUMINUM-COATED STEEL NO. 1047-6-9 OR ZINC-COATED STEEL NO. 1047-6-9.

O.D. DEPICTED FOR TUBULAR POSTS IS NOMINAL – ASTM F 1083 SHALL GOVERN.

GATES SHALL HAVE HEAVY PRESSED STEEL CORNERS SECURELY RIVETED OR SHALL BE MACHINE NOTCHED AND ELECTRICALLY WELDED SO AS TO BE RIGID AND WATER TIGHT. ALL WELDED JOINTS SHALL BE CLEANED AND PAINTED WITH TWO (2) COATS OF ALUMINUM PAINT.

**GENERAL:**

① 6' TO 13' WIDTH FOR SINGLE GATE AND 12' TO 26' WIDTH FOR DOUBLE GATE.
② 4' TO 6' WIDTH

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DIVISION OF ENGINEERING

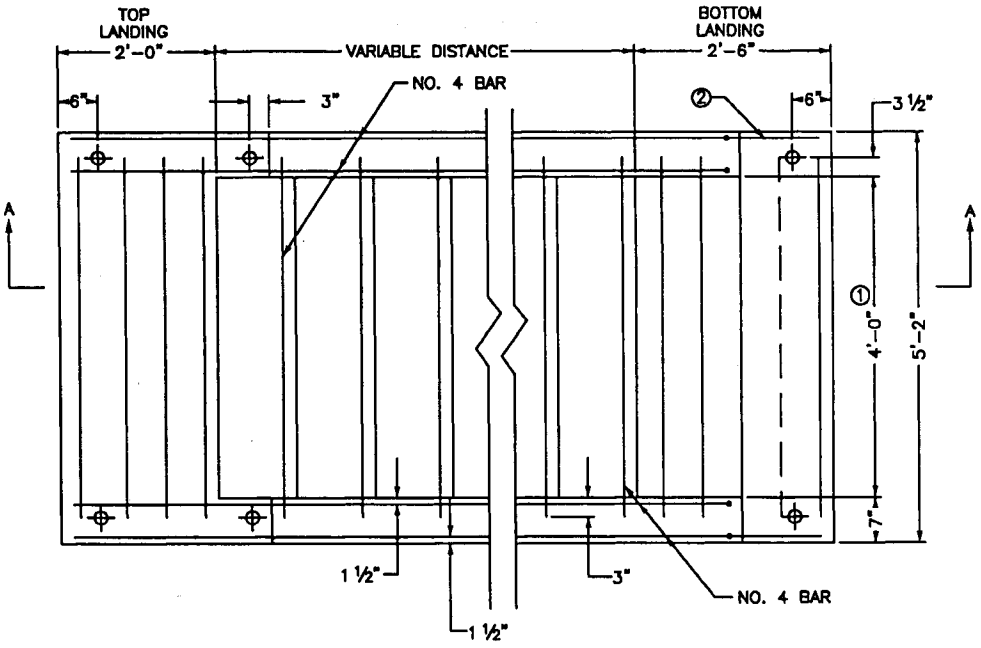
WOVEN WIRE GATES

STANDARD DRAWING NO. 314

APPROVED _____ DATE 5/1/08
URBAN COUNTY ENGINEER

_____ DATE 5/1/08
COMMISSIONER

LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




PLAN

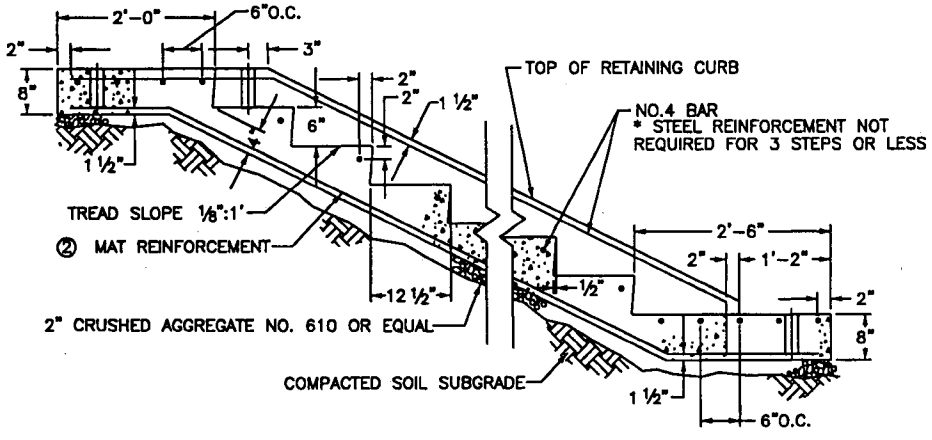
NOTES:

1. MAT REINFORCEMENT ②
   NO. 4 REINFORCEMENT BARS, LONG. BARS 6"O.C. AND TRANSV. BARS 12"O.C., MIN. GRADE 40, OR WELDED WIRE FABRIC–6X6–W4XW4, 58 LBS./100 SQ. FT.
2. NO. 4 REINFORCEMENT BARS ADDITIONALLY AS SHOWN.
3. ROUND ALL EXPOSED EDGES AND CORNERS ¼" R.
4. MAT REINFORCEMENT IN BOTTOM OF THE STEPS SHALL BE WIRE FABRIC OR BAR MAT ② .
5. HANDRAIL SHALL BE REQUIRED WITH THREE OR MORE STEPS.

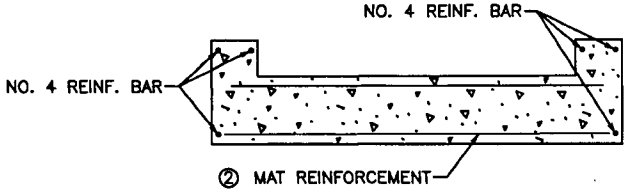
TABLE OF QUANTITIES

| SLOPE | LOCATION | ADDITIONAL NO. 4 BAR REINF. (LBS) | | MAT REINFORCEMENT WIRE FABRIC(SQ.FT.) | | MAT REINFORCEMENT BAR MAT (LBS) | | CU. YDS. CLASS "A" CONCRETE | |
|---|---|---|---|---|---|---|---|---|---|
| | | 4' WIDTH | ① | 4' WIDTH | ① | 4' WIDTH | ① | 4' WIDTH | ① |
| 2:1 | BOTTOM LANDING | 23.547 | 3.340 | 11.776 | 2.375 | 27.388 | 5.177 | 0.337 | 0.059 |
| | INTERMEDIATE STEP | 8.015 | 1.336 | 5.991 | 1.208 | 12.191 | 2.283 | 0.16 | 0.025 |
| | TOP LANDING | 22.483 | 3.340 | 9.504 | 1.917 | 20.708 | 3.897 | 0.265 | 0.051 |
| 1½:1 | BOTTOM LANDING | 23.603 | 3.340 | 12.602 | 2.542 | 28.613 | 5.400 | 0.36 | 0.062 |
| | INTERMEDIATE STEP | 7.431 | 1.336 | 5.268 | 1.063 | 11.119 | 2.088 | 0.17 | 0.027 |
| | TOP LANDING | 22.545 | 3.340 | 9.710 | 1.958 | 21.014 | 3.952 | 0.281 | 0.054 |

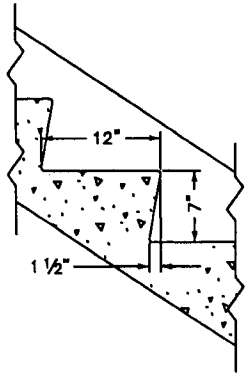
① APPROXIMATE QUANTITY TO ADD FOR EACH ADDITIONAL FOOT OF WIDTH OVER 4'–0".




SECTION A–A 2:1 SLOPE




STEP CROSS SECTION




STEP DETAIL FOR 1 ½:1 SLOPE

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

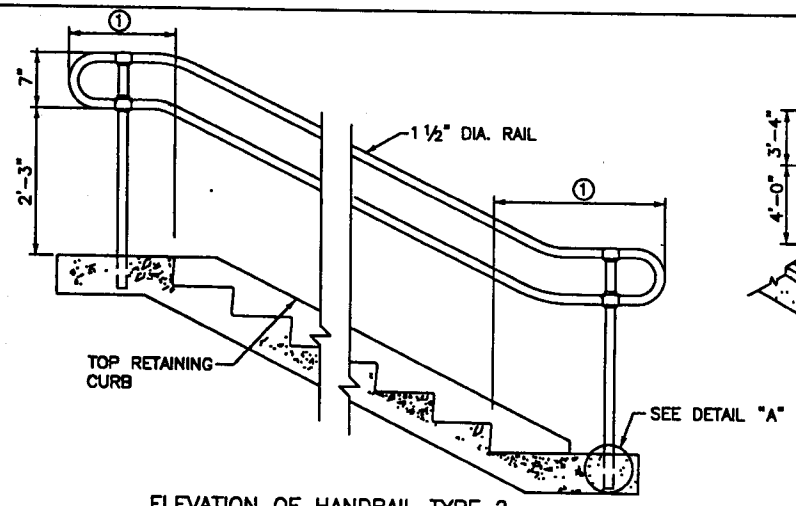
CONCRETE STEPS

STANDARD DRAWING NO. 315

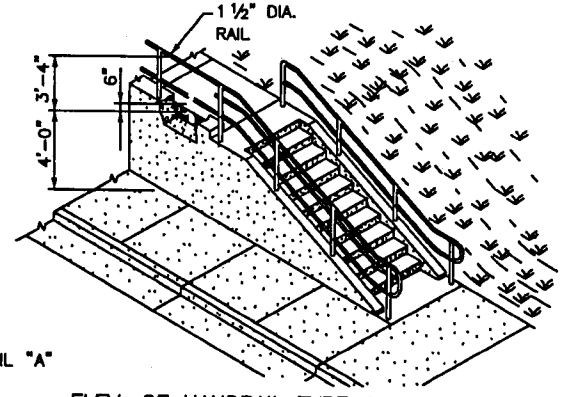
APPROVED 5/1/08
URBAN COUNTY ENGINEER DATE

5/1/08
COMMISSIONER DATE

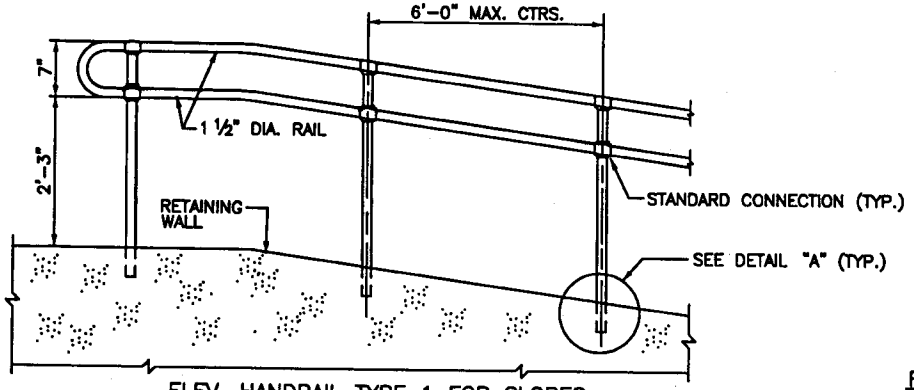
LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT



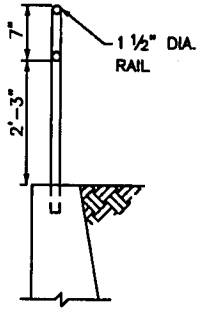

ELEVATION OF HANDRAIL TYPE 2



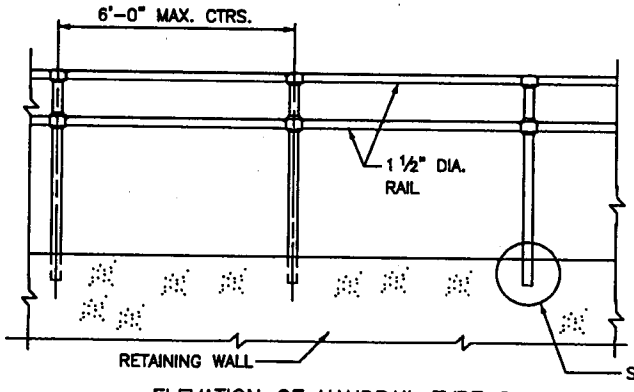

ELEV. OF HANDRAIL TYPE 1



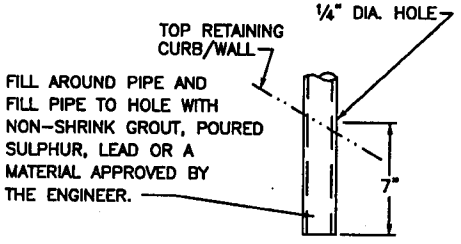

ELEV. HANDRAIL TYPE 1 FOR SLOPES




RT. SIDE ELEVATION




ELEVATION OF HANDRAIL TYPE 2




DETAIL "A"

NOTES:

1. ALL HANDRAILS SHALL COMPLY WITH THE LATEST EDITION OF THE AMERICANS WITH DISABILITIES ACT (ADA) GUIDELINES.
2. ANCHOR POST IN CORED OR FORMED HOLES (SEE DETAIL "A").
3. HANDRAIL SHALL BE REQUIRED WITH THREE OR MORE STEPS.
4. HANDRAIL USED AS A TOP HANDRAIL ON STEPS AND HANDRAIL USED ON A RETAINING WALL SHALL BE REQUIRED WHEN THE ADJACENT FLOOR, GROUND LEVEL, ROAD, WALK, ETC. IS 4' OR MORE BELOW THE TOP OF THE RETAINING WALL. HANDRAIL SHALL BE UNIFORMLY CONSTRUCTED.
5. THE TOP OF THE RETAINING WALL OR CURB SHALL BE A MINIMUM OF 6" ABOVE THE ADJOINING SIDEWALK.
6. RAILS SHALL NOT ROTATE IN FITTINGS AND SHALL HAVE WELDED CONNECTIONS.
7. THE CLEAR SPACE BETWEEN HANDRAILS AND WALL SHALL BE 1½".
8. HANDRAILS SHOULD BE CONSTRUCTED OF DN 40 SCHEDULE 40 ALUMINUM PIPE IN ACCORDANCE WITH ASTM-B221 OR B210 ALLOY 6061-T6.

SHEET NOTE: ◯

① HANDRAILS SHALL EXTEND 12" BEYOND THE TOP RISER AND AT LEAST 12" PLUS THE WIDTH OF ONE TREAD BEYOND THE BOTTOM RISER. AT THE TOP, THE EXTENSION SHALL BE PARALLEL WITH THE FLOOR OR GROUND SURFACE. AT THE BOTTOM, THE HANDRAIL SHALL CONTINUE TO SLOPE FOR A DISTANCE OF THE WIDTH OF ONE TREAD FROM THE BOTTOM RISER, THE REMAINDER OF THE EXTENSION SHALL BE HORIZONTAL.

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DIVISION OF ENGINEERING

HANDRAIL

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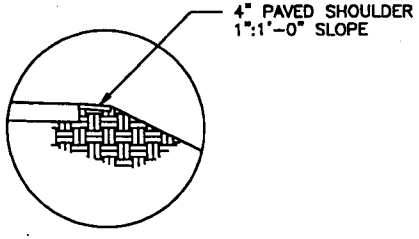
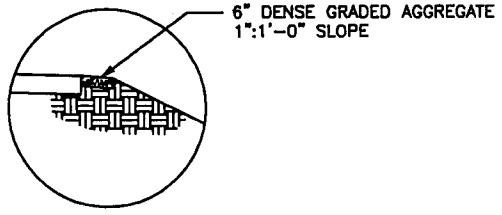
| STANDARD DRAWING NO. | 316 |
| APPROVED: URBAN COUNTY ENGINEER | DATE 5/1/08 |
| COMMISSIONER | DATE 5/1/08 |

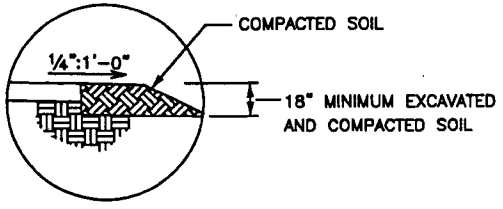
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT



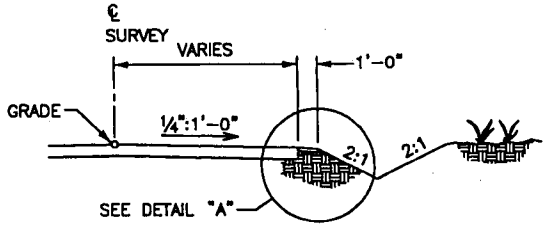

DETAIL "A"



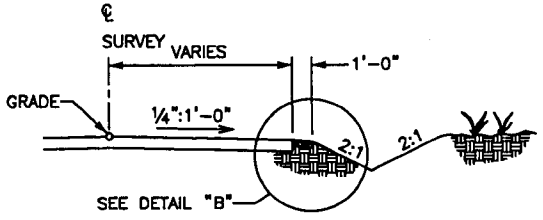

DETAIL "B"



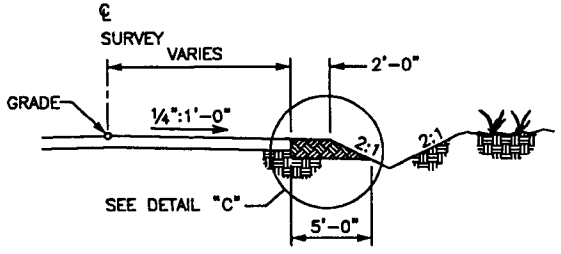

DETAIL "C"




PAVED SHOULDER




ROCK SHOULDER




SOIL SHOULDER

NOTES:

1. SLOPES AND DRAINAGE DITCHES OUTSIDE THE R/W SHALL BE APPROVED BY THE ENGINEER.
2. DRAINAGE DITCH SIDE SLOPES SHALL BE 2:1 MAXIMUM.

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DIVISION OF ENGINEERING

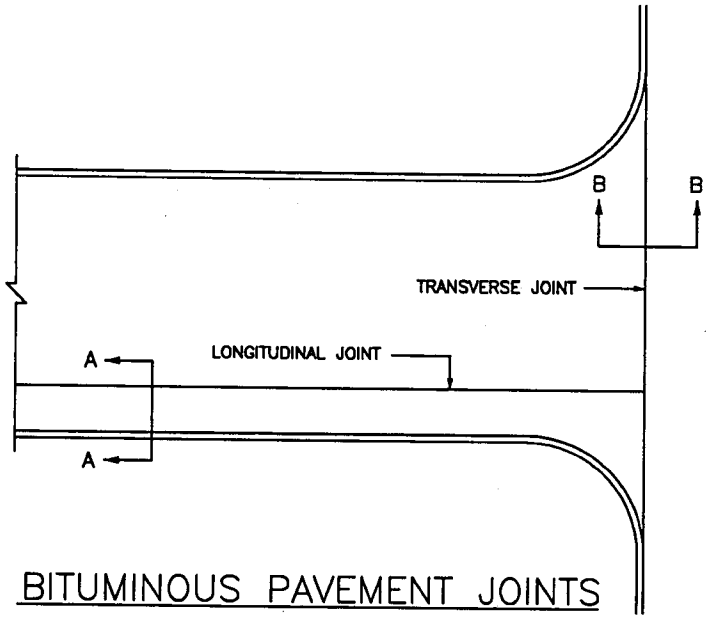
COUNTY ROAD
TYPICAL SHOULDER SECTIONS
(MINIMUM REQUIREMENTS)

STANDARD DRAWING NO. 317

APPROVED _____ DATE 5/1/08
URBAN COUNTY ENGINEER

_____ DATE 5/1/08
COMMISSIONER

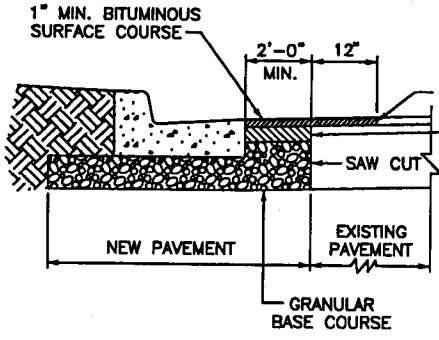
LEXINGTON–FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT



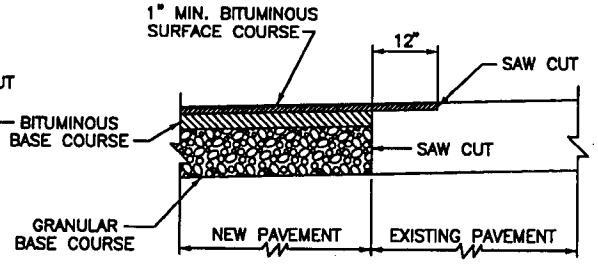

## BITUMINOUS PAVEMENT JOINTS

NOTES:

1. ALL SAW-CUTS SHALL BE NEAT AND STRAIGHT.
2. IMMEDIATELY BEFORE LAYING NEW BITUMINOUS COURSES, ALL SAW CUT EDGES SHALL BE CLEANED OF DUST AND DEBRIS AND SPRAYED WITH A BITUMINOUS TACK COAT.
3. EDGE KEY SHALL NOT BE REQUIRED IF BOTH EXISTING AND NEW PAVEMENT ARE TO RECEIVE AN OVERLAY AS PART OF THIS CONTRACT.




## SECTION A-A
## LONGITUDINAL EDGE KEY




## SECTION B-B
## TRANSVERSE EDGE KEY

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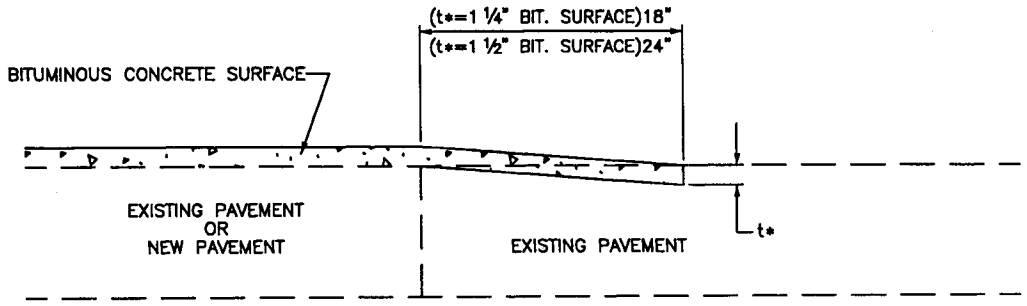
DIVISION OF ENGINEERING

EDGE KEY

STANDARD DRAWING NO. 318

APPROVED _____ DATE 5/1/08

URBAN COUNTY ENGINEER / COMMISSIONER _____ DATE 5/1/08




EDGE KEY

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DIVISION OF ENGINEERING

TYPICAL EDGE KEY
FOR
MINIMUM OVERLAYS,
SHORT PROJECTS,
LOW SPEED

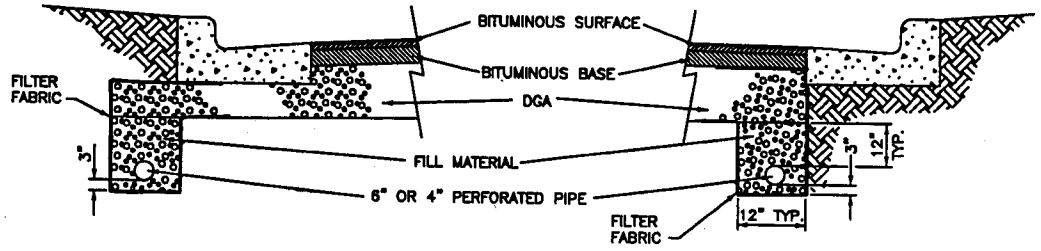
STANDARD DRAWING NO. 319

APPROVED _____ DATE 5/1/08
URBAN COUNTY ENGINEER

_____ DATE 5/1/08
COMMISSIONER

# TYPICAL SECTION

CASE 1

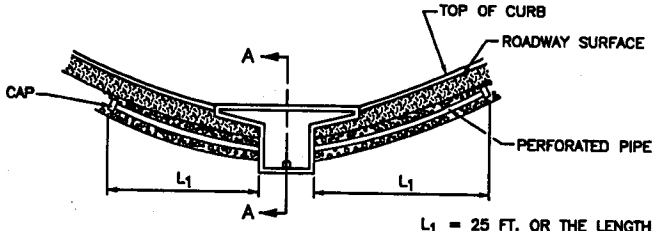



CASE 2

NOTES:

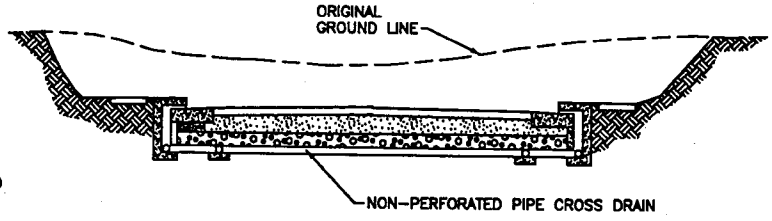
1. SUBGRADE DRAINAGE, AS DEPICTED, IS INTENDED FOR USE WITH THE SURFACING PHASE OF CONSTRUCTION, AND SHALL BE INSTALLED ONLY AFTER THE SUBGRADE HAS BEEN COMPLETED, AND PRIOR TO CONSTRUCTING PAVING MATERIALS.
2. THE CAP SHALL BE A STANDARD MANUFACTURED ITEM FURNISHED BY THE PIPE SUPPLIER.
3. TERMINATE PERFORATED PIPE IN CATCH BASIN AT AN ELEVATION WHICH PROVIDES POSITIVE DRAINAGE (MAY REQUIRE ADDITIONAL OPENING IN CATCH BASIN WALL).
4. BACKFILL TO CONSIST OF NO. 78, 8, 9M COARSE AGGREGATE OR NATURAL SAND. THE FILL MATERIAL SHALL BE THOROUGHLY COMPACTED IN LAYERS NOT EXCEEDING 6 INCHES LOOSE MEASUREMENT.
5. CONNECTIONS TO DRAINAGE STRUCTURES AND PIPE TERMINI SHALL BE NON-PERFORATED PIPE MEETING THE REQUIREMENTS OF THE PERFORATED PIPE EXCEPT FOR PERFORATIONS.
6. ALL RAISED NON-PAVED MEDIANS SHALL HAVE SUBGRADE DRAINAGE ASSOCIATED WITH CURB AND GUTTER.

# TYPICAL SUBGRADE DRAINAGE LOCATIONS

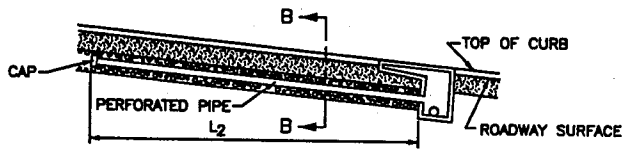



SAG VERTICAL CURVE

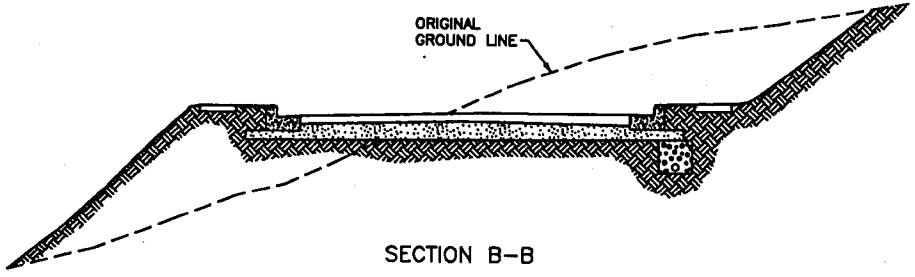
$L_1$ = 25 FT. OR THE LENGTH REQUIRED TO REACH THE 1% SLOPE POINT, WHICHEVER IS LARGER.



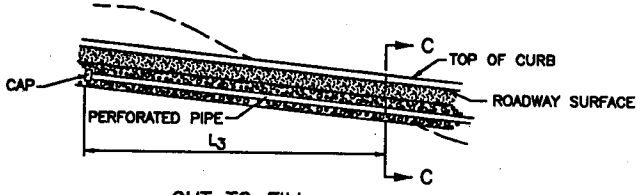

SECTION A-A




HILLSIDE $L_2$ = 50 FT. OR THE LENGTH TO THE CREST OF THE HILL, WHICHEVER IS LARGER.

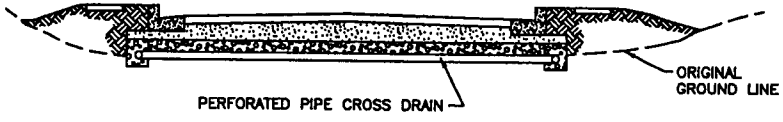



SECTION B-B




CUT TO FILL

$L_3$ = 25 FT. OR THE LENGTH REQUIRED TO REACH THE CREST OF THE HILL, WHICHEVER IS LARGER.




SECTION C-C

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DIVISION OF ENGINEERING

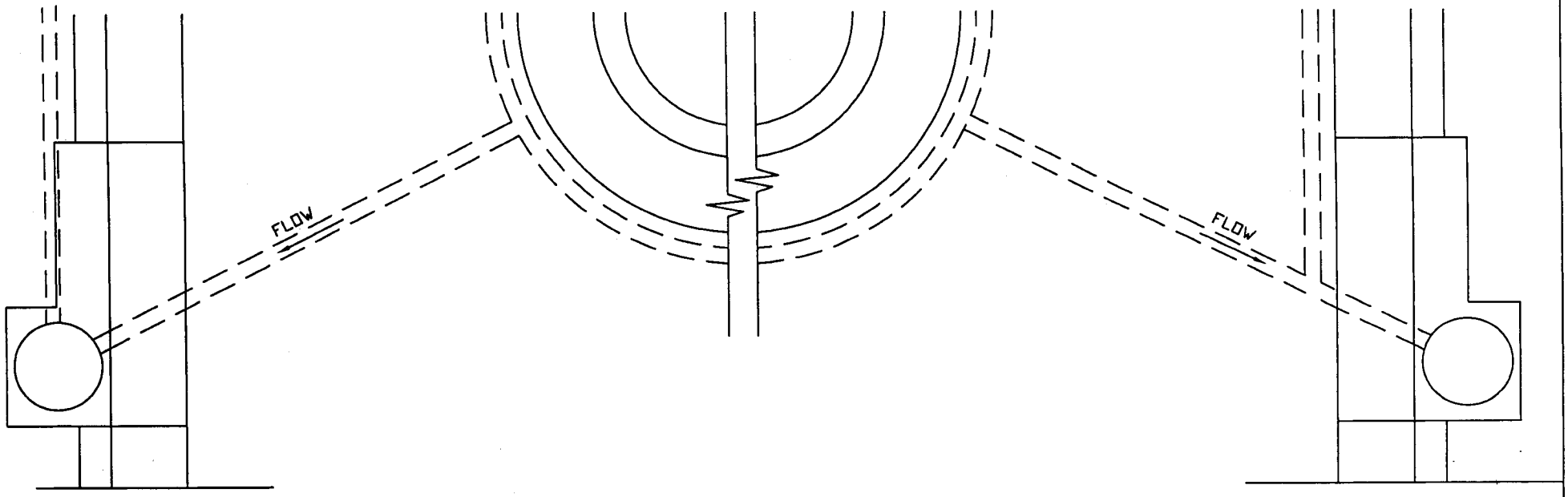
PERFORATED PIPE SUBGRADE DRAINAGE ALONG ROADWAY

STANDARD DRAWING NO. 320

APPROVED _____ DATE 5/1/08
URBAN COUNTY ENGINEER

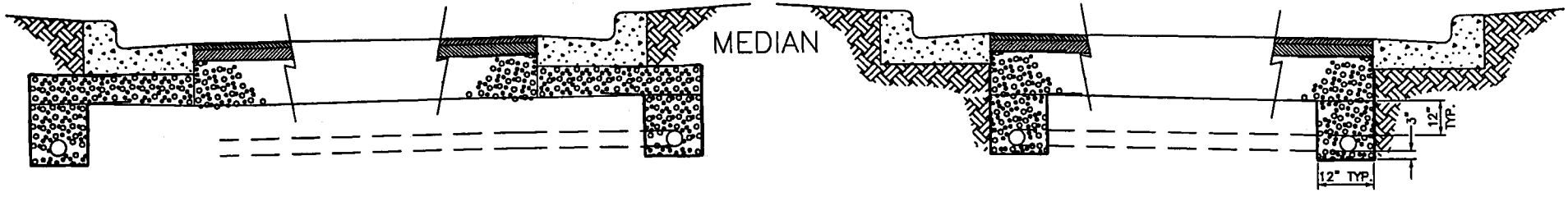
_____ DATE 5/1/08
COMMISSIONER

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




CURB ON PAVEMENT

CURB ON SOIL




## TYPICAL SECTION

1. For installation of perforated pipe see Detail Sheet #320
2. Perforated pipe shall completely surround all islands
3. For islands greater than 50" long or wide, perforated pipe surrounding island and leading to the curb inlet shall be 6" diameter.

| NO. | DATE | REVISION DESCRIPTION | BY |
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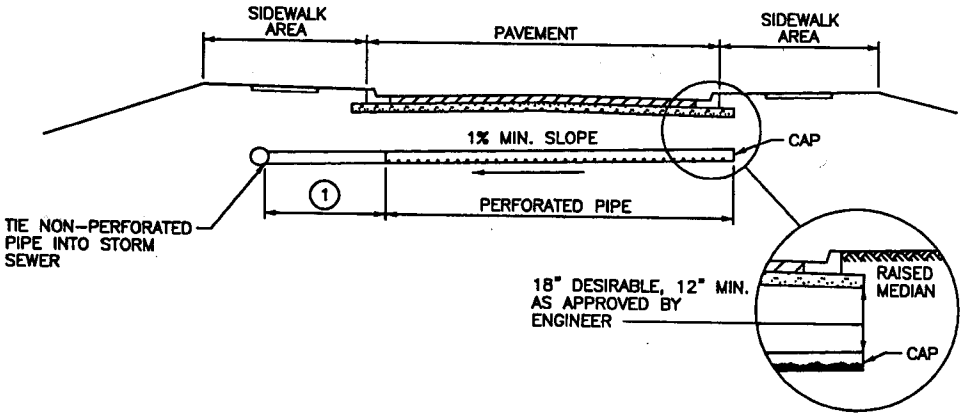
DIVISION OF ENGINEERING

PERFORATED PIPE
SUBGRADE DRAINAGE
FOR RAISED
NON-PAVED MEDIANS

STANDARD DRAWING NO. 320-1

APPROVED _____ DATE 5/1/08
URBAN COUNTY ENGINEER

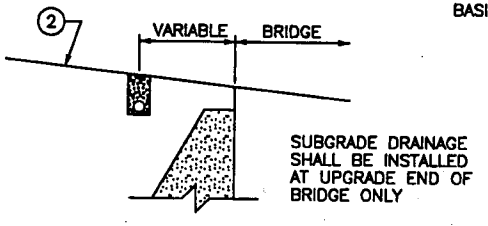
_____ DATE 5/1/08
COMMISSIONER




NOTES:

1. SUBGRADE DRAINAGE, AS DEPICTED, IS INTENDED FOR USE WITH THE ROADWAY CONSTRUCTION PHASE AND SHALL BE INSTALLED ONLY AFTER THE SUBGRADE HAS BEEN COMPLETED, AND PRIOR TO PLACING PAVING MATERIALS.
2. SUBGRADE DRAINAGE WILL NOT BE REQUIRED WHEN:
   A. AGGREGATE SUBGRADE OR NATURAL BANK GRAVEL IS SPECIFIED.
   B. POROUS OR FREE DRAINING SUBGRADES ARE EVIDENT.
   C. DIRECTED BY THE ENGINEER.
3. THE CAP SHALL BE A STANDARD MANUFACTURED ITEM FURNISHED BY THE PIPE SUPPLIER.
4. FLOW SHALL BE DIRECTED TOWARD THE FILL SIDE OF THE ROADWAY WHEN POSSIBLE.
5. IF ROCK IS ENCOUNTERED WITHIN 24" OF SUBGRADE, PERFORATED PIPE IS REQUIRED THE FULL LENGTH OF ROCK. POSITIVE OUTLET IS REQUIRED.
6. A MIN. OF 50' OF PERFORATED PIPE IS REQUIRED UPHILL FROM BASINS ON GRADE AND 25' OF PERFORATED PIPE IS REQUIRED EACH WAY FROM SAG BASINS.

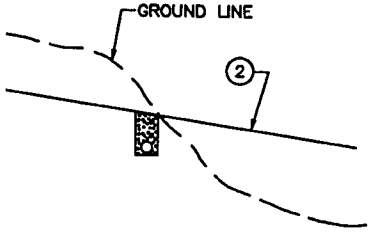

SAG VERTICAL CURVES



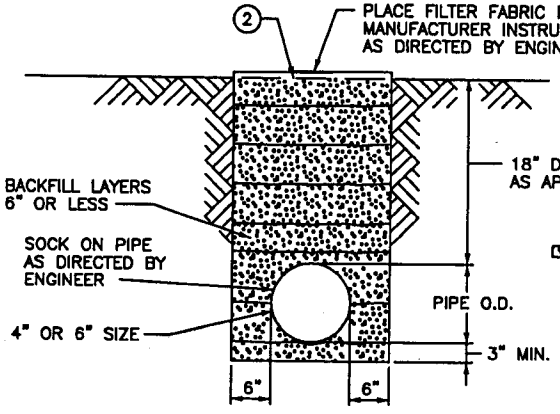

BRIDGES

(1) APPROXIMATELY 8 TO 12 FEET OF PIPE AT THE OUTLET SHALL BE NON-PERFORATED PIPE MEETING THE REQUIREMENTS OF THE PERFORATED PIPE, EXCEPT FOR PERFORATIONS.

(2) SUBGRADE ELEVATION




CUT TO FILL




TRENCH DETAIL

SM-1 – NO. 78, 8, OR 9M COARSE AGGREGATE. THE FILL MATERIAL SHALL BE THOROUGHLY COMPACTED IN LAYERS NOT EXCEEDING 6 INCHES LOOSE MEASUREMENT.

| NO. | DATE | REVISION DESCRIPTION | BY |
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DIVISION OF ENGINEERING

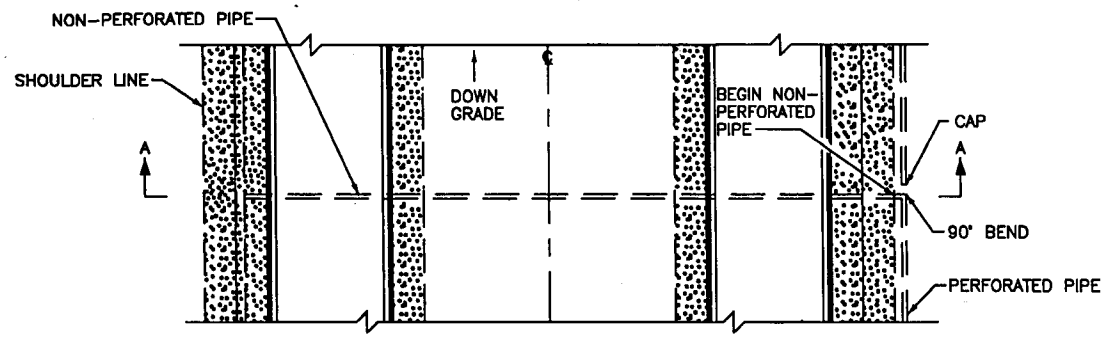
PERFORATED PIPE FOR SUBGRADE DRAINAGE

STANDARD DRAWING NO. 321

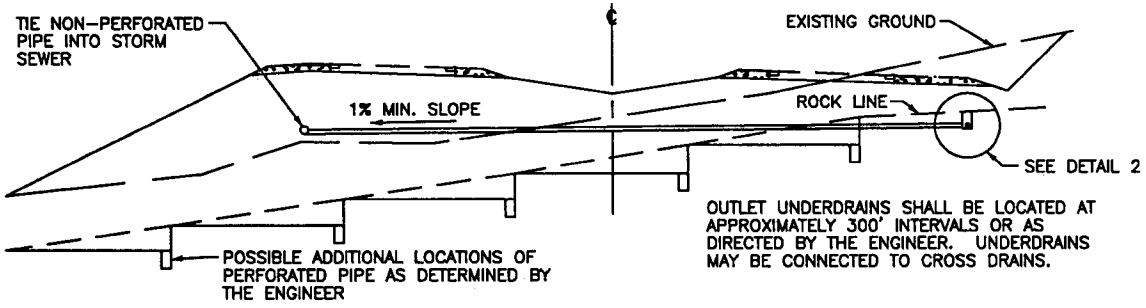
APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08

# TYPICAL SUBGRADE DRAINAGE LOCATIONS

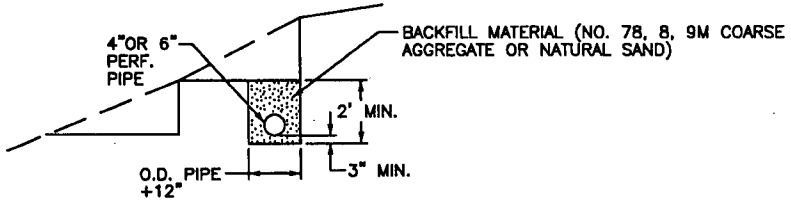
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT




PLAN VIEW



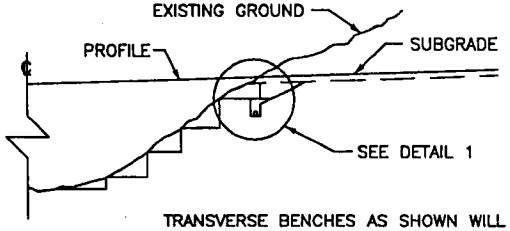

SECTION A-A




DETAIL 2

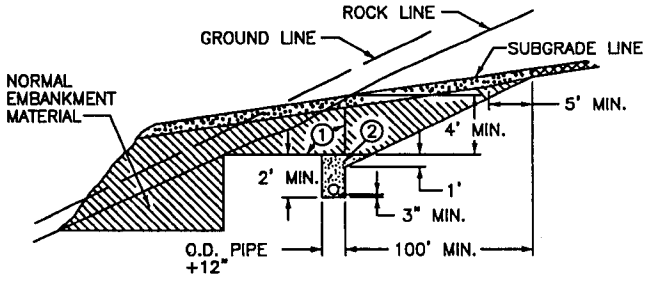
DETAIL FOR LONGITUDINAL UNDERDRAINS

DETAIL FOR TRANSVERSE UNDERDRAIN CUT TO FILL CONDITION




TRANSVERSE BENCHES AS SHOWN WILL BE REQUIRED WHERE PROPOSED GRADE INTERSECTS EXISTING GROUND.

1. UNDERDRAINS WILL BE REQUIRED ON UPGRADE BENCH. THIS PERFORATED PIPE UNDERDRAIN SHOULD BE PLACED IN ROCK OR SHALE FORMATIONS IF POSSIBLE. EXACT LOCATIONS TO BE DETERMINED BE THE ENGINEER ON CONSTRUCTION.
2. BENCHING AND UNDERDRAIN SHALL BE REQUIRED AT ALL TRANSITIONS FROM ROCK CUTS TO FILL WHETHER OR NOT UNDERDRAIN IS REQUIRED.
3. IF ROCK IS ENCOUNTERED WITHIN 24" OF SUBGRADE, PERFORATED PIPE IS REQUIRED THE FULL LENGTH OF ROCK. POSITIVE OUTLET IS REQUIRED.




DETAIL 1

SHEET NOTES:
① LIMITS OF FIRST BENCH.
② BACKFILL MATERIAL

NOTE:
1. ALL PERFORATED AND NON-PERFORATED PIPE SHALL COMPLY WITH ASTM & KDOT SPECIFICATIONS.

| NO. | DATE | REVISION DESCRIPTION | BY |
|---|---|---|---|
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DIVISION OF ENGINEERING

PERFORATED PIPE UNDERDRAINS

STANDARD DRAWING NO. 322

APPROVAL
URBAN COUNTY ENGINEER — DATE 5/1/08
COMMISSIONER — DATE 5/1/08

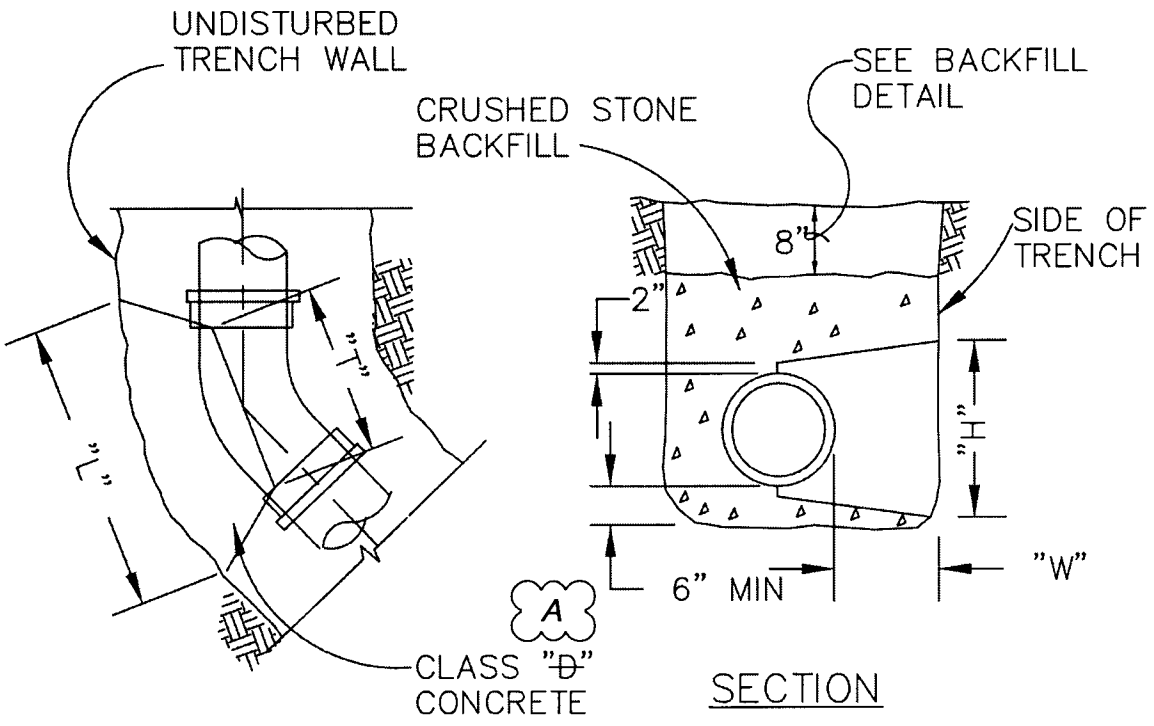
LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT, DEPARTMENT OF PUBLIC WORKS AND DEVELOPMENT

# APPENDIX B

# LFUCG SANITARY SEWER & PUMPING STATION STANDARD DRAWINGS 2009

# APPENDIX B – DRAWINGS

* ALL PIPE AND FITTINGS TO BE BLOCKED SHALL BE WRAPPED TO PREVENT PERMANENT ENCASEMENT OF JOINTS.



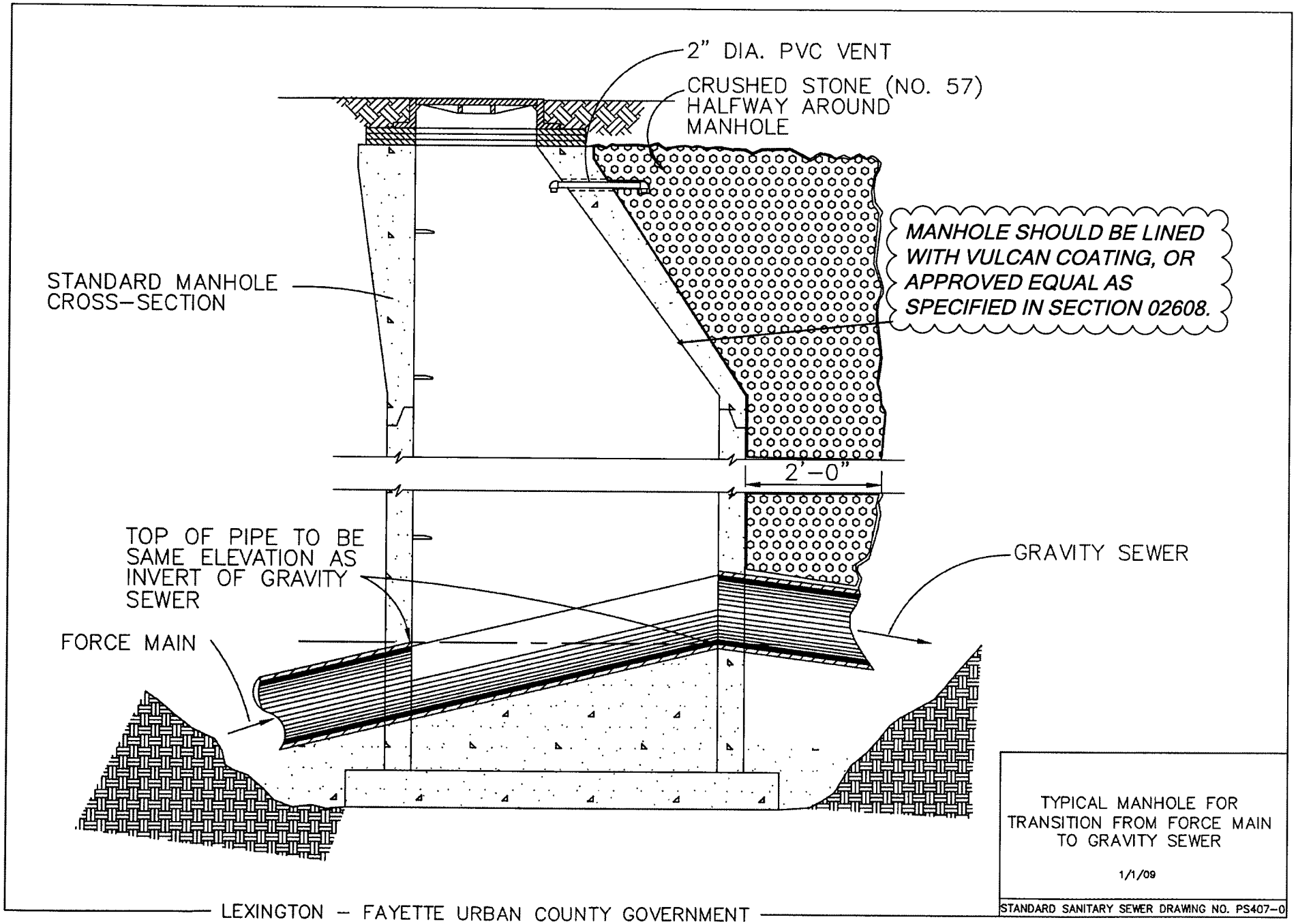

| 45° BEND | | | | | |
|---|---|---|---|---|---|
| SIZE D | 4" | 6" | 8" | 10" | 12" |
| W | 8" | 8" | 10" | 12" | 12" |
| L | 14" | 18" | 20" | 22" | 27" |
| H | 14" | 16" | 18" | 20" | 24" |
| T | 13" | 15" | 16" | 18" | 18" |

| 90° BEND | | | | | |
|---|---|---|---|---|---|
| SIZE D | 4" | 6" | 8" | 10" | 12" |
| W | 8" | 8" | 10" | 12" | 12" |
| L | 14" | 24" | 30" | 35" | 40" |
| H | 14" | 16" | 18" | 24" | 30" |
| T | 13" | 16" | 18" | 20" | 22" |

HORIZ. & VERT. BENDS & CONCRETE BACKING

1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS406-0

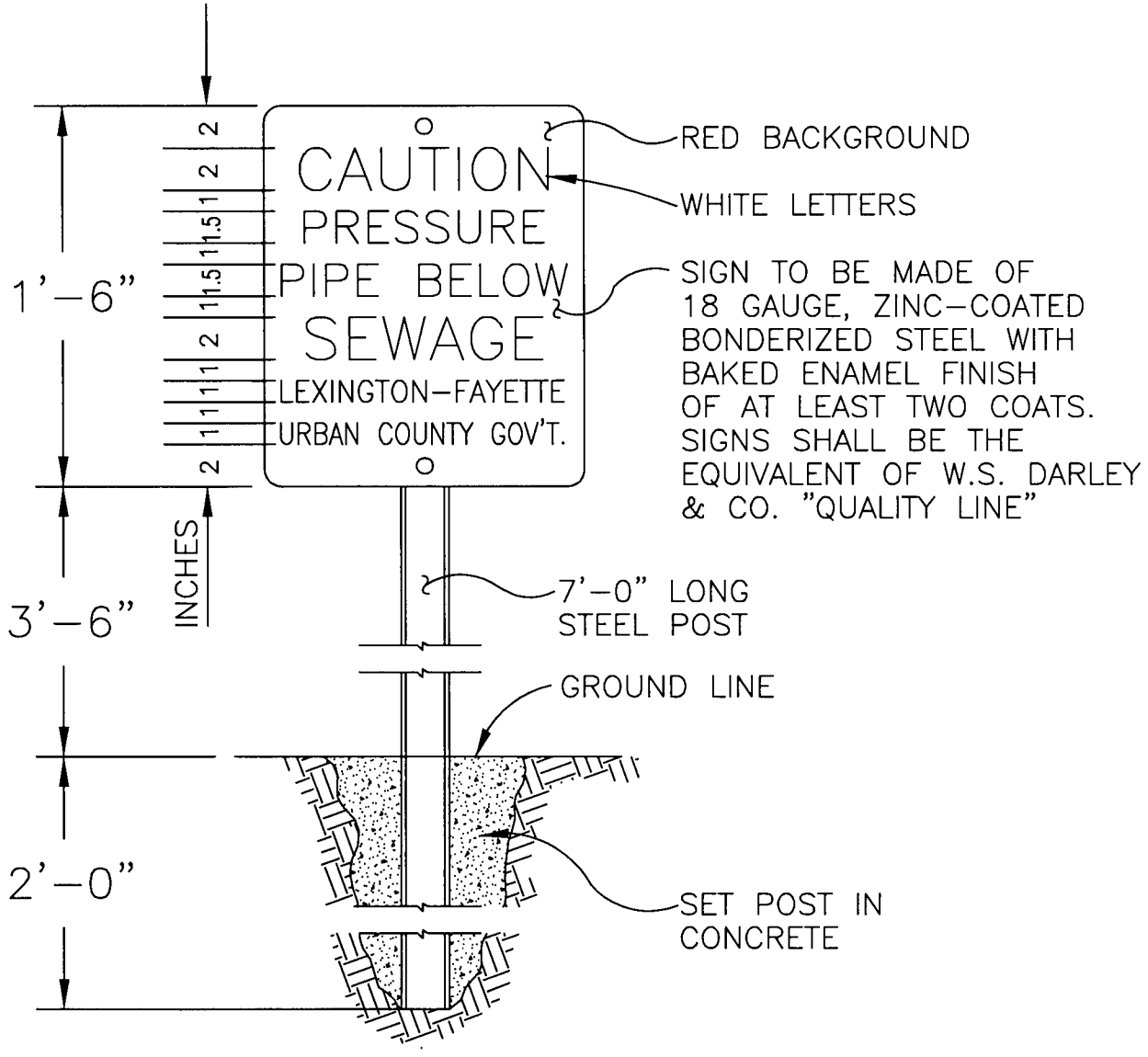



TYPICAL MANHOLE FOR TRANSITION FROM FORCE MAIN TO GRAVITY SEWER

1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS407-0

LEXINGTON – FAYETTE URBAN COUNTY GOVERNMENT

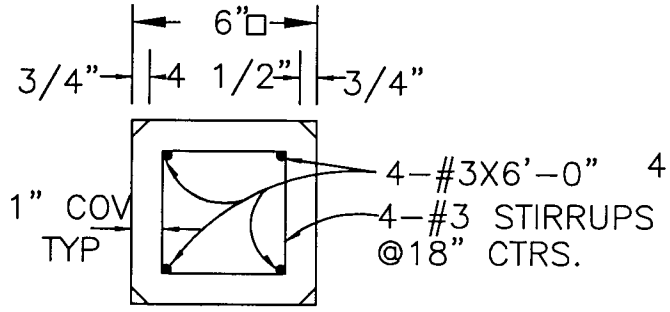



STEEL POST AND LINE MARKER

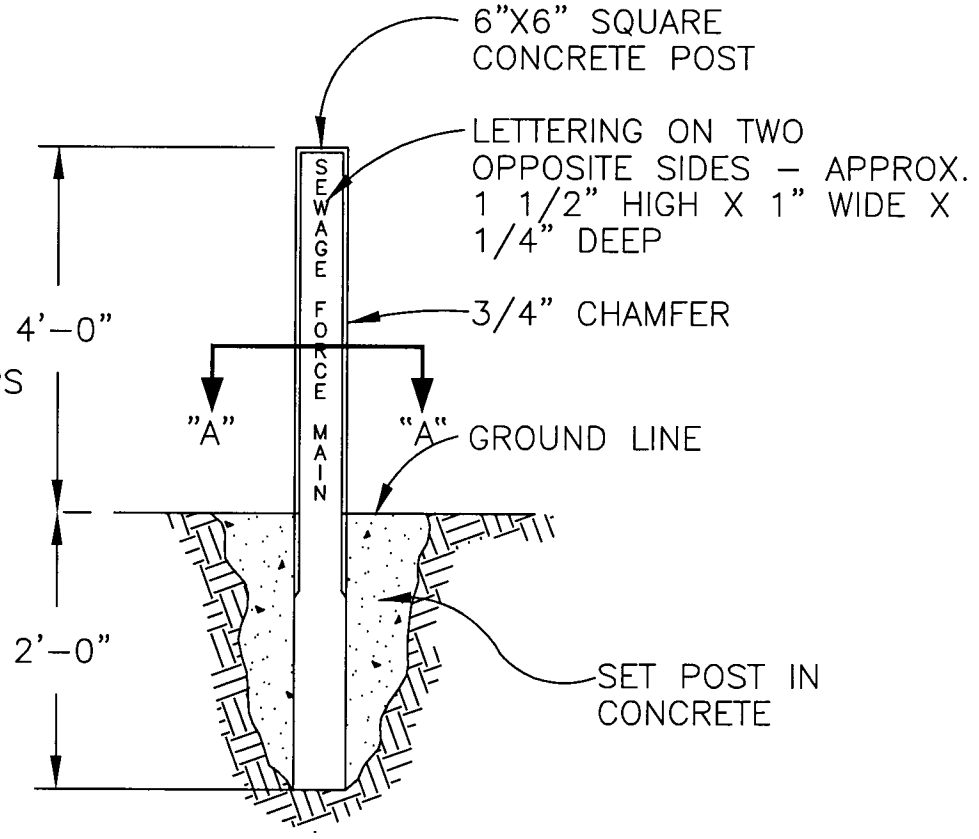
1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS408–0

LEXINGTON – FAYETTE URBAN COUNTY GOVERNMENT



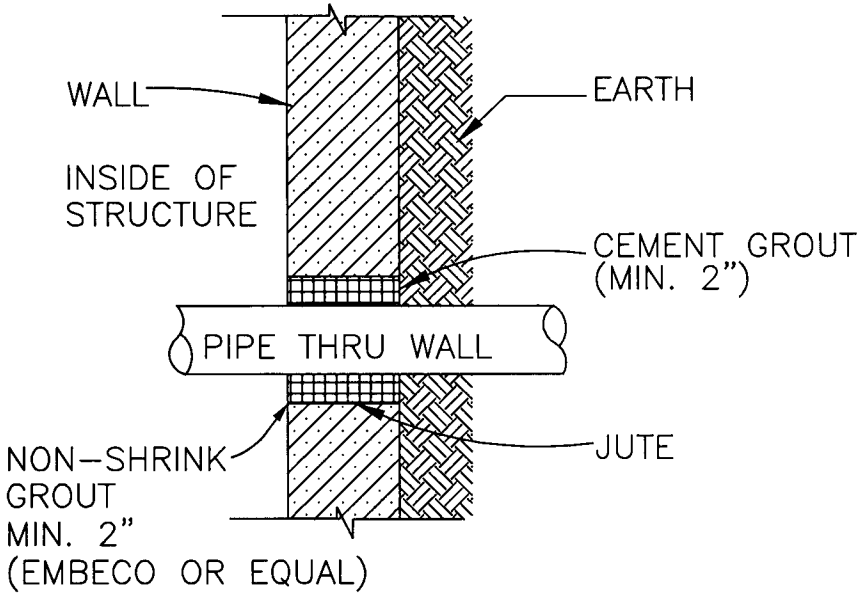

SECTION "A"

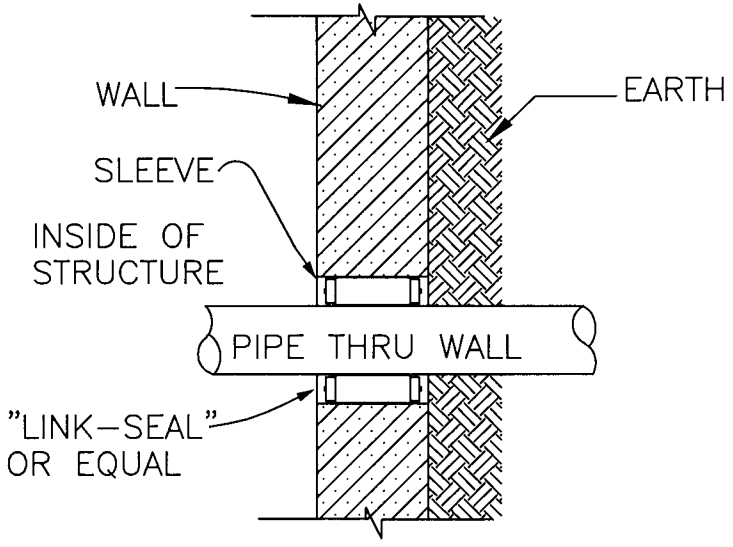



CONCRETE LINE MARKER

1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS409-0

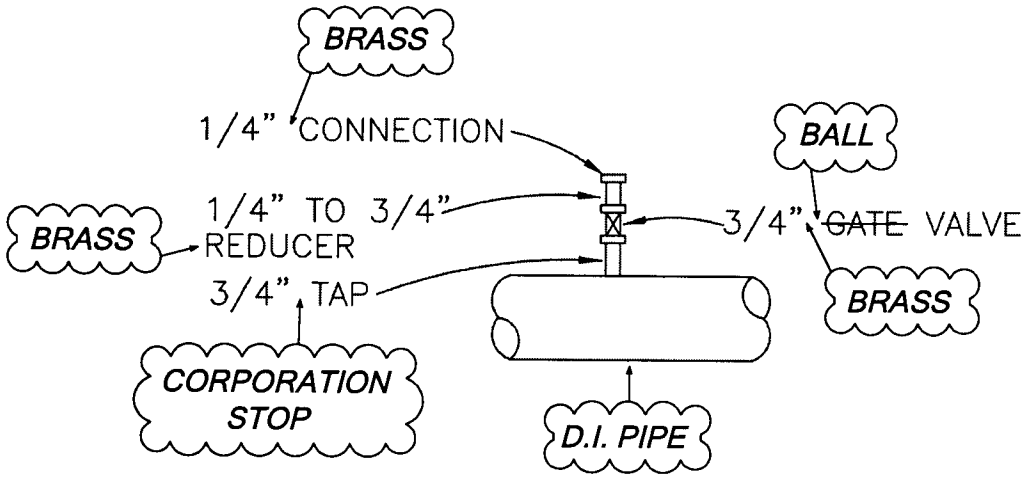



WALL PENETRATION DETAIL

1/1/09

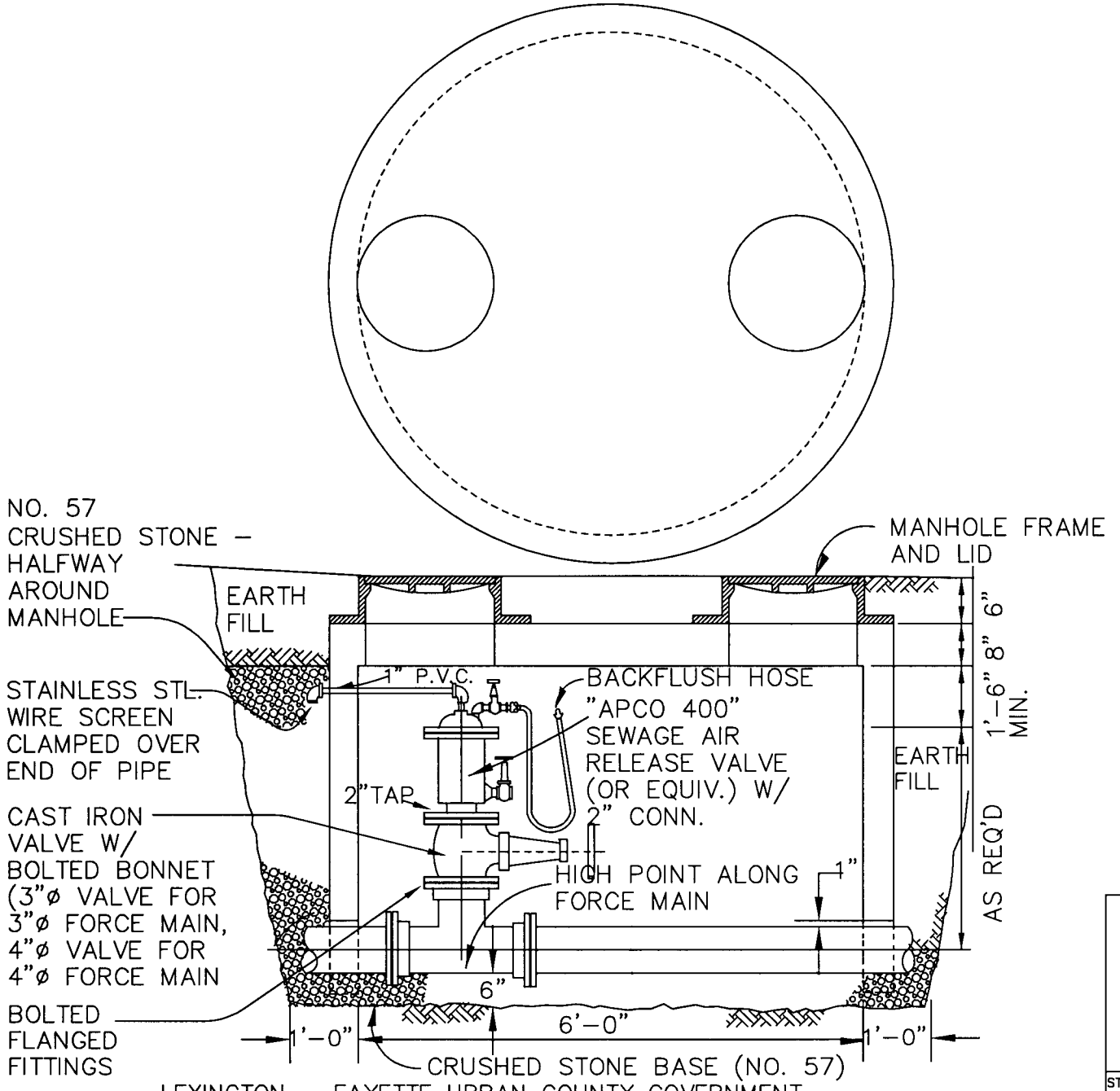
STANDARD SANITARY SEWER DRAWING NO. PS410-0




GAUGE TAP DETAIL

1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS411-0

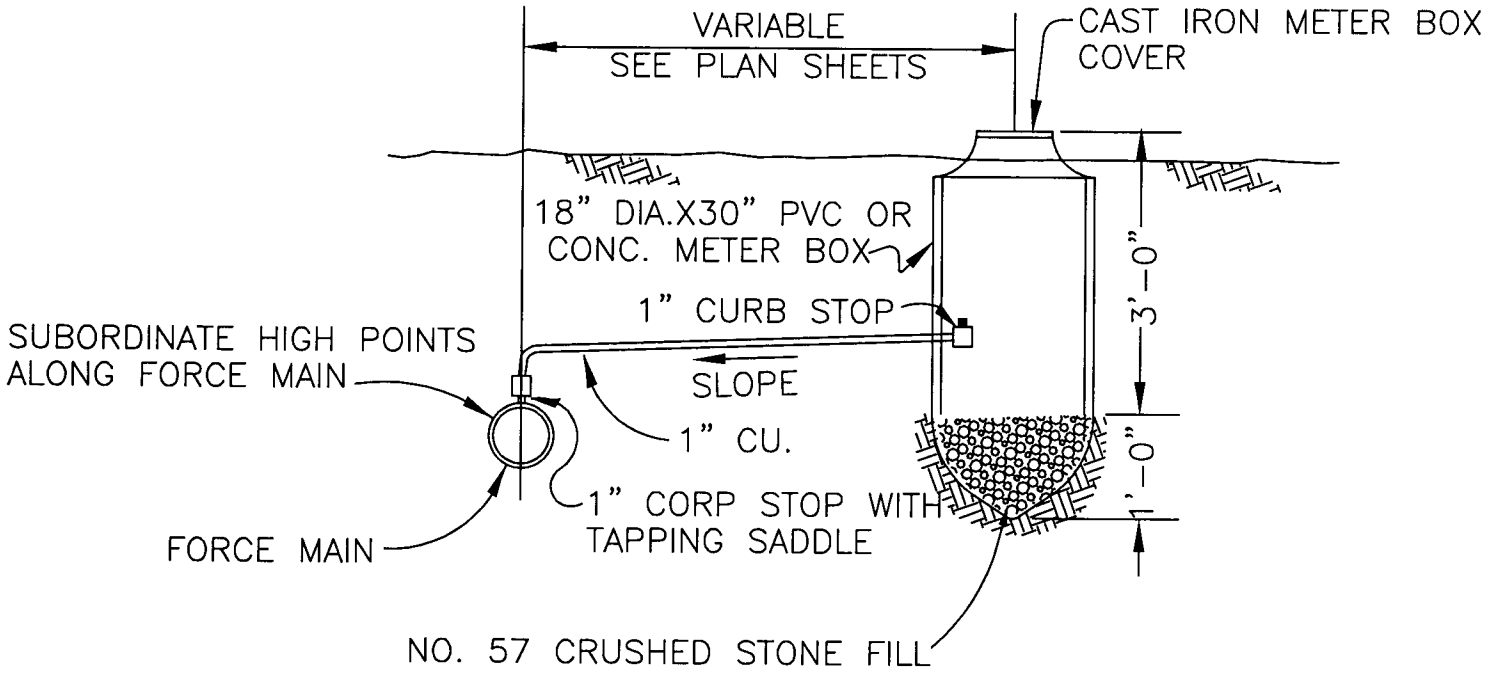



AUTOMATIC AIR RELEASE ASSEMBLY

1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS415–0

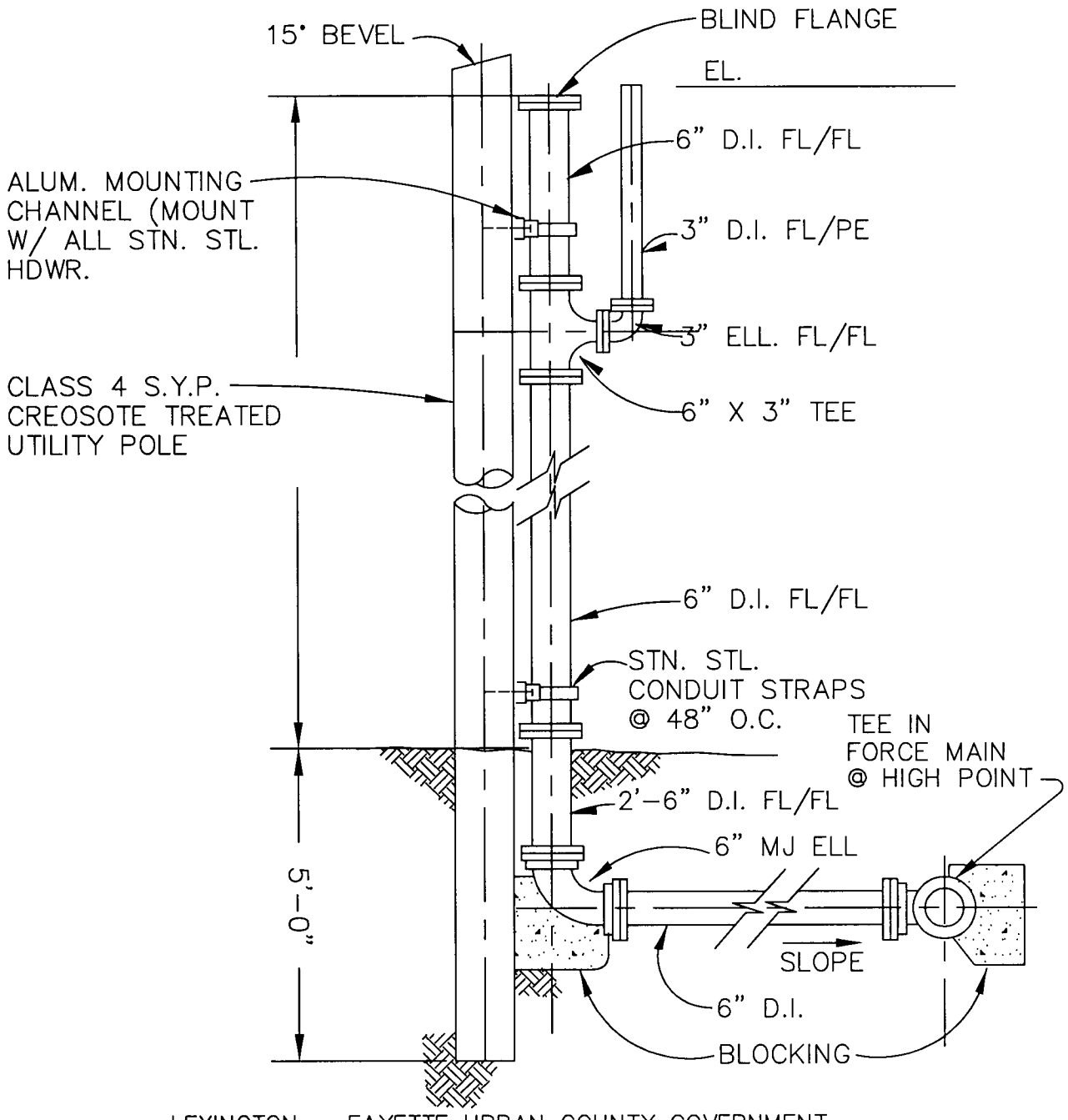
LEXINGTON – FAYETTE URBAN COUNTY GOVERNMENT




MANUAL AIR RELEASE ASSEMBLY

1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS416-0

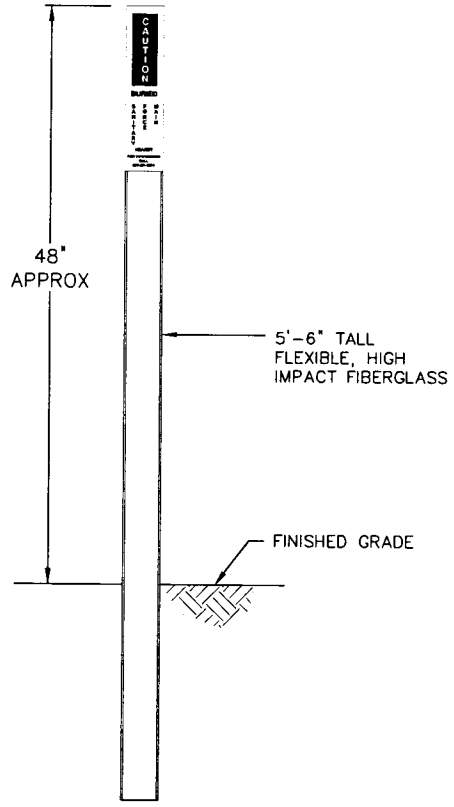


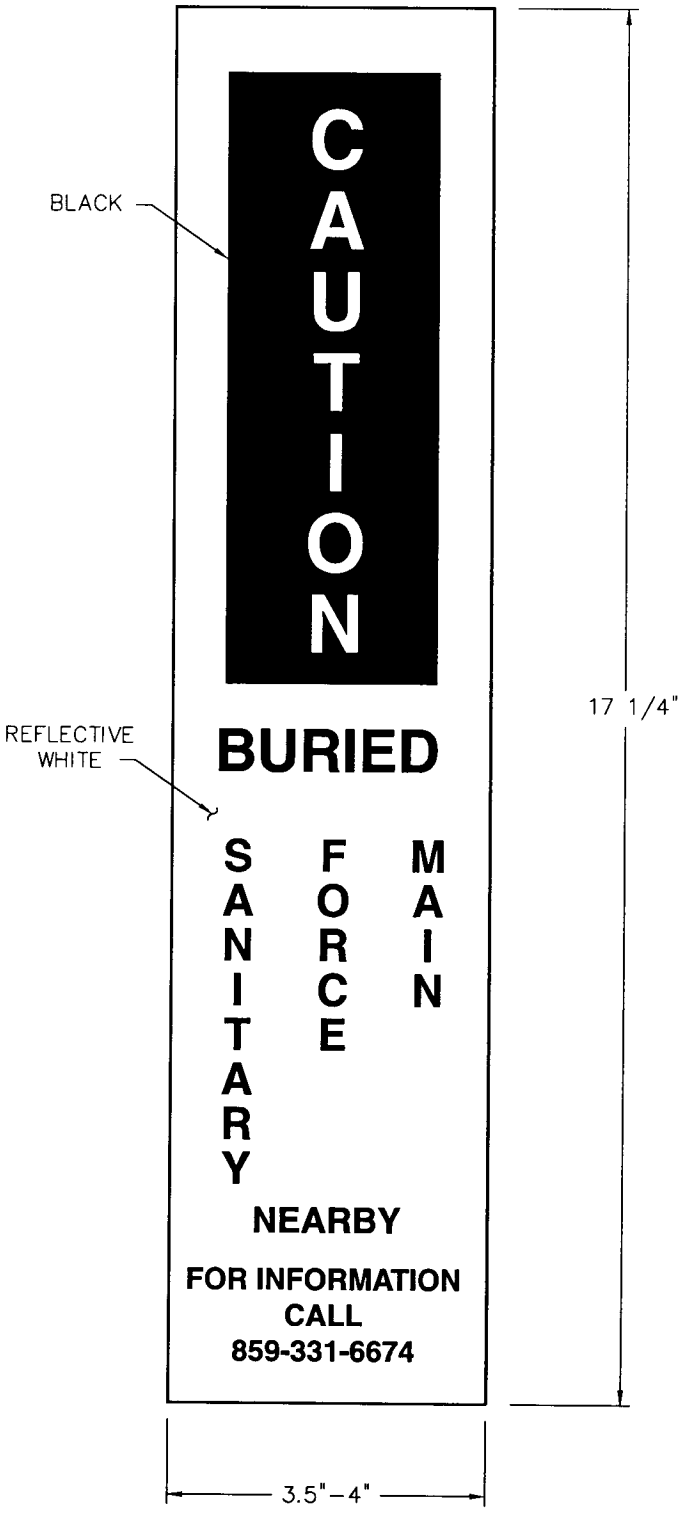

NON-MECHANICAL AIR RELEASE

1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS417-0

LEXINGTON - FAYETTE URBAN COUNTY GOVERNMENT




# FIBERGLASS FORCE MAIN MARKER SIGN

N.T.S.

| REVISION | BY | DATE |
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SANITATION DISTRICT NO. 1
1045 Eaton Drive
FT. Wright, Kentucky 41017
Ph: (859) 578-7460
Fax: (859) 331-2436

DATE:
NOVEMBER 2011

STANDARD
DRAWING NO:
136