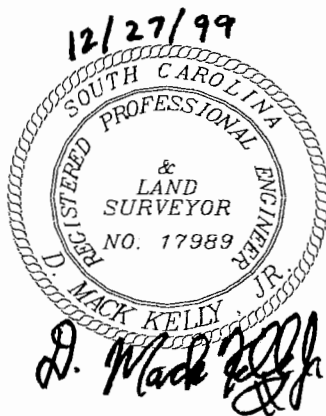


City of Anderson  
Standard Specification  
for Construction of  
Gravity and Force Main Sanitary Sewerage Systems



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December 27, 1999

SC DEPT. of HEALTH & ENVIRONMENTAL CONTROL

BUREAU OF WATER

STANDARD SPECIFICATIONS APPROVAL

WATER SYSTEMS  SEWER SYSTEMS

DATE APPROVED: 3/13/00

APPROVED BY: D. Mack Kelly, Jr.

APPROVED FOR: Anderson DRP

## GRAVITY AND FORCE MAIN SANITARY SEWERAGE SYSTEMS

### I. PURPOSE

The following specifications shall serve as "Standard Specifications for Construction of Gravity and Force Main Sanitary Sewerage Systems, for the City of Anderson, prepared by D. Mack Kelly, Jr., PE, PLS, Anderson City Engineer, South Carolina." Approved copies of these specifications shall remain on file with South Carolina Department of Health and Environmental Control (SCDHEC) and shall become part of technical specifications for any project that includes the construction of public gravity and force main sanitary sewerage system. Any sections which do not apply to a specific project may be deleted. The gravity and force main sanitary sewerage system shall be installed as shown on the plans, as herein specified, and in accordance with all SCDHEC regulations. In addition to these minimum specifications, "The City of Anderson Sewer Construction Standards and Policy (COASCSAP)" handbook should be reviewed and observed. If the COASCSAP handbook should conflict with these specifications, the most restrictive specification shall govern. All referenced specifications, guidelines, or designations shall refer to the most recent edition or publication. No construction shall begin until Contractor is in possession of the SCDHEC Permit to Construct a Public Wastewater Facility, which will be obtained by the Owner. In addition, Contractor shall be in possession of permits to construct sanitary sewer collector lines along state highways by South Carolina Department of Transportation (SCDOT) or local roads were applicable.

### II. MATERIAL STANDARDS

#### A. Pipe

All pipe and fittings shall be manufactured in the United States. Pipe shall be virgin and completely clean when laid in a trench and jointed. Pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects. Pipe shall be uniform in color opacity, density, and other physical properties. Nonmetallic pipe shall be installed with a copper wire or other means of detection approved by Engineer. For force mains, pipe and fittings shall be designed for use at maximum hydrostatic working pressure of 200 psi, at 73° F.

Pipe shall be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Storage of pipe shall be done in a manner to avoid extreme or prolonged heat conditions as well as direct sunlight.

Under no circumstances shall the pipe be dropped or dumped. The pipe shall not be dragged in a manner which would cause scratching to the pipe surface. An excessive amount of scratching on the surface of the pipe will be considered cause for rejection.

1. Polyvinyl Chloride (PVC) Pipe

PVC pipe shall conform to American Standard for Testing and Measurements (ASTM) standard D 3033 or D 3034. Pipe for force mains shall be PVC AWWA C900, Class 150, manufactured in the United States, and shall meet requirements of ASTM D-2241. Force main pipe and fittings shall be Type 1, Grade I PVC plastic conforming to ASTM Specifications D-1784. Pipe and fittings shall bear NSF seal of approval.

2. Ductile Iron Pipe (DIP)

DIP shall be class 50 (or heavier) push-on or joint type pipe conforming to ASTM A-746 or ASTM A-377, and AWWA C 151. All fittings shall be Gray Iron or Ductile Iron conforming to AWWA C 110 or for compact fittings AWWA C 153.

B. Pipe Joints

All pipe joints shall be made in accordance with manufacturers' instructions, resulting in clean, watertight joints. All joints shall be made with a rubber sealing gasket supplied by the pipe manufacturer and shall allow for expansion and contraction at each joint. Cutting of the pipe shall be done in a neat manner with a fine tooth saw or tubing cutter approved for PVC or DIP pipe. Cuts must be square and rough edges removed and beveled with a cutting tool and/or file.

C. Service Connections

Service lines shall be 4" PVC-DWV, Schedule 40, dual marked pipe or better. The service line shall be connected to the main with a standard wye entering the main at 45° from horizontal as shown on the drawings. The line shall have a minimum depth of 3 feet of cover. The end shall be capped watertight at the property line. This location shall be marked by a 2" X 4" stake. The Contractor shall be responsible for supplying the Engineer with a sewer drawing showing exact locations of the end of all taps prior to final payment. No service connections are allowed to Force Mains.

D. Concrete Thrust Blocks

Force mains shall require concrete thrust blocking at all bends of 22-1/2° or greater. Thrust block bearing shall be minimum of 2'-6" x 2'-6" against firm undisturbed soil. Concrete strength is to be 3,000 psi, minimum.

E. Manholes

Base slab for manholes shall be formed from ready-mixed concrete, 3000 psi strength, conforming to ASTM C-94. Manhole frames and covers shall conform to current specifications of the ASTM designation A48 for Class 30 Gray Iron and shall be of the type and weight as shown in details included in these specifications. Manhole steps shall be Cast Iron or Aluminum approved by the Engineer.

Invert channels shall be smooth and semicircular in shape and shall conform to the inside of the adjacent pipe sections. Changes in direction of flow shall be made with a smooth curve of as large a radius as practical. The floor of the manholes outside the channels shall be smooth and slope toward the channels at approximately 1-1/2 inch per foot. The difference in elevation between the inverts of the outlet and inlet pipes shall not exceed 24 inches. Whenever the difference exceeds this amount, drop manholes shall be constructed as shown in details included in these specifications. Pipe connections to manholes shall be watertight.

Manholes shall be built to the elevations as shown on the plans, as specified by the Engineer, or to comply with final grade as determined in the field. Manhole top elevations shall be greater than the 50-year flood elevation or watertight covers shall be required.

Pre-cast Concrete Manholes shall be built of pre-cast concrete sections conforming to ASTM Specifications for Pre-cast Reinforced Concrete Manhole Risers and Tops, Designation C478, with the following modifications:

- Type II cement shall be used unless otherwise approved by the Engineer, and
- Section shall be a minimum of 5 inches in thickness; shall have integrally-cast, approved manhole steps a maximum of 16 inches on center; shall not be shipped prior to five days after manufacture; and shall be steam cured.

### III. TRENCHES

Trenches and excavations shall be adequately sheathed, braced, and drained as required by the soil conditions encountered and as required by the Occupational Safety and Health Act. Where unstable trench bottoms are encountered, they must be stabilized before laying pipe by removing unstable soil material and replacing with crushed stone. The depth of the stone shall depend upon the severity of the soil conditions. In severe conditions, special foundations approved by the Engineer shall be provided. Where rock is encountered, a minimum cushion of 6 inches of soil or specified bedding material shall be placed over the rock. For PVC pipe, trench bottoms shall be excavated below pipe grade and brought back up to grade by placing bedding material as specified under Pipe Laying.

Trench bottoms shall be graded to provide a uniform, solid base throughout the entire length of the pipe. Excavation and grading shall be done to produce final grades providing a minimum cover of 36 inches over the top of all pipe. Where it is not possible to provide the 36 inches of cover, DIP may be used with a minimum of 18 inches of cover, subject to inspection and approval by the Engineer. Excavated material shall be piled in a manner that will not obstruct road, driveway and sidewalk traffic, or proper drainage. Trenches and excavations shall be adequately sheathed, braced and dewatered at the Contractor's expense as required by the soil conditions encountered and as required by the Occupational Safety and Health Act.

#### IV. CLEARING

The Contractor shall clear the construction area within the right-of-way of all objectionable materials. Only trees which badly interfere with construction shall be cut down; others shall be protected. Trees must be felled so as not to cause damage outside of the right-of-way. All usable timber shall be cut in lengths designated by the landowner and stacked at the edge of the right-of-way. This timber shall remain the property of the landowner unless otherwise specified. All spoil materials shall be disposed of by burning or by removal to approved disposal areas. The Contractor will be responsible for controlling fires in compliance with all Federal, State, and County laws and Regulations relative to building fires at the site.

#### V. PIPE LAYING

Each pipe shall be laid on an even, firm bed. The interior of the sewer shall, as the work progresses, be cleared of all dirt, jointing material and superfluous materials of every description. Gaskets and spigots shall be wiped clean. Each section of pipe shall be laid to the specified line and grade, working in the upstream direction with the bell end laid upgrade.

PVC pipe shall be installed in accordance with ASTM D2321 "Underground Installation of Flexible Thermoplastic Sewer Pipe." Class I materials (1/4 inch to 3/4 inch graded stone as defined in D2321) shall be used for bedding (4 inch minimum) and haunching as shown in details included in these specifications. DIP shall be laid in accordance with AWWA C 600.

#### VI. BACKFILLING

Backfill to a level of 1 foot over the top of the pipe. Use only select material free from clods, rocks, or foreign matter and placed in layers not exceeding 6 inches. Each layer must be carefully and uniformly tamped. The remainder of the backfill except in roads, may be placed in layers not exceeding 12 inches in thickness, with no rocks larger than 6 inches. Mechanical tamping to avoid future settlement shall be used. No excavation shall begin until the Contractor has on the site a backfilling tamper in good working condition. At least 3 feet of cover will be maintained over all sewer lines. Where this is not feasible, ductile iron pipe shall be used. All disturbed areas shall be seeded and mulched as necessary to return them to the original state of vegetation.

#### VII. CUTTING AND REPAIRING PAVEMENT

Where bituminous surfacing (single, double, or triple surface treatment or asphaltic concrete) is to be cut for the installation of pipe, the Contractor shall cut it neatly in advance of trenching one foot wider than the trench. Backfill shall be thoroughly tamped and compacted to assure proper consolidation. "Binder Base" properly compacted shall be used in the top 6 inches, with the surface matching existing pavement surface. Flagmen and warning signs shall always be present while construction along roads is underway.

## VIII. CLEANING PIPE

All pipe shall be left free of any sand, mud, debris or foreign material. After lines and manholes are completed and ready for inspection, they shall be flushed clean with water. If obstructions are found in the pipe when it is inspected, it shall be the responsibility of the Contractor to remove the obstruction or replace the line. Flushing of force main shall be accomplished prior to connecting into existing sewer line. All mud and other foreign matter shall be washed out of the pipe.

## IX. HORIZONTAL SEPARATION

Sanitary sewer mains shall be laid at least 10 feet, measured horizontally, from any existing or proposed water line and in accordance with Regulation 61-67. Should local conditions prevent a lateral separation of 10 feet, a sewer main may be laid closer than 10 feet to a water line if:

- It is laid in a separate trench.
- It is laid in the same trench with the sewer line, located at one side on a bench of undisturbed earth.
- In either of the above cases, the vertical separation between the water main and the sewer line shall be a minimum of 18 inches outside to outside.

## X. VERTICAL SEPARATION

Whenever sanitary sewer mains must cross water lines, or minimum horizontal separation cannot be maintained, the water main shall be laid such that the outside of the sewer main is at least 18 inches below the outside of the water line and in accordance with Regulation 61-67. When this requirement cannot be met, the water main shall be relocated to provide this separation, or shall be constructed with slip-on or mechanical-joint Ductile Iron Pipe. The Ductile Iron Pipe shall be centered over the sewer line with a minimum of 10 feet on each side of the sewer.

## XI. TESTING WATERTIGHTNESS

Testing of watertightness shall be done as required by Engineer or governing authority, according to the following requirements:

The sanitary sewer line shall be cleaned, inspected and tested. All repairs shown necessary by the test shall be made, broken or cracked pipe replaced, all deposits removed, the sewers left true to line and grade as herein specified or shown on plans, entirely clean, free from dirt, etc., ready for use. Upon examination, each section of sewer between manholes is to show from both ends a full circle of light.

Measurement of the infiltration will be made before sewage flows are allowed in the sewer and shall be made by means of a pressure test for the gravity sewer lines and be measuring the direct volume of leakage for the manholes. All infiltration tests shall be made by the Contractor in the presence of the Engineer. Leakage into or out of the sewers and manholes shall not be tolerated. If infiltration or leakage is present, the sewer will not be accepted until so repaired that it will comply with these requirements.

Sewer lines shall be air tested in accordance with the procedures and requirements of ASTM C828-75T. The section of the sewer line to be tested shall be plugged and low pressure air introduced into the plugged line. After an internal pressure of approximately 4.0 psi gage is obtained, allow time for the air pressure to stabilize (some pressure drop may be expected until the temperature of the air in the test section stabilizes). When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi gage, commence the test. Record the drop in pressure for the test period. The test may be discontinued when the prescribed test time has been completed. If the pressure has dropped more than 1.0 psi gage during the test period, the line is presumed to have failed and shall not be accepted until so repaired that it will comply with the requirements.

Manholes shall be water tested for leakage by visually measuring the volume of water lost from the manhole. Inlet and outlet pipes shall be plugged and the manhole filled with water (above the top seam). After the concrete is saturated, the amount of water required to maintain the manhole full for not less than two hours shall be measured. If infiltration or leakage is present, the manhole will be rejected.

Pressure testing of force main shall be performed by filling the pipe with water and plugging the ends of the force main. Pressure shall be pumped to a minimum of 75 psi. Test shall last a minimum of two hours and leakage shall not exceed 10 gallons/inch diameter/mile/day.

## XII. SEDIMENT AND EROSION CONTROL

It is the Contractor's responsibility to control sediment and erosion. Management practices that may be used to control sediment and erosion are as follows: silt fencing, grass seeding and mulching, straw bales, temporary rock check dams, construction entrance/exit, and sweeping or brushing sediment and debris from existing paved roads.

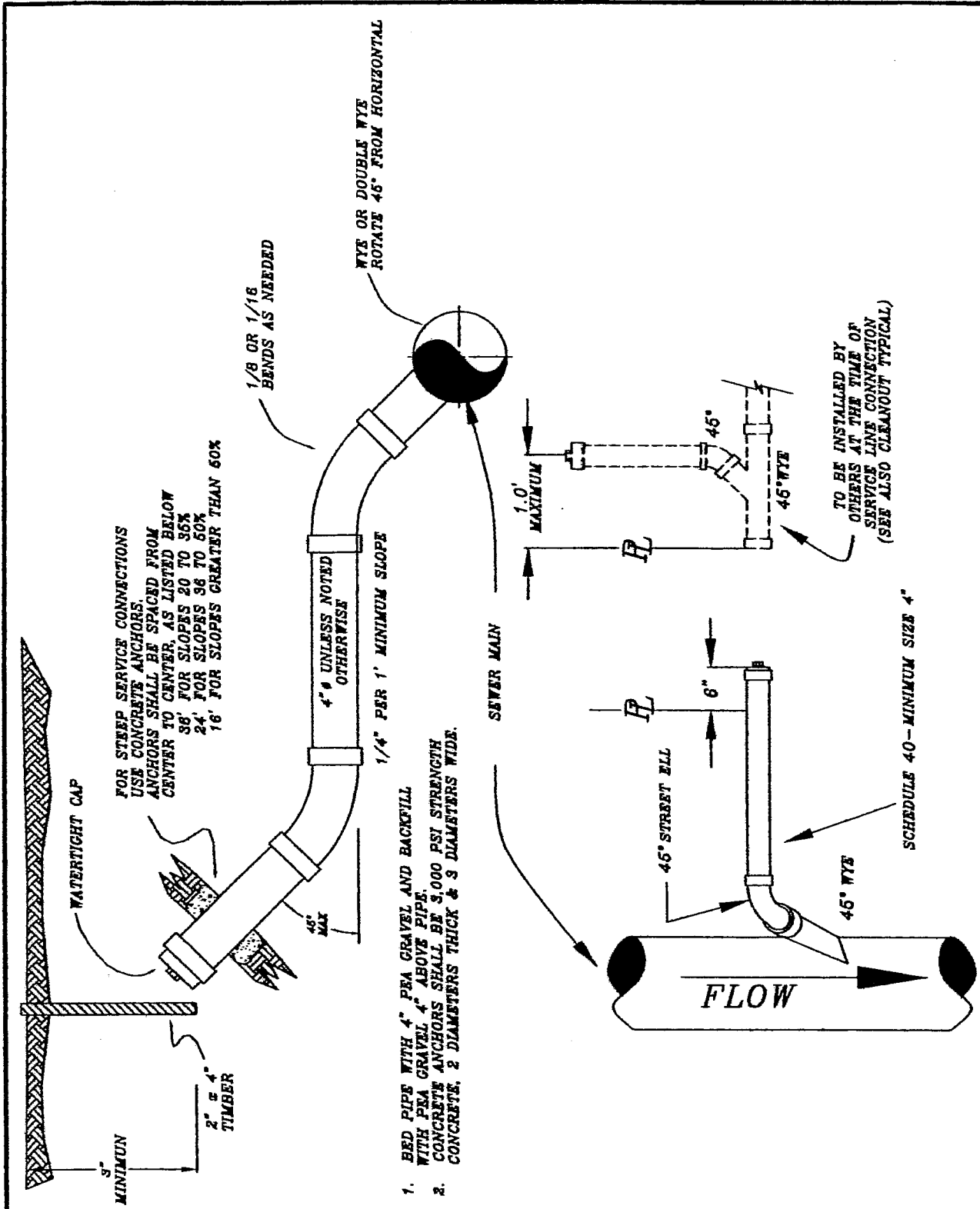
### XIII. CONSTRUCTION ON HIGHWAYS

Obtaining easements and permits for construction across and along State Highways shall be the responsibility of the owner. All work shall be done in accordance with the SCDOT specifications and requirements, including methods of construction, provisions for inspections, and the required notices. Should these specifications be in conflict, with those of the SC Department of Transportation, the latter shall govern. No additional payment shall be allowed the Contractor for any extra work done due to SC Department of Transportation requirements.

### XIV. EXISTING UTILITIES

It is the Contractor's responsibility to locate and protect other utilities, both above ground and underground. No compensation will be allowed for any damage to utilities resulting from the Contractor's work. The fact that an underground utility (i.e., telephone, power, cable TV, water, sewer, gas, etc.) is not shown on the plans does not relieve the Contractor of his responsibility.





FOR STEEP SERVICE CONNECTIONS USE CONCRETE ANCHORS. ANCHORS SHALL BE SPACED FROM CENTER TO CENTER, AS LISTED BELOW  
 36' FOR SLOPES 20 TO 35%  
 24' FOR SLOPES 36 TO 50%  
 16' FOR SLOPES GREATER THAN 60%

1. BED PIPE WITH 4" PEA GRAVEL AND BACKFILL WITH PEA GRAVEL 4" ABOVE PIPE.
2. CONCRETE ANCHORS SHALL BE 3,000 PSI STRENGTH CONCRETE, 2 DIAMETERS THICK & 3 DIAMETERS WIDE.

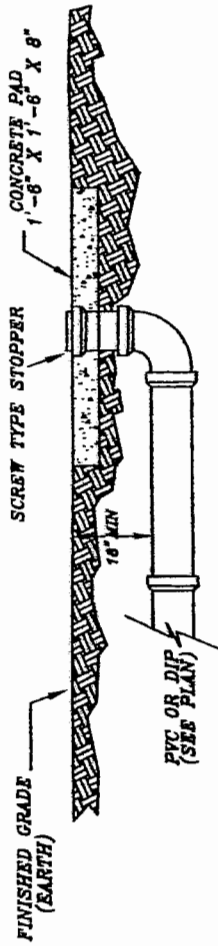
TO BE INSTALLED BY OTHERS AT THE TIME OF SERVICE LINE CONNECTION (SEE ALSO CLEANOUT TYPICAL)

SANITARY SEWER SERVICE CONNECTION  
 NO SCALE

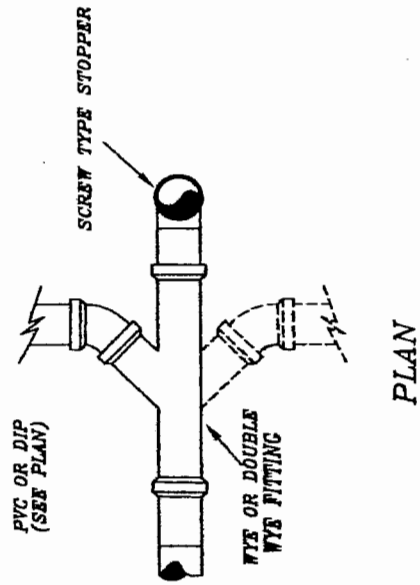
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 ENGINEERING DEPARTMENT



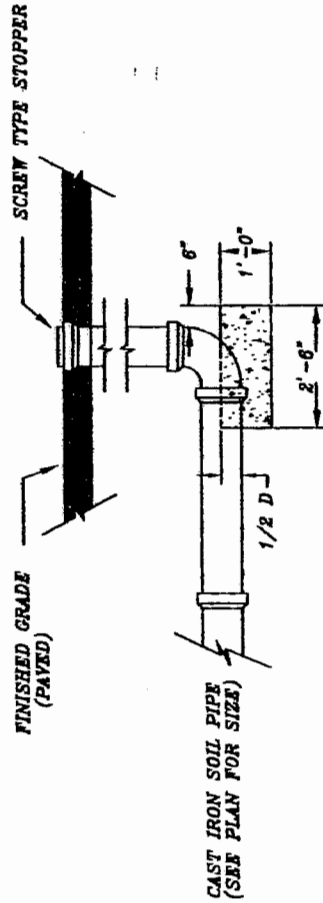
DECEMBER 27, 1999  
 D.MACK KELLY JR., PE, PLS.  
 CITY ENGINEER



ELEVATION - CLEANOUT IN EARTH AREAS



PLAN



ELEVATION - CLEANOUT IN PAVED AREAS

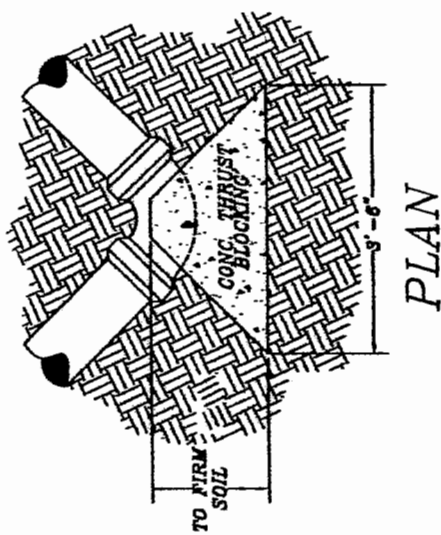
TYPICAL CLEANOUT  
NO SCALE

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ENGINEERING DEPARTMENT

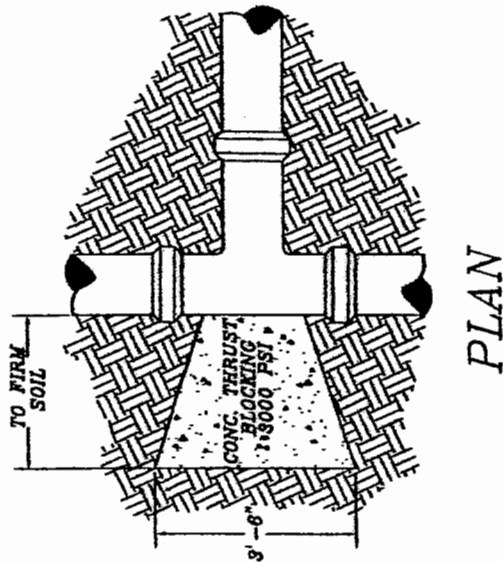
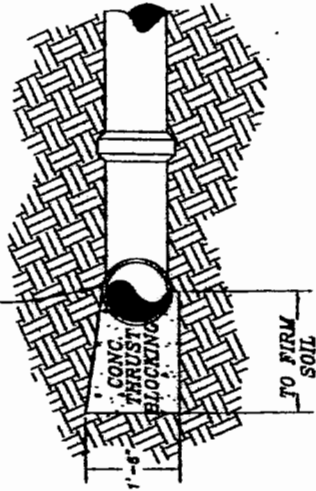


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TEE (BEND SECTION BLOCKING SIMILAR)



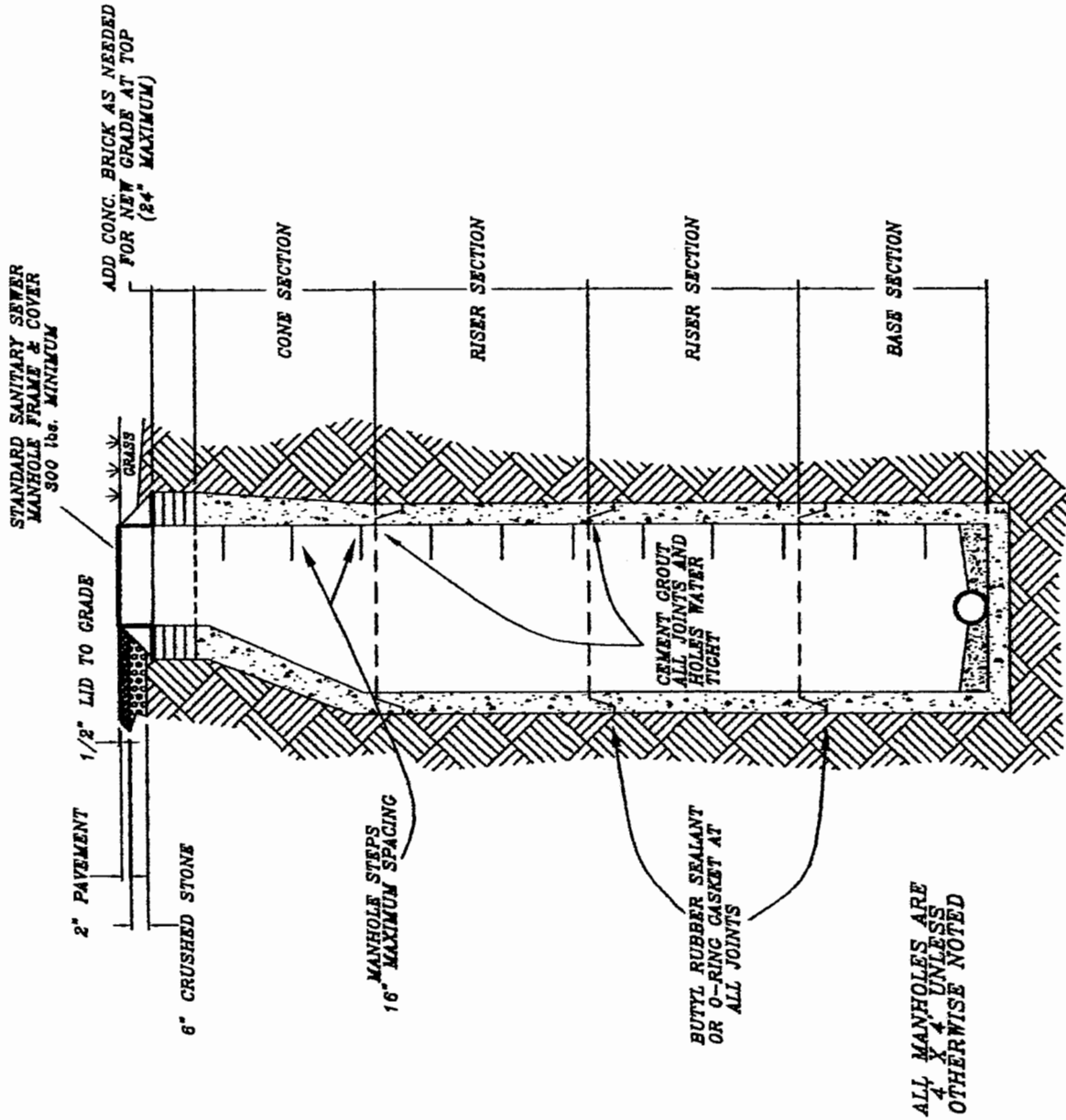
TYPICAL THRUST BLOCKING OF FORCE MAINS  
AT TEES AND BENDS  
NO SCALE

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CITY ENGINEER



PRECAST CONCRETE SANITARY SEWER MANHOLE

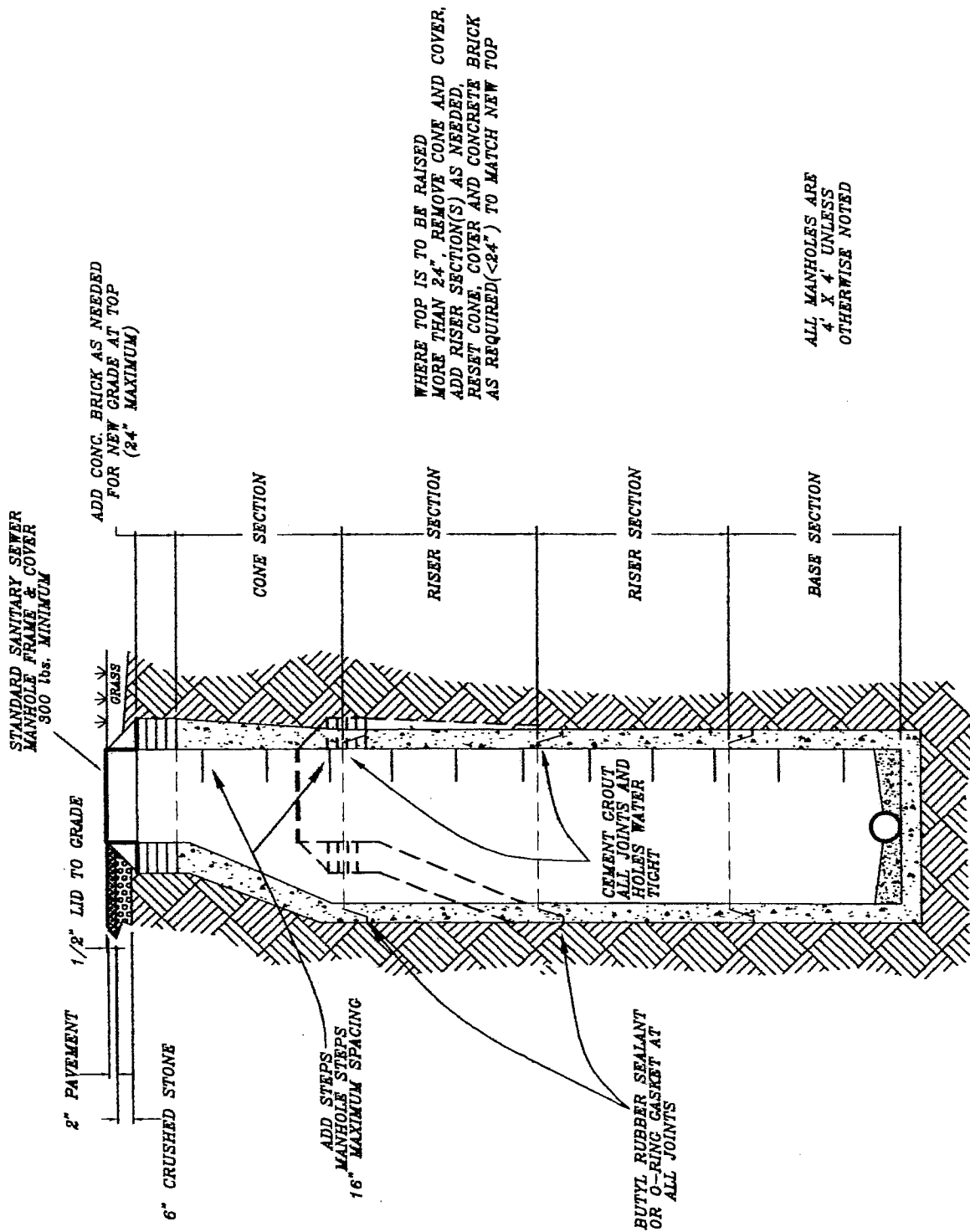
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CITY ENGINEER



WHERE TOP IS TO BE RAISED MORE THAN 24", REMOVE CONE AND COVER, ADD RISER SECTION(S) AS NEEDED, RESET CONE, COVER AND CONCRETE BRICK AS REQUIRED (<24") TO MATCH NEW TOP

ALL MANHOLES ARE 4' X 4' UNLESS OTHERWISE NOTED

DETAIL FOR RAISING TOP OF PRECAST CONCRETE MANHOLE

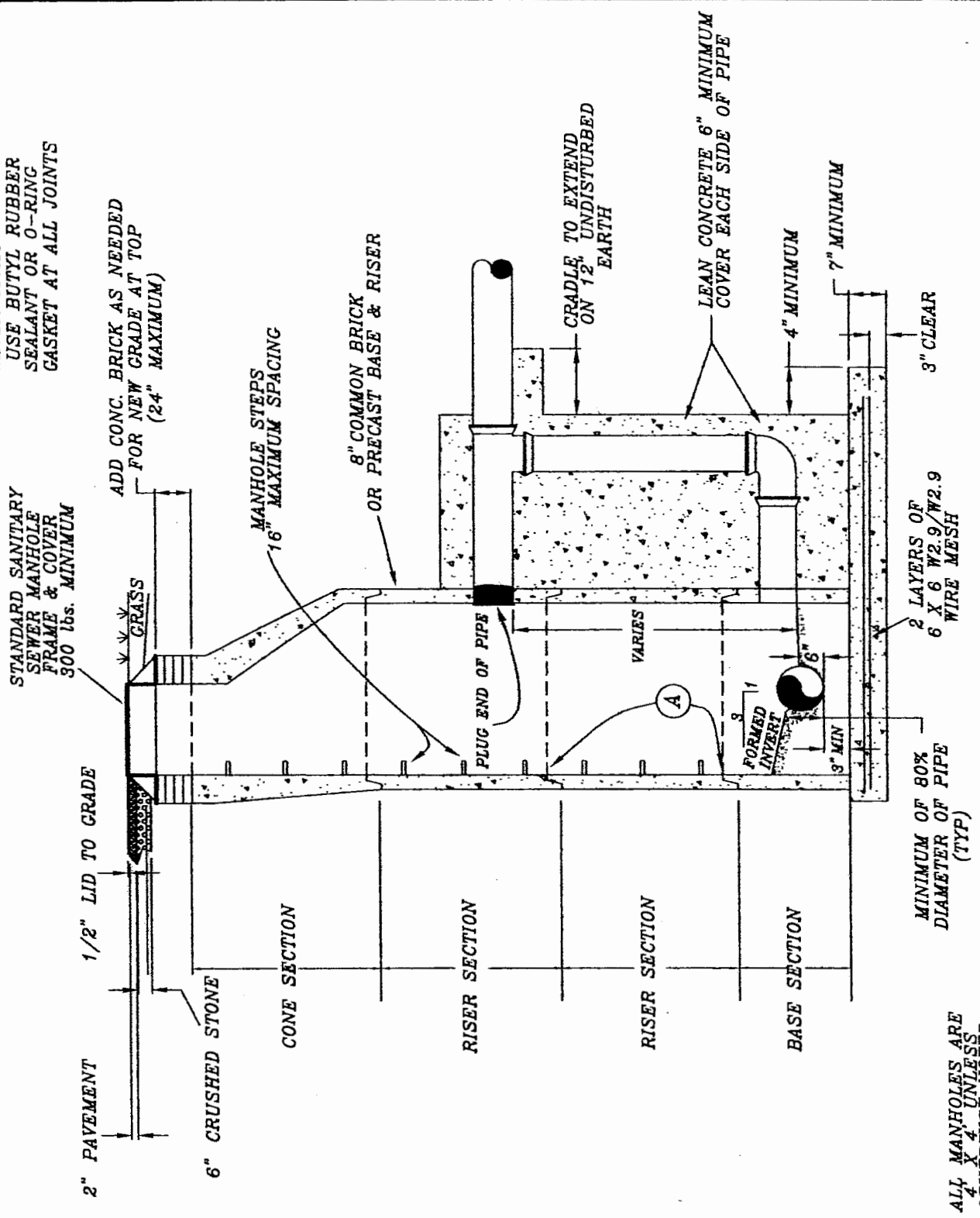
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CITY ENGINEER

(A) CEMENT GROUT ALL JOINT AND HOLES WATER TIGHT. USE BUTYL RUBBER SEALANT OR O-RING GASKET AT ALL JOINTS



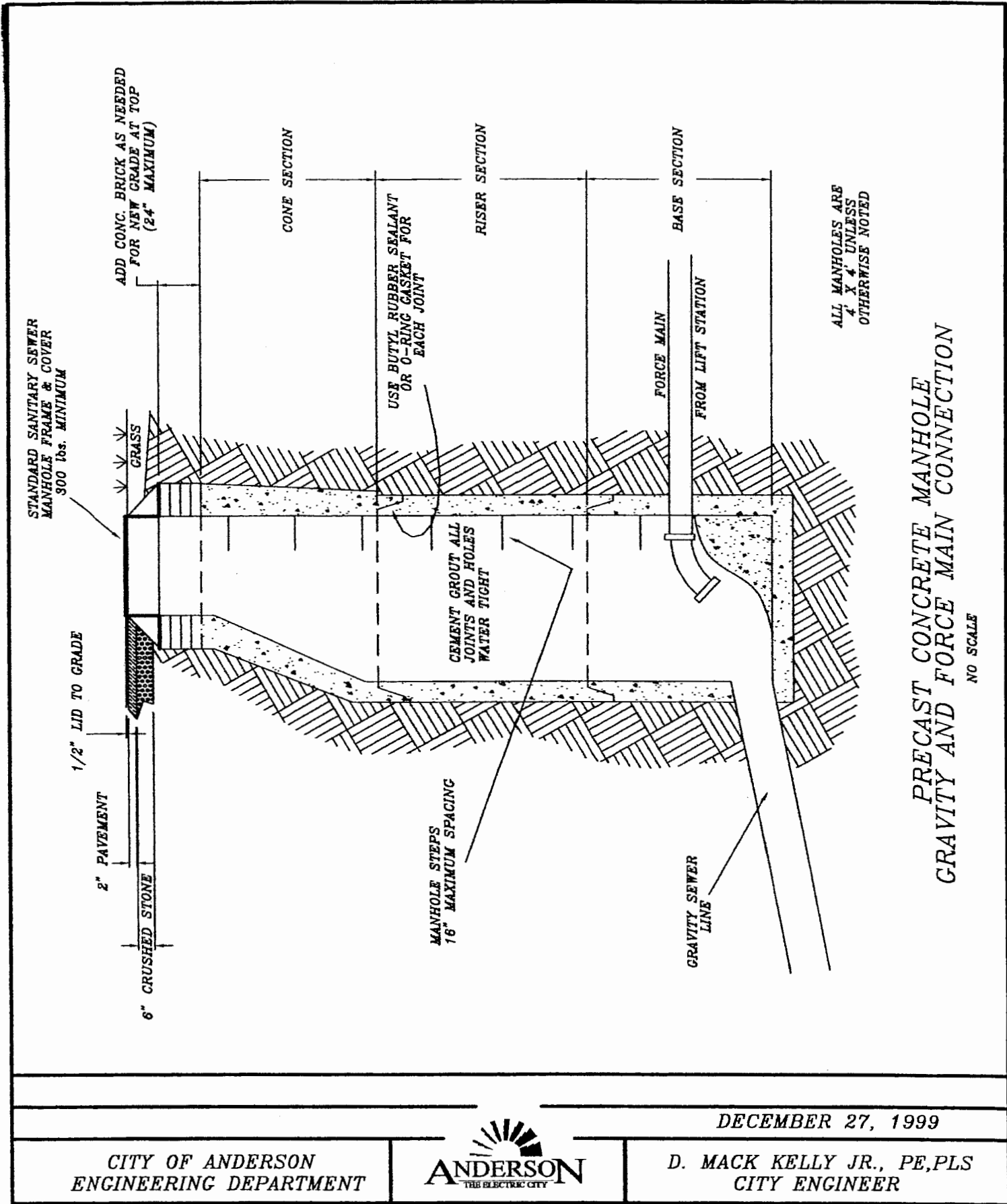
TYPICAL DROP MANHOLE SECTION  
NO SCALE

ALL MANHOLES ARE 4' UNLESS OTHERWISE NOTED

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CITY ENGINEER



ALL MANHOLES ARE  
4' X 4' UNLESS  
OTHERWISE NOTED

PRECAST CONCRETE MANHOLE  
GRAVITY AND FORCE MAIN CONNECTION

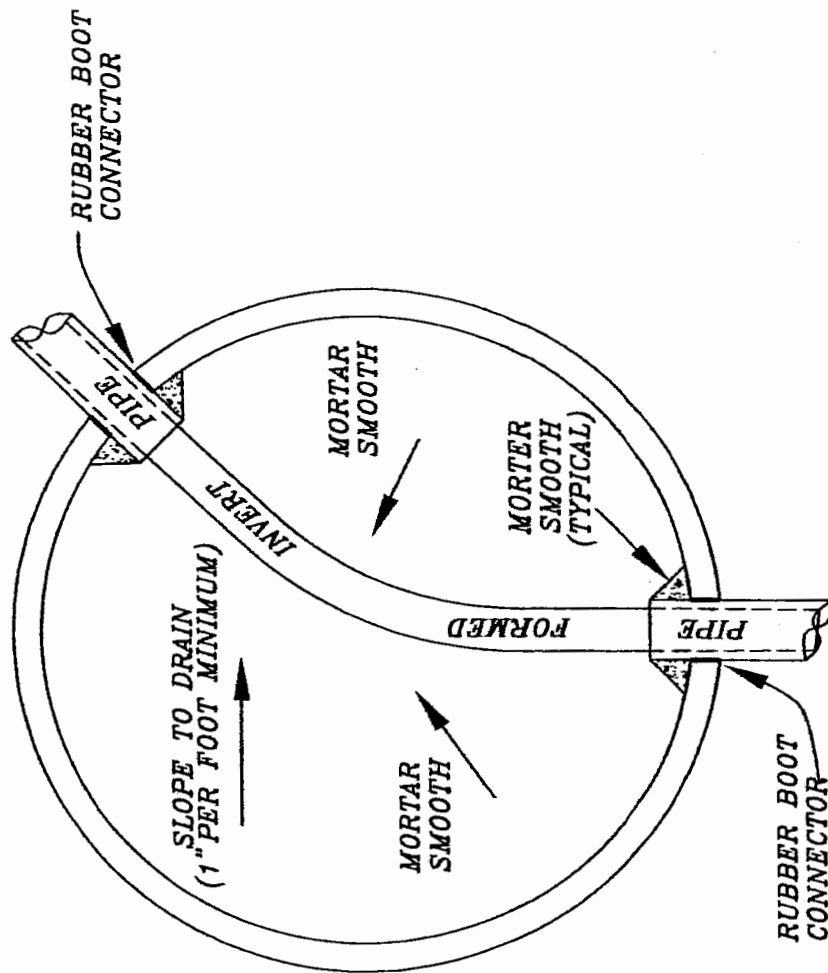
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CITY ENGINEER



TYPICAL INVERT  
 FOR SANITARY SEWER MANHOLE  
 NO SCALE

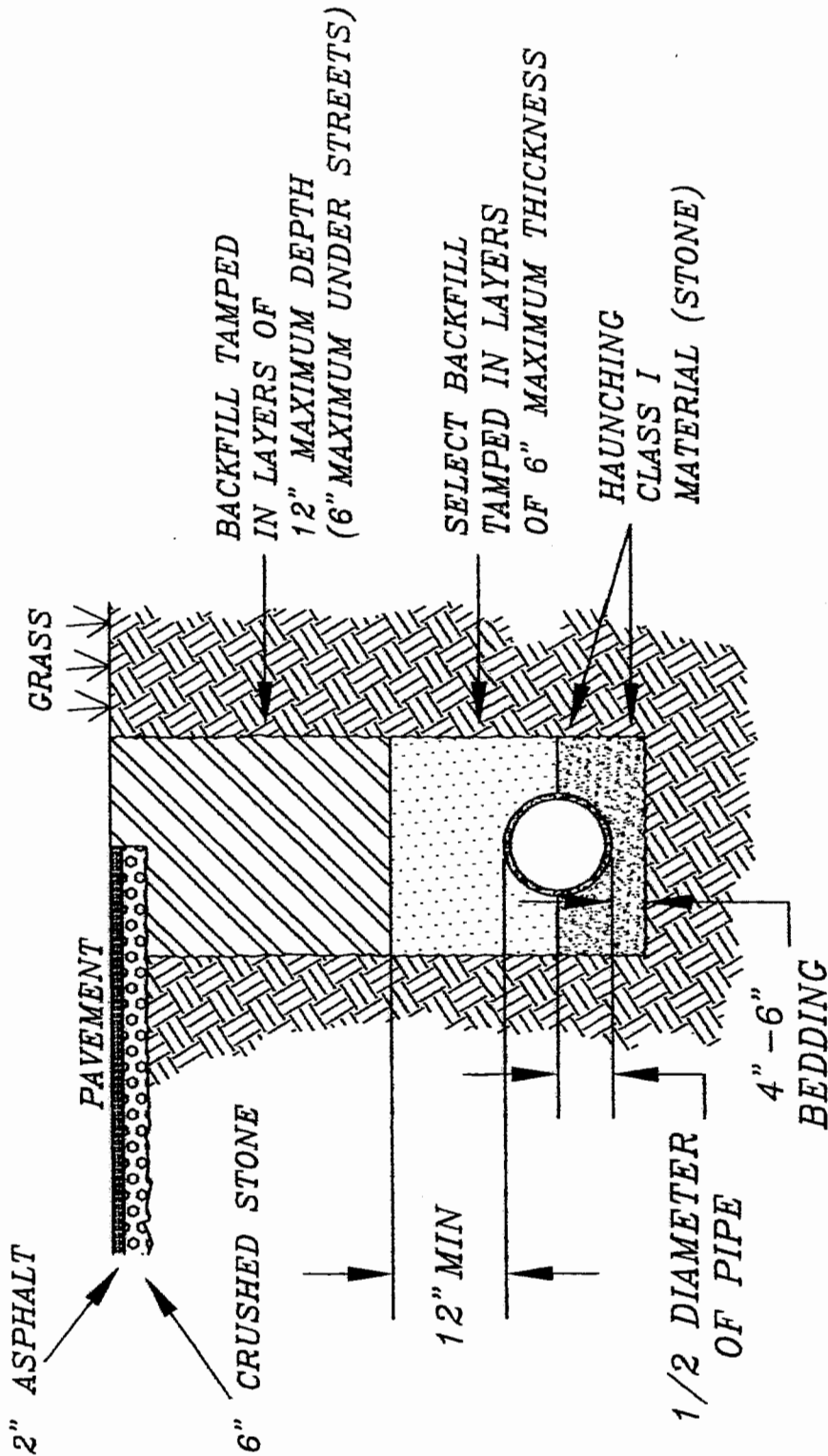
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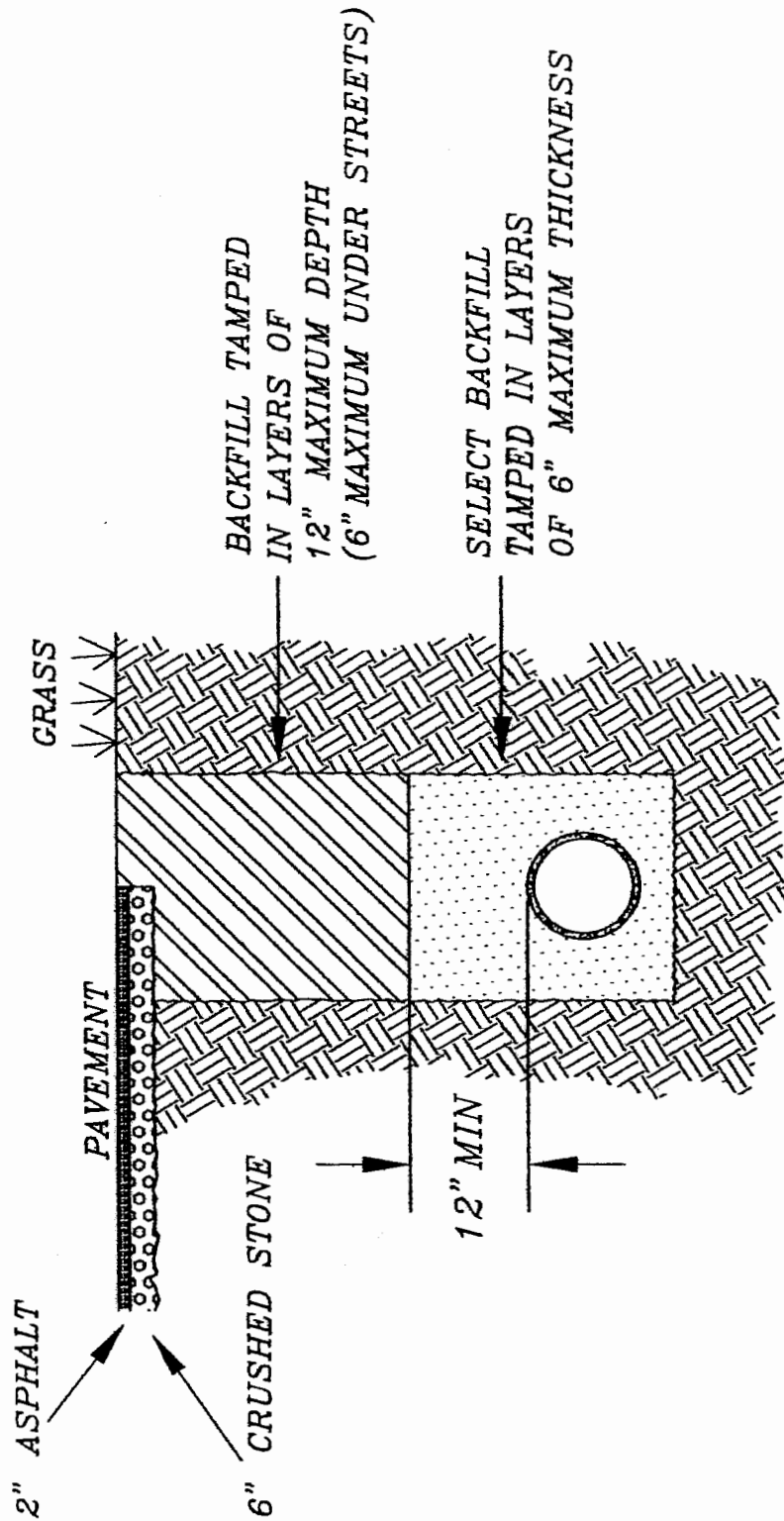
DETAIL OF TYPICAL BEDDING  
 GRAVITY SEWER LINE  
 NO SCALE

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 ENGINEERING DEPARTMENT



DECEMBER 27, 1999

D. MACK KELLY JR., PE, PLS  
 CITY ENGINEER



DETAIL OF TYPICAL BEDDING  
 SANITARY SEWER FORCE MAIN  
 NO SCALE

CITY OF ANDERSON  
 ENGINEERING DEPARTMENT



DECEMBER 27, 1999

D. MACK KELLY JR., PE, PLS  
 CITY ENGINEER

*CITY OF ANDERSON*  
*Sewer Construction*  
*Standards and Policy*

NPDES # SC 0023744 Rocky RIVER WWTP  
SC 0023752 GENEROSTEE WWTP

*MAY 1997*



*CITY OF ANDERSON*  
*Sewer Construction*  
*Standards and Policy*

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EXHIBITS

Exhibit A	Application Form
Exhibit B	System Layout
Exhibit C	Pipe Bedding Details
Exhibit D	Service Details
Exhibit E	Sample R/W Form

## *SEWER CONSTRUCTION STANDARDS AND POLICY*

### A. GENERAL

Any person, firm, or corporation who proposes to construct sanitary sewer facilities within the City limits of Anderson or its service areas shall be required to submit an application duly executed, complete construction plans, specifications, and construction details to the Wastewater Treatment Division, City of Anderson, 309 Kirkwood Drive, Anderson, South Carolina 29624 for approval prior to construction.

### B. REQUIREMENTS FOR SUBMITTAL

1. An "Application To Construct Sanitary Sewers" shall be completed, dated and signed by the project owner or his agent. Refer to Exhibit "A" for an example of this document form.
2. Plans, specifications, and construction details shall be prepared and signed by a professional engineer, licensed to practice in the State of South Carolina, and must be submitted to the City's Wastewater Treatment Division in triplicate. Each set of plans must include a location plan giving the general vicinity of the proposed construction and the major street routing to reach the job site.
3. Plans will be reviewed for conformance to the minimum construction standards for the City of Anderson. Upon completion of the review, the City will return one (1) set of construction drawings, specifications, and details to the Design Engineer. These plans will be marked either "approved", "approved as noted", or "revise and resubmit". Plans marked "approved" or "approved as noted" may begin construction as desired; however, the requirements of all notes must be met during construction. Plans marked "revise and resubmit" must be submitted to the City for approval prior to beginning construction.

4. The Design Engineer shall submit to the City's Wastewater Treatment Division a drawing of the proposed subdivision or development street layout including the sanitary sewer lines to a scale of 1" = 200'. This drawing indicating the project layout shall be similar to Exhibit "B" attached hereto.

C. MINIMUM CONSTRUCTION STANDARDS

Any person, firm, or corporation who proposes to construct sanitary sewers within the City limits or service area shall conform to the following listed requirements as a minimum if the City is to accept the system for maintenance. Nothing in these requirements shall be construed to conflict with minimum requirements of the South Carolina Department of Health and Environmental Control, and, in the event of conflict, the requirements of the South Carolina Department of Health and Environmental Control shall govern. All pipeline materials, installation, clean-up and rights-of-way acquisition must meet the following conditions in order to be approved and accepted as a part of the City of Anderson's sewer system:

1. Clearing. When sewers are constructed outside of street rights-of-way, the entire 25 foot right-of-way width shall be cleared and all debris removed, unless the City is notified and agrees to the clearing of less than the entire right-of-way width.
2. Minimum Pipe Size. No pipe to be used as a sewer collector line shall be installed which has an inside diameter less than eight (8) inches. No individual service connection within the right-of-way shall be less than six (6) inches in diameter.

It is the policy of the City to require all lines to be of adequate size to accommodate the sewer needs of the drainage basin in which the

improvements are proposed. All improvements are to be installed at the developer's expense except as otherwise provide in this policy statement.

3. Pipe Slope. No pipe shall be installed on a slope resulting in a liquid velocity that is less than two feet per second when the pipe is flowing full. Where pipes are installed on a slope resulting in a full flow velocity exceeding 13 feet per second, ductile iron pipe and anchor blocking shall be provided. Anchor block spacing shall conform to "Ten State Standards" recommendations.
4. Pipe Material. The following pipe materials have been approved for installation by the City of Anderson:
  - a. Vitrified clay pipe. VCP shall be extra strength vitrified clay pipe conforming to ASTM C-700, latest revision.
  - b. Polyvinyl chloride pipe. PVC shall conform to ASTM D3034, F794, or F949 latest revision, cell classification 12454B, SDR35.
  - c. Ductile iron pipe. DIP shall comply with ASTM A-746, ANSI A21.50 and ANSI A21.51 latest revision, class 50.
5. Pipe Installation. The minimum pipe bedding for all sewer pipe installed in the City's service area will be as follows:
  - a. Vitrified clay pipe. The minimum bedding shall be 4" of bedding stone (Class C-2).
  - b. Polyvinyl chloride pipe. The minimum bedding for all PVC pipe shall be a complete stone encasement; 4" below to 6" above the pipe (Class B-1).

- c. Ductile iron pipe. The minimum bedding shall be 4" of bedding stone (Class C-2).

Bedding stone shall conform to ASTM D448 size No. 67 or 6M with size range of ¼ inch to ¾ inch.

See Exhibit "C" for pipe bedding details.

6. Pipe Trench. Trench width for sewer pipes shall be that required to allow proper construction of bedding, laying, jointing, sheeting and backfill compaction. Trench width for VCP and PVC to a point twelve inches above the top of pipe, shall not exceed pipe bell OD + 24 inches.
7. Trench Backfill. Trench excavations shall be backfilled with special materials when required by bedding requirements. Otherwise backfill must be earth material free of debris, large roots, and sharp objects. Stones larger than 6 inches shall not be used as backfill within 3 feet of pipe.
8. Compaction. The backfill material shall be compacted at least to 85 percent maximum density at optimum moisture content in areas not subject to vehicular traffic. Within road rights-of-way and areas subject to vehicular traffic compaction shall be to a minimum of 95 percent of maximum density at optimum moisture content. Where sewer joins a structure, such as a manhole, earth shall be backfilled in maximum 8 inch layers and compacted thoroughly to at least 95 percent maximum density at optimum moisture content. Any noticeable settlement of backfill along trenches shall be filled in and compacted flush with grade existing prior to settlement, or original ground.
9. Erosion Control. The disturbed areas of each bank of large ditches and stream banks shall be riprapped each side of pipe centerline. Minimum total



width riprapped shall be 12 feet. Stone may be from trench excavation, but shall have a minimum dimension of 12 inches.

10. Grassing. All unpaved areas disturbed by construction of sewers shall be cleaned up, fine graded and grassed upon completion of the backfill and compaction operations.
11. Manholes. All manholes shall have a minimum inside diameter of four feet.
  - a. Type. Manholes are to be constructed of precast concrete conforming to ASTM C-478, latest revision, with monolithically poured bottoms and preformed or core drilled pipe openings. Connections to manholes shall be made using a flexible boot or external masonry collar. All manhole joints and pipe connections to manholes must be sufficiently watertight to prevent water seepage into interior of sewer system.
  - b. Spacing. Off-street manholes must be spaced not more than 300 feet apart but manholes on streets, or street right-of-way, may be placed at maximum 350 ft. center to center unless otherwise approved by the City.
  - c. Manhole castings. Manhole frame and covers shall be gray cast iron ASTM Class 30 having a minimum tensile strength of 300,000 psi. Total frame and cover weight must exceed 310 lbs. And dimensions must allow interchangeability with existing City castings.
12. Services. All services shall be of the wye type. Tees will not be accepted. Refer to Exhibit "D" for a typical service detail.

13. Connection of Sewer Lines to Existing System. Where a newly constructed sewer line must be tied to an existing manhole, the connection shall be made to insure that no structural damage to the manhole occurs and a leakage (inflow/infiltration) source is not created. The contractor shall carefully excavate around the exterior manhole wall to expose the area where the new line will connect and construct an opening no larger than necessary to receive the pipe. Care shall be taken when placing the opening that no more manhole wall material is removed than necessary. Pipe shall be placed in openings as previously specified. Non-shrink grout shall be placed around the joint between pipe and the manhole and rammed or vibrated in such a manner as to fill all cracks and voids in the wall. Following connection of the line to the manhole, a collar shall be constructed around the new pipe connection. The collar shall be either clay brick or concrete brick jointed with mortar.
14. Rights-of-Way. No sewer collector shall be installed in a right-of-way having a width of less than 25 feet. Sewers will be located on the centerline of the right-of-way whenever possible. A written request must be forwarded to the City, and written approval received, for permission to encroach upon the sewer right-of-way for the purpose of constructing other pipelines, utilities, drainage ways, structures, etc.

See Exhibit "E" for sample form.

D. INSPECTION AND TESTING

1. The Owner or Agent will be required to notify the City's Wastewater Treatment Division in writing not less than 24 hours prior to beginning construction and shall submit to the City a proposed construction schedule.

2. The City's Inspector will make periodic inspection trips to the site to insure conformance to the requirements of the City of Anderson. It will be the responsibility of the Design Engineer to make detail inspections and to insure that the minimum requirements of the City are met.
  
3. Pipe Inspection
  - a. Air Test. All sewer pipes and individual service connection laterals shall be subjected to a low-pressure air test, with minimum starting pressure of 3.5 psi, in accordance with ANSI/ASTM C-828, latest revision, in the presence of the City's Inspector or representative.
  
  - b. Deflection Test. All PVC sewer pipe sections shall be tested for deflection at least thirty (30) days, but not more than twelve months, after installations. Deflection test is to be performed from manhole to manhole in the presence of the City's Inspector or representative. Maximum allowable deflection shall be five (5) percent.
  
4. Manhole Inspection.
  - a. Manholes shall be true circles of acceptable concrete with properly corbeled tops, satisfactory inverts and properly placed steps and castings. Manholes shall not show evidence of leakage.
  
  - b. All manholes shall be vacuum tested to determine the presence of damaged or faulty installation. The Contractor will furnish all facilities, personnel, and equipment needed for conducting the test. The acceptance vacuum test shall be made after backfilling has been completed and will be in the presence of the City's Inspector. The test will be performed as follows:

Plug all manhole entrances and exits other than the manhole top access using suitably sized pneumatic or mechanical pipeline plugs and follow all manufacturers' recommendations and warnings for proper and safe installation of such plugs.

Install the vacuum tester head assembly at the top access of manhole.

Evacuate the manhole to 10" Hg. (approximately negative 5 psig, 0.3 bar).

Close vacuum inlet/outlet ball valve and monitor vacuum for one minute. If vacuum does not drop in excess of 1" Hg., manhole is considered acceptable and the manhole passes the test. If manhole fails the test, complete necessary repairs and repeat test procedures until satisfactory results are obtained.

**E. FINAL ACCEPTANCE**

1. Upon completion of construction of the sanitary sewer system, the Design Engineer will request that a final inspection be made by the City's Inspector. A final inspection for a completed sewer system shall be required before the City's Inspector will recommend final approval. The inspection requires that each manhole be opened to determine if any problems have occurred after the periodic inspections. The Design Engineer will also submit to the City's Wastewater Treatment Division one set of plans indicating the "as-built" sewer system, the locations of all service connections on the system and the Engineer's certification letter.

2. Upon receipt of all the above documents and required fees, the City will instruct the Owner or Agent to proceed with conveyance of title for the installed system and right-of-way to the City for operation and maintenance.

F. INSPECTION FEES

1. A \$75 fee will be charged for air and/or deflection testing conducted in the presence of the Inspector. Any return trips to the job-site by the City's Inspector due to failed tests or incomplete tests will require an additional \$75 fee each trip.
2. A \$75 fee will be charged for each FINAL inspection by the City's Inspector. Any subsequent inspections related to the final will require an additional \$75 fee each trip.
3. A \$75 fee will be charged for each Vacuum Test conducted in the presence of the City's Inspector. Any return trips to the job-site by the Inspector due to failed tests or incomplete tests will require an additional \$75 fee each trip.
4. No letters of acceptance will be issued until all fees are paid.



WASTEWATER TREATMENT DIVISION
CITY OF ANDERSON
309 Kirkwood Drive
Anderson, South Carolina 29624

Telephone (864) 231-2250
Fax (864) 231-2251

APPLICATION TO CONSTRUCT SANITARY SEWERS

(THIS APPLICATION IS NON-TRANSFERABLE)

PROJECT NAME: \_\_\_\_\_

PROJECT DESCRIPTION: \_\_\_\_\_

SITE LOCATION: \_\_\_\_\_

TAX MAP NO. \_\_\_\_\_ OWNER(S): \_\_\_\_\_

ADDRESS: \_\_\_\_\_

PHONE NO. \_\_\_\_\_

DESIGN ENGINEER: \_\_\_\_\_

ADDRESS & PHONE NO. \_\_\_\_\_

We hereby agree to comply with all rules and regulations of the City of Anderson regarding subject project, to pay all fees applicable thereto, and to warrant the sewer system free from any and all defects in construction, workmanship and materials for a period of one year following acceptance by the City.

The design engineer will submit <sup>Four (4)</sup>~~three (3)~~ sets of complete plans, profiles and specifications meeting the City's sewer construction standards along with a 1" = 200' drawing of the project for approval.

Total wastewater flow of the project should not exceed \_\_\_\_\_ gallons per day.

Upon inspection of the completed sewer system, we will deed the lines, manholes and appurtenances with a permanent 25' right-of-way to the City of Anderson for operation and maintenance. A set of "as-built" drawings locating service connections will be provided to the City's Wastewater Treatment Division.

Date: \_\_\_\_\_

By: \_\_\_\_\_

(Owner/Agent)

Title: \_\_\_\_\_

APPROVAL TO CONSTRUCT

The City of Anderson will permit construction of the proposed sanitary sewers with the understanding that the system will be conveyed to the City for public use.

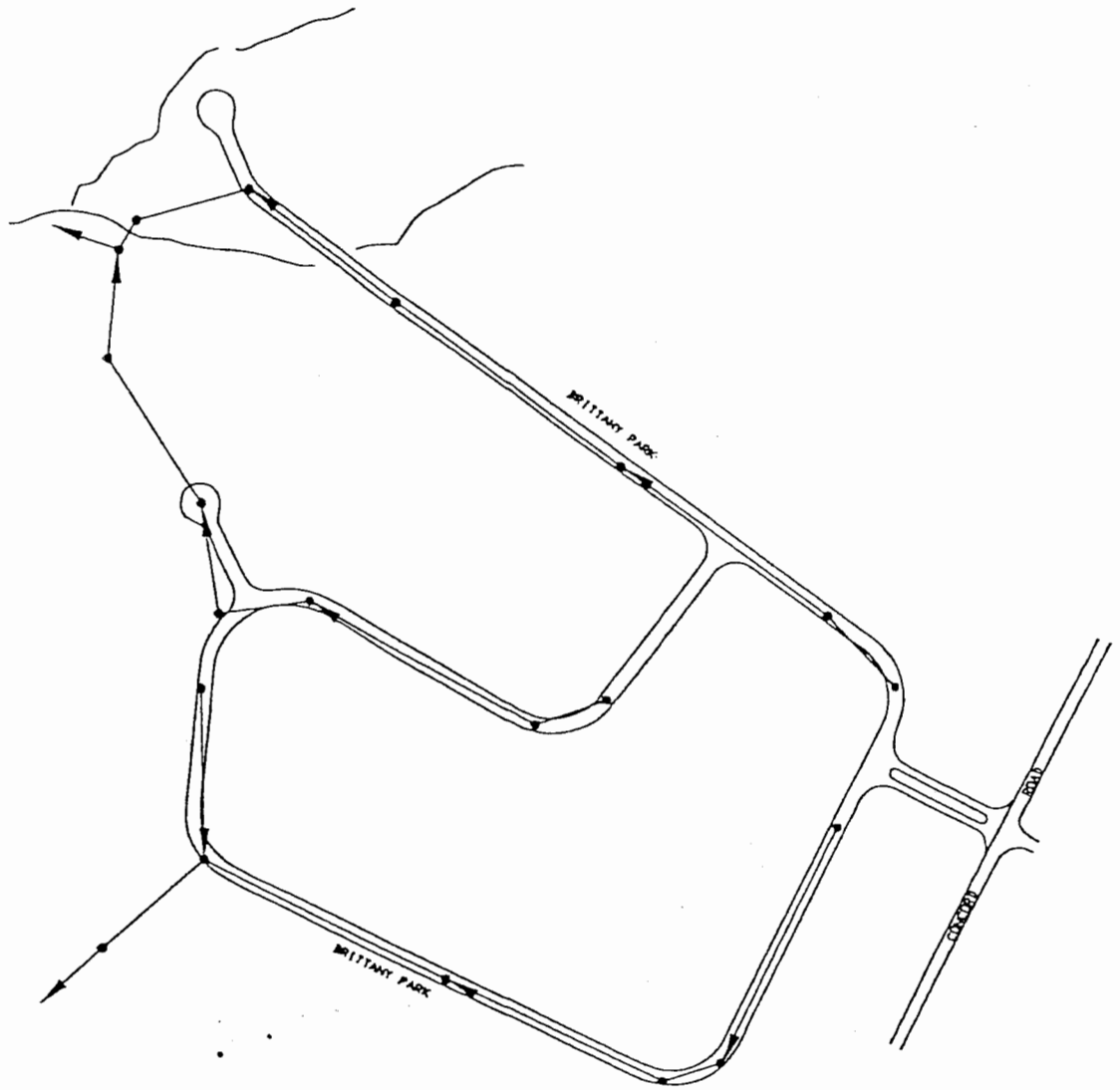
Date: \_\_\_\_\_

By: \_\_\_\_\_

Wastewater Director

c: Owner/Agent, SCDHEC, Building Department and Project File

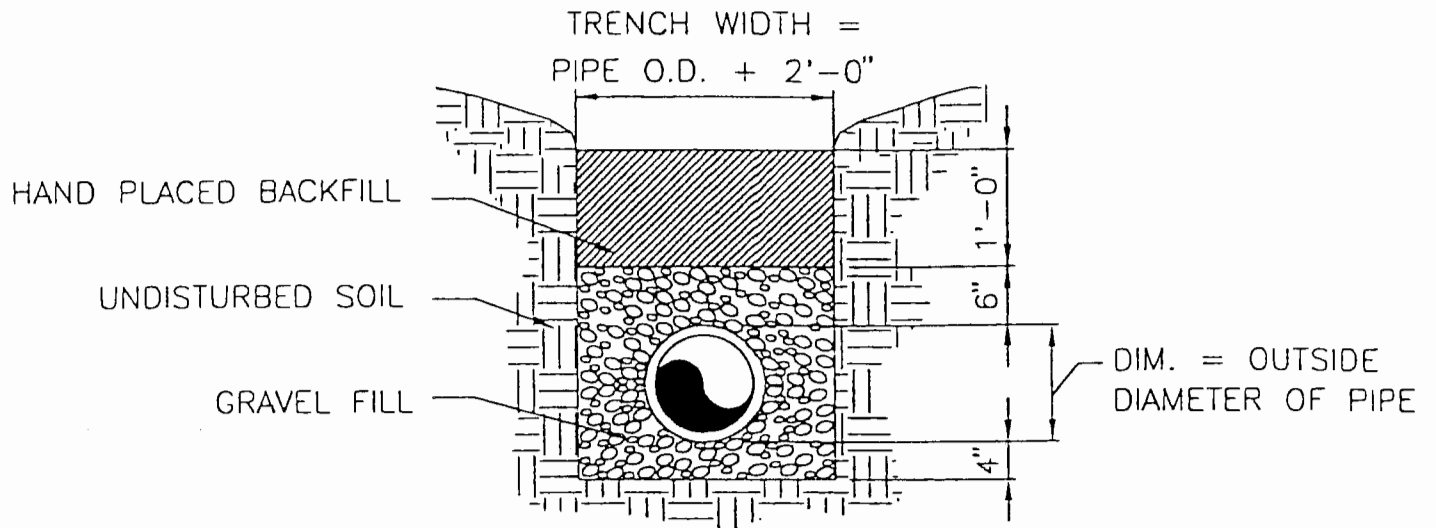
Exhibit "A"



KEY PLAN  
SCALE: 1" = 200'

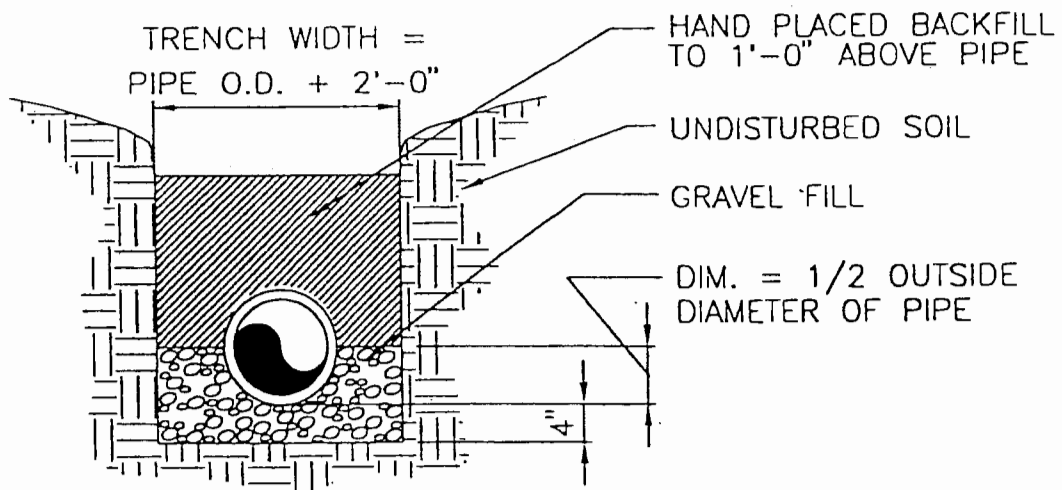


SYSTEM LAYOUT  
EXHIBIT "B"



CLASS B-1 BEDDING

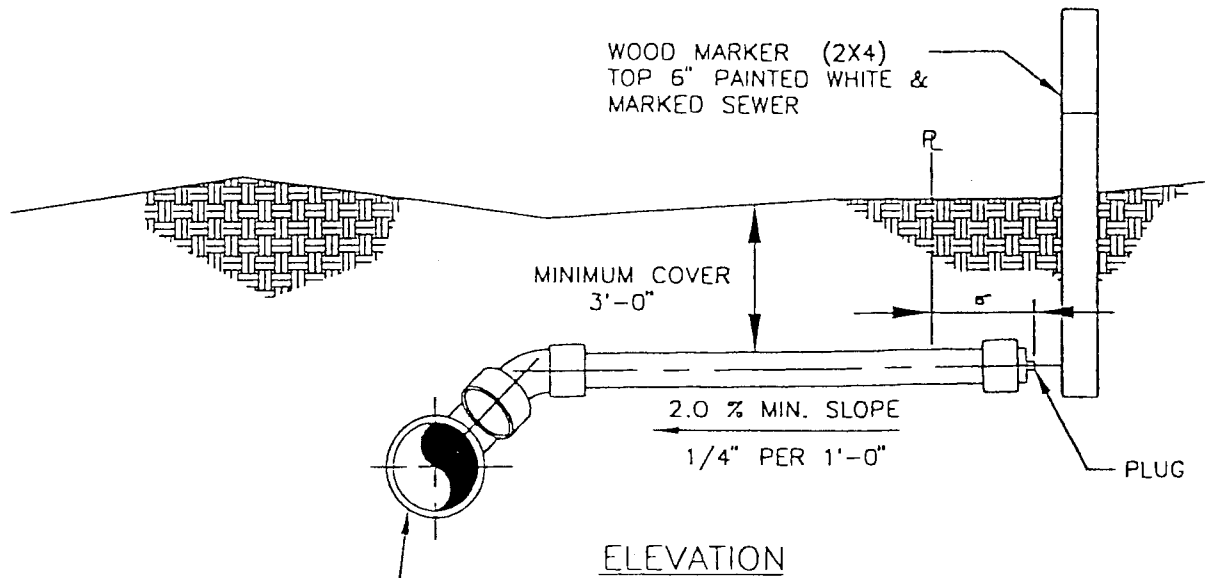
N.T.S.



CLASS C-2 BEDDING

N.T.S.





SEWER MAIN

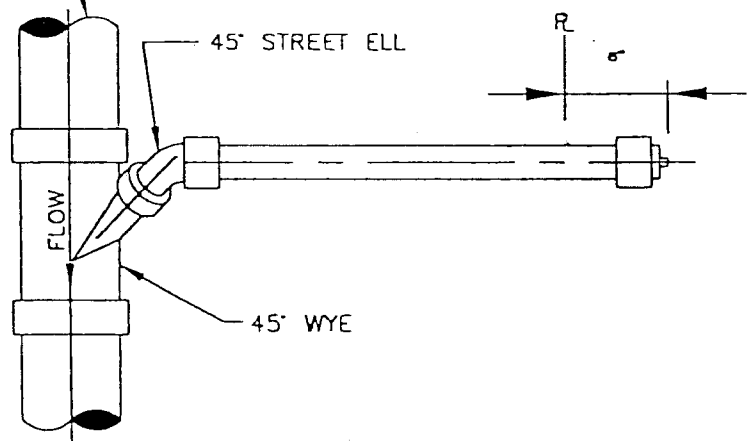


Exhibit "E" - Sample Form  
[Corporate Grantor]

STATE OF SOUTH CAROLINA    )  
COUNTY OF ANDERSON         )

DEDICATION AND CONVEYANCE OF  
SANITARY SEWER LINE AND EASEMENT

KNOW ALL MEN BY THESE PRESENTS, that \_\_\_\_\_, a corporation, (Grantor) in consideration of One (\$1.00) Dollar to the Grantor paid in hand at and before the sealing of these presents by the Grantee, the receipt of which is hereby acknowledged, have granted, bargained, sole, released, dedicated and conveyed, and by these presents does grant, bargain, sell, release, dedicate and convey to the CITY OF ANDERSON, its successors and assigns (Grantee):

Those certain sanitary lines, manholes, valves, adjuncts and appurtenances installed and located in, under or along the property of Grantor as shown on a plat entitled \_\_\_\_\_ prepared by \_\_\_\_\_ dated \_\_\_\_\_, recorded in Plat Book \_\_\_\_\_, Page \_\_\_\_\_, which plat is by reference made a part of this description; together with and including an easement 12-1/2 feet in width on either side of said sanitary sewer line as shown on said plat for purposes of the operation, maintenance, repair, replacement or relocation of such lines and appurtenances.

The above described property is all or a portion of that conveyed to Grantor herein by Deed of \_\_\_\_\_ recorded \_\_\_\_\_ in the RMC office for Anderson County, South Carolina in Deed Book \_\_\_\_\_, Page \_\_\_\_\_.

TOGETHER WITH all and singular the rights, members, hereditaments and appurtenances to said premises belonging or in any wise incident or appertaining, including, without limitation, the right of ingress and egress to the above easement over and through lands of Grantor; to have and to hold all and singular the premises before mentioned unto the Grantee, and the Grantee's successors and assigns, forever, subject to the reservations, terms and provisions hereof.

GRANTOR WARRANTS AND REPRESENTS that the property and the rights and easements herein conveyed are not subject to any mortgage, judgment or lien other than for property taxes which are not yet past due, nor to any encumbrance which would interfere with Grantee's ability to operate, maintain, repair, replace, relocate or otherwise own and utilize the lines and system described above. And, the Grantor does hereby bind itself and its successors to warrant and forever defend all and singular said premises unto the Grantee and the Grantee's heirs or successors and against the Grantor and the Grantor's successors and against every person whomsoever lawfully claiming or to claim the same or any part thereof.

WITNESS the Grantor's hand and seal this \_\_\_\_\_ day of \_\_\_\_\_, 19 \_\_\_\_.

SIGNED, sealed and delivered  
in the presence of:

\_\_\_\_\_(SEAL)  
Name of Corporation

\_\_\_\_\_  
By: \_\_\_\_\_  
President

\_\_\_\_\_  
And: \_\_\_\_\_  
Secretary

STATE OF SOUTH CAROLINA )  
COUNTY OF ANDERSON )

PROBATE

Personally appeared the undersigned witness and made oath that (s)he saw the within named \_\_\_\_\_ (Grantor), by its authorized officer(s), sign, seal, and as the Grantor's act and deed, deliver the within written deed and that (s)he, with the other witness subscribed above, witnessed the execution thereof.

SWORN to before me this \_\_\_\_\_ day  
of \_\_\_\_\_, 19\_\_\_\_.

\_\_\_\_\_  
Notary Public for South Carolina  
My Commission expires:

CONSENT AND JOINDER OF MORTGAGE

\_\_\_\_\_, the owner and holder of a certain encumbrance, to wit: that certain mortgage encumbering the property described in the foregoing Dedication and Conveyance, which mortgage is recorded in Mortgage Book \_\_\_\_\_ at page \_\_\_\_\_ of the RMC office of Anderson County, South Carolina, does hereby join in the grant of the dedication and conveyance for the purpose of consenting to the same, thereby agreeing to honor and recognize the same hereafter, in accordance with its terms.

In Witness Whereof, the undersigned has executed this Consent and Joinder this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_\_.

WITNESS

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
By: \_\_\_\_\_

STATE OF \_\_\_\_\_ )  
COUNTY OF \_\_\_\_\_ )

MORTGAGE  
PROBATE (INDIVIDUAL)

Personally appeared the undersigned witness and made oath that (s)he, saw the within mortgagee sign, seal and as the mortgagee's act and deed, deliver the within written Consent and Joinder of Mortgagee and that (s)he, with the other witness subscribed above, witnessed the execution thereof.

SWORN to before me this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_\_.

\_\_\_\_\_(SEAL)  
Notary Public for  
My commission expires:

STATE OF \_\_\_\_\_ )  
COUNTY OF \_\_\_\_\_ )

PROBATE (CORPORATE)

Personally appeared the undersigned witness and made oath that (s)he saw the within named corporate mortgagee by its duly authorized officer(s), sign, seal and as its act and deed deliver the within written Consent and Joinder of Mortgagee and that (s)he, with the other witness subscribed above, witnessed the execution thereof.

SWORN to before me this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_\_.

\_\_\_\_\_(SEAL)  
Notary Public for  
My commission expires: