

**UTILITIES**

|                 |                        |                |
|-----------------|------------------------|----------------|
| WATER:          | PWSO NO. 2             | (636) 561-3737 |
| SANITARY SEWER: | PWSO NO. 2             | (636) 561-3737 |
| GAS:            | LACLEDE GAS COMPANY    | (314) 658-5449 |
|                 | WILLIAMS PIPELINE      | (913) 310-7812 |
| ELECTRIC:       | AMEREN UE              | (636) 639-8312 |
|                 | CENTRAL ELECTRIC POWER | (573) 634-2454 |
|                 | CUMRE RIVER ELECTRIC   | (636) 528-8261 |
| TELEPHONE:      | CENTURYTEL             | (636) 332-7261 |
| CABLE TV:       | CHARTER COMMUNICATIONS | (314) 280-2372 |
| MO. ONE CALL    | (800) DIG-RITE         | (800) 344-7483 |

# CIVIL ENGINEERING for SANITARY SEWER EXTENSION FEISE ROAD/SERVICE DRIVE

## CITY OF LAKE SAINT LOUIS ST. CHARLES COUNTY, MISSOURI

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**OWNER/OPERATOR**  
PUBLIC WATER SUPPLY DISTRICT #2  
OF ST. CHARLES COUNTY, MISSOURI  
100 WATER DRIVE, P.O. BOX 370  
O'FALLON, MISSOURI 63366  
(636) 561-3737

**CIVIL ENGINEER**  
THOUVENOT WADE & MOERCHEN, INC.  
1001 CRAIG ROAD, SUITE 260  
ST. LOUIS, MISSOURI 63146  
(314) 727-9131

**THOUVENOT,  
WADE &  
MOERCHEN, INC.**  
ENGINEERS ♦ SURVEYORS ♦ PLANNERS

- TWM**
- CORPORATE OFFICE**  
4940 OLD COLLINSVILLE RD.  
SWANSEA, ILLINOIS 62226  
TEL (618) 624-4488  
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stlouis@twm-inc.com

|                                     |                    |
|-------------------------------------|--------------------|
| <b>PROFESSIONAL REGISTRATIONS:</b>  | <b>LICENSE NO.</b> |
| ILLINOIS PROFESSIONAL DESIGN FIRM   | 154-001200         |
| PROFESSIONAL ENGINEERING CORP.      | 62-03570           |
| PROFESSIONAL STRUCTURAL ENGR. CORP. | 61-005202          |
| ILLINOIS PROF. LAND SURVEYING CORP. | 048-000029         |
| MISSOURI PROFESSIONAL ENGR. CORP.   | MC 001528          |
| MISSOURI LAND SURVEYING CORP.       | MC 000346          |

**CIVIL SITE ENGINEERING NOTES**

**General Notes**

THESE CONSTRUCTION PLANS AND SPECIFICATIONS ARE SUBJECT TO MODIFICATIONS DURING CONSTRUCTION WHEN CONDITIONS DEVELOP THAT WERE NOT APPARENT DURING THE DESIGN AND PREPARATION OF THESE PLANS. ALL MODIFICATIONS MUST BE APPROVED BY ALL PERTINENT APPROVING AGENCIES PRIOR TO CONSTRUCTION AND/OR IMPLEMENTATION.

BEFORE COMMENCEMENT OF WORK, THE CONTRACTOR SHALL REVIEW ALL PLANS AND SPECIFICATIONS AND THE JOB SITE. THE CONTRACTOR SHALL NOTIFY THE OWNER AND THE ENGINEER WHO PREPARED THE PLANS OF ANY DISCREPANCIES THAT MAY REQUIRE MODIFICATION TO THESE PLANS OR OF ANY FIELD CONFLICTS.

IN THE EVENT OF ANY DISCREPANCY BETWEEN ANY DRAWING AND THE FIGURES WRITTEN THEREON, THE FIGURES SHALL BE TAKEN AS CORRECT.

SHOULD IT APPEAR THAT THE WORK TO BE DONE OR ANY MATTER RELATIVE THERETO IS NOT SUFFICIENTLY DETAILED OR EXPLAINED ON THESE PLANS, THE CONTRACTOR SHALL CONTACT THE ENGINEER FOR SUCH FURTHER EXPLANATIONS AS MAY BE NECESSARY.

CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY, AND HOLD THE OWNER AND DESIGN PROFESSIONAL HARMLESS OF ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

CONTRACTOR SHALL OBTAIN ENCROACHMENT PERMITS PRIOR TO COMMENCING CONSTRUCTION INVOLVING RIGHT-OF-WAYS, AND FOR THE CONSTRUCTION, MODIFICATION, OR CONNECTION TO FACILITIES. ALL WORKMANSHIP EQUIPMENT AND MATERIALS SHALL CONFORM TO LOCAL JURISDICTION STANDARDS AND SPECIFICATIONS.

TRAFFIC CONTROL SHALL BE PROVIDED IN ACCORDANCE WITH LOCAL JURISDICTION.

THE CONTRACTOR SHALL PROVIDE ALL LIGHTS, SIGNS, BARRICADES, FLAG MEN, OR OTHER DEVICES NECESSARY TO PROVIDE FOR PUBLIC SAFETY.

TWM, INC. SHALL NOT BE RESPONSIBLE FOR OR HAVE CONTROL OVER THE MEANS AND METHODS OF CONSTRUCTION.

THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE APPROPRIATE GOVERNMENTAL ENTITY AT LEAST FORTY-EIGHT (48) HOURS IN ADVANCE PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES OR WORK REQUIRING INSPECTION OR APPROVAL BY THE AFFECTED UNITS OF GOVERNMENT.

**TITLE DISCLAIMER**

IT IS NOT WARRANTED THAT THESE DRAWINGS CONTAIN COMPLETE INFORMATION REGARDING EASEMENTS, RESERVATIONS, RESTRICTIONS, RIGHT-OF-WAYS, BUILDING LINE SETBACKS, AND OTHER ENCUMBRANCES. FOR COMPLETE INFORMATION, A TITLE OPINION OR COMMITMENT FOR TITLE INSURANCE SHOULD BE OBTAINED AND THOROUGHLY REVIEWED.

**Utility Notes**

THE TYPE, SIZE, AND LOCATION OF UTILITIES AS DELINEATED IN THESE TOPOGRAPHIC LAND SURVEY DOCUMENTS AND/OR CIVIL ENGINEERING DESIGN DOCUMENTS HAVE BEEN DETERMINED BY REVIEW OF AVAILABLE EXISTING "AS-BUILT" OR RECORD DRAWINGS; FIELD SURVEY OF J.U.L.I.E. MARKED UTILITIES; OR FIELD SURVEY OF ABOVE GROUND SURFACE UTILITY FEATURES. THE OWNER AND ENGINEER HAVE NOT UNDERTAKEN SUBSURFACE EXPLORATORY INVESTIGATIONS TO CONFIRM OR VERIFY THE UTILITIES SHOWN ON THESE DOCUMENTS, THEREFORE THEIR EXACT LOCATION, SIZE AND FUNCTION MUST BE CONSIDERED APPROXIMATE AND MUST BE FIELD CONFIRMED BY THE CONTRACTOR.

THE ENGINEER AND OWNER FURTHER DO NOT WARRANT THAT ALL UTILITIES HAVE BEEN ILLUSTRATED ON THESE DOCUMENTS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR CONTACTING J.U.L.I.E. FOR FIELD VERIFICATION OF ALL UTILITIES ON THE SITE PRIOR TO COMMENCEMENT OF CONSTRUCTION. IF THE CONTRACTOR DETERMINES THAT SUBSTANTIAL DISCREPANCY EXISTS BETWEEN FIELD VERIFIED UTILITIES AND THESE PLANS WHICH WOULD SIGNIFICANTLY AFFECT THE FUNCTION, COST, OR PERFORMANCE OF THE PROJECT, THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE ENGINEER FOR CLARIFICATION AND PROJECT DIRECTION.

THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY AND ALL DAMAGE TO EXISTING STRUCTURES AND/OR UTILITIES DURING CONSTRUCTION. PROPER REPAIR SHALL BE UNDERTAKEN TO THE SATISFACTION OF THE APPROPRIATE UTILITY COMPANY.

THE CONTRACTOR SHALL NOTIFY ALL UTILITIES COMPANIES 48 HOURS PRIOR TO ANY EXCAVATION SO THAT THEIR LINES CAN BE MARKED.

THE CONTRACTOR SHALL COORDINATE THE WORK TO AVOID CONFLICTS BETWEEN SEWERS, STORM DRAINS, AND WATER MAINS.

TEMPORARY REPAIRS TO ALL TRENCHES WITHIN THE TRAVELED WAY ON EXISTING ROADS SHALL BE MADE WITHIN TWENTY-FOUR (24) HOURS OF TRENCH OPENING. MINIMUM TEMPORARY REPAIRS SHALL CONSIST OF BACKFILLING AND COMPACTING 6" OF AGGREGATE BASE AND 1" OF TEMPORARY ASPHALTIC SURFACING.

ANY RELOCATION OF PUBLIC UTILITIES SHALL BE DONE IN ACCORDANCE WITH ANY AND ALL REQUIREMENTS OF THE UTILITY COMPANY AND WITH REGARD TO THE REQUIRED FEES, BONDS, PERMITS, WORKING CONDITIONS, ETC. OF SAID COMPANY.

**Erosion Control**

THE EROSION CONTROL MEASURES ARE TO BE IN PLACE PRIOR TO THE COMMENCEMENT OF ANY EARTHWORK OPERATIONS.

ALL EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL DISTURBED AREAS ARE PERMANENTLY STABILIZED.

ALL EROSION CONTROL FACILITIES SHALL BE INSPECTED AND REPAIRED AT THE END OF EACH WORKING DAY AND/OR AFTER EACH PRECIPITATION EVENT.

ALL PAVED AREAS SHALL BE KEPT CLEAR OF EARTH MATERIALS AND DEBRIS. THE SITE SHALL BE MAINTAINED SO AS TO MINIMIZE SEDIMENT-LADEN RUNOFF TO ANY STORM DRAIN SYSTEM.

VEGETATED SLOPES SHALL BE RESTORED AS SOON AS POSSIBLE AFTER DAMAGE.

BORROW AREAS AND TEMPORARY STOCKPILES SHALL BE PROTECTED WITH APPROPRIATE EROSION CONTROL MEASURES.

ALL CUT AND FILL SLOPES SHALL BE PROTECTED TO PREVENT OVER BANK FLOW.

DURING CONSTRUCTION, THE CONTRACTOR SHALL TAKE PRECAUTION TO INSURE THAT SEDIMENTATION DAMAGE WILL NOT OCCUR. THE CONTRACTOR SHALL RESTRICT THE THE AMOUNT OF LAND AREA GRADED AT ANY ONE TIME TO A MINIMUM. IT IS THE AMOUNT OF LAND AREA GRADED AT ANY ONE TIME TO A MINIMUM. IT IS RECOMMENDED DURING AND AFTER GRADING, THAT A TEMPORARY VEGETATIVE COVER BE ESTABLISHED TO PROTECT THE BARE SOIL SURFACE.

**General Specifications**

ALL WORK, INSTALLATION, PROCEDURES, MATERIALS, AND TESTING ASSOCIATED WITH THIS PROJECT SHALL CONFORM TO THE LATEST EDITION OF THE METROPOLITAN ST. LOUIS SEWER DISTRICT'S STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES.

ALL WORK, INSTALLATION, PROCEDURES, MATERIALS, AND TESTING SHALL CONFORM TO THE REQUIREMENTS OF THE PUBLIC WATER SUPPLY DISTRICT NO. 2 OF ST. CHARLES COUNTY, MISSOURI.

ALL WORK, INSTALLATION, PROCEDURES, MATERIALS, AND TESTING SHALL CONFORM TO THE REQUIREMENTS OF FEDERAL, STATE, MUNICIPAL, AND LOCAL GOVERNMENT ENTITIES HAVING JURISDICTION OVER THIS PROJECT.

SEAL

Signature: \_\_\_\_\_  
Signature Date: 3/22/05  
Expiration Date: 12/31/10

**STATEMENT OF RESPONSIBILITY**

I hereby confirm that the document herein to be authenticated by my seal is restricted to this sheet, and I hereby disclaim any responsibility for all other drawings, specifications, estimates, reports or other documents or instruments relating to or intended to be utilized for any other part of the architectural, engineering or survey project.

COVER SHEET

C.C.S. SANITARY SEWER EXTENSION  
ST. CHARLES COUNTY, MISSOURI

TITLE PROJECT

| REV | DATE    | DESCRIPTION              |
|-----|---------|--------------------------|
| △   | 3/22/05 | CHANGE TO GRAVITY SYSTEM |
| △   |         |                          |
| △   |         |                          |

|  |            |             |
|--|------------|-------------|
| DRAWN BY:  | RPM        | SHEET       |
| DESIGNED BY:   |            | <b>S1</b>   |
| CHECKED BY:  |            |             |
| APPROVED BY:   |            |             |
| PROJECT NUMBER:  | 107000565B | OF 7 SHEETS |
| <input checked="" type="checkbox"/> ISSUED FOR REVIEW <input type="checkbox"/> ISSUED FOR BIDDING<br><input type="checkbox"/> ISSUED FOR CONSTR. <input type="checkbox"/> RECORD DRAWING |            |             |



PART 1 - GENERAL OVERVIEW

1.01 Liability and Costs for PROJECT

No direction, field directive or other instruction contemplated by these SPECIFICATIONS and/or conducted by others shall incur any liability, charge or cost to the ENGINEER.

1.02 Standards, Specification and Details

A. These specifications, plans and details are subject to revision at any time prior to the start of construction of the PROJECT. These documents are also subject to revision at any time during construction when, in ENGINEER'S opinion, these revisions materially affect the maintenance, operation or life of the PROJECT. All such revised documents must replace the corresponding documents in the CONSTRUCTION PLANS at the time when provided to the CONTRACTOR. B. The ENGINEER reserves the right to modify or waive any of these SPECIFICATIONS and/or its other standards, specifications and details in its best interest. C. These SPECIFICATIONS are intended to define the construction requirements of SANITARY SEWER FACILITIES which are constructed and operated under typical conditions in the PWSID NO.2 service area. Depending on field conditions and the composition and characteristics of the sanitary sewer flow, different or unusual conditions may occur which cannot be anticipated in a document of this nature. ENGINEER may impose additional or special construction requirements under these circumstances.

1.03 Drawing Discrepancies and Omissions

A. If construction practices are not described, but in the ENGINEER'S opinion, will affect the quality of construction or long term maintainability of the SANITARY SEWER FACILITIES, then the ENGINEER must approve any construction practices proposed by the CONTRACTOR.

1.04 Governing Laws, Codes and Regulations

A. Construction practices must meet all applicable laws, codes or regulations and be in accordance with the requirements of all governmental agencies and public utilities having jurisdiction. B. These SPECIFICATIONS shall not be considered as a substitute, nor shall supersede any state or federal law, code or regulation related to the PROJECT. In the event of a conflict between any state or federal law, code or regulation governing the PROJECT and these SPECIFICATIONS, the more stringent requirement will apply.

PROTECTION OF WATER MAINS FROM SANITARY SEWER MAINS IS REQUIRED AND SHALL BE MADE IN ACCORDANCE WITH THE LATEST EDITION OF THE MISSOURI CODE OF STATE REGULATIONS, TITLE 10, DIVISION 20, CHAPTER 8.120. THE WATER AND SEWER MAIN AS DELINEATED ON THE DRAWINGS SHALL BE CONSTRUCTED WITH A MINIMUM OF 10' HORIZONTAL SEPARATION AND 1.5' VERTICAL SEPARATION.

PART 2 - GENERAL CONSTRUCTION REQUIREMENTS

2.01 Confined Space Entry

All persons, including but not limited to SUBCONTRACTORS, CONTRACTORS, sub-contractors, DESIGN ENGINEERS, RECORD DRAWING ENGINEERS and surveyors must abide by the most recent OSHA confined space entry standards.

2.02 Quality Assurance

A. The CONTRACTOR must hire and perform quality assurance requirements on all SANITARY SEWER FACILITIES in accordance with these SPECIFICATIONS. B. Execute work in conformance with applicable sections of the latest published editions of American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American Welding Society (AWS) and National Electrical Manufacturers Association (NEMA) standards or as indicated in these SPECIFICATIONS and/or the CONSTRUCTION PLANS, whichever is more stringent. C. All materials and products installed by CONTRACTOR must be of the type approved by the National Electric Code (NEC), Uniform Building Code and Underwriters Laboratories Inc. (UL). All components of control panels must conform to the above, however, the assembled control panel does not require a UL label. D. All SANITARY SEWER FACILITIES must be new and unused.

2.03 Product Installation

A. Install all products in strict accordance with manufacturer's recommendations and these SPECIFICATIONS in a neat and workmanlike manner. B. Bring all conflicts between the manufacturer's recommendations and these SPECIFICATIONS to the attention of ENGINEER and obtain direction from ENGINEER as to the resolution of any conflict in installation directives.

2.04 As-Built Record Set

A. CONTRACTOR must maintain, during the course of the PROJECT, an up-to-date log set which accurately reflects the actual, as-built dimensions, materials of construction, horizontal location, vertical elevation and other relevant information necessary to develop a set of as-built record drawings in accordance with the requirements of PWSID No. 2. B. As-built horizontal locations and vertical elevations are required on all fittings (including lifts, lines, valves and adapters), the force main (if a maximum separation of 500 feet) and MANHOLES (including initially installed 1 & A septic tanks and grinder pump stations). C. Failure to provide as-built information as specified may require execution by the CONTRACTOR of his own cost to obtain this information.

PART 3 - TESTING AND CLEANING

3.01 Deflection Testing

A. At ENGINEER'S discretion, prior to a mandrel test, the Project must be cleaned with jet rodder and vacuum truck to remove mud, silt and construction debris. B. All PVC and brass (non-lateral) pipe must be tested for deflection with an acceptable go-no-go mandrel. The pipe can exceed a deflection of five (5) percent. The deflection test must be conducted using a mandrel having a diameter equal to ninety-five (95) percent of the inside diameter of the pipe. The test must be performed without a mechanical pulling device and the rope used to pull the mandrel must be no stronger than one hundred fifty (150) pound test. Tag/trim rope may be of any size to allow removal of mandrel. A single individual of average weight and strength without the use of tools to gain leverage must pull the mandrel. All pipe exceeding the allowable deflection must be replaced or repaired and re-tested. C. ENGINEER reserves the right to require an additional mandrel test of sections of flexible pipe which are crossed by storm sewers within fifteen (15) days prior to the initial mandrel test or at anytime after the initial test. D. ENGINEER will not accept sewers with "logs" greater than one thirty-second (1/32) of an inch per inch of pipe diameter, not to exceed one half (0.5) inch total.

3.02 Sewer Water Tightness Testing

A. Acceptability Limits 1. Maximum infiltration/exfiltration limits for all new sanitary sewers will be fifty (50) gallons per inch of diameter per mile of pipe per twenty-four (24) hours. This standard is applicable to each discrete section of the Project and includes all Manholes and lateral service connections. All sections of the sewer must be tested and any sections not meeting these limits must be repaired and re-tested. 2. In the presence of groundwater or poor soil conditions, and if required by the Engineer, the sewer may be required to successfully complete a water tightness test before proceeding with any additional construction. B. Tests for water tightness must be conducted on all sewers in the Project. C. Where the test results are in excess of the allowable limits, the Contractor must correct the construction of the sewer and retest so that the section tested is within the allowable limit. All methods and materials used in the repair must be accepted by the Engineer in writing. Grouting of joints is not an acceptable repair method. D. If water-tightness tests are not present, the Contractor must determine the groundwater level at each downstream manhole on the section being tested by providing a three-eight (3/8) inch inside diameter pipe through each manhole barrel at an elevation near the base. Aggregate must be placed on the outside of the pipe to prevent clogging. The end of the pipe on the inside of the manhole must contain fittings together with a vertical transparent pipe to determine the groundwater level. The pipe through the manhole must be permanently sealed after the tests have been finished. E. At the Engineer's discretion, the following tests may be required: 1. Infiltration Test for Leakage a. The infiltration test may be used where the natural groundwater table is a minimum of two (2) feet over the top of pipe in the section being tested. b. The test must be conducted by plugging off the upper end of the pipe section being tested and placing a water or other acceptable measuring device in the pipe at the lower end of the section. Sufficient time must be allowed for the water level over the weir to stabilize before reading the flow. 2. Exfiltration Test for Leakage a. The exfiltration test for leakage may be used where the natural groundwater table is less than two (2) feet over the top of pipe in the section being tested. b. The test must be conducted by plugging off the ends of the pipe being tested and filling the section with water. A standpipe must be provided at one end of the pipe section so that a minimum internal pressure of five (5) feet can be maintained above the higher of either the top of the pipe or the groundwater level. If a manhole or stub-out is included in the section tested, the manhole can be used in place of the standpipe, and the allowable leakage from the manhole riser and stub-out must be calculated as for the respective diameter pipe. 3. Air Test for Leakage a. The ends of the pipe being tested must be sealed and properly worked to prevent displacement while the line is under pressure. The seal of one end must have an orifice through which to pass air into the pipe. An air supply must be connected to the orifice at one end of the section. The air supply line will contain an off-gas valve and a pressure gauge having a range from zero (0) to fifteen (15) psi. The gauge must have minimum divisions of five hundredths (0.05) psi and have an accuracy of +/- five hundredths (0.05) psi. b. Clean pipe to be tested by propelling a soap fitting inflated ball through the pipe by water pressure at other adequate method. This step is important because it flushes out construction debris. c. The groundwater level surrounding the section of pipe under testing must be determined by the procedure previously outlined. If the groundwater table is above the pipe, then test pressures must be increased according to the following formula: the air pressure should be increased forty-three hundredths (0.43) psi for each foot of water over the section of pipe under evaluation until the internal air pressure is five (5) psi greater than the hydrostatic pressure head created by the groundwater over the pipe section. d. Once the pipe section is sealed, air must be introduced in a single, pressurized air is introduced to the system. The air must be fed through a single control panel with three (3) individual hose connections as follows: (1) From control panel to pneumatic slugs for inflation in sewer pipe. (2) From control panel to sealed line for introducing the pressurized air. (3) From sealed line to control panel. This line will enable continuous monitoring of the air pressure rise in the tested line. e. The air must be introduced slowly to the section of pipe under evaluation until the internal air pressure is five (5) psi greater than the hydrostatic pressure head created by the groundwater over the pipe section. f. A minimum of two (2) minutes must be provided for the air pressure to stabilize to conditions within the pipe. Engineer shall determine the stabilization time based on field conditions and weather. The stabilization period is necessary for variations in temperature to adjust to the interior pipe conditions. Air can be added slowly during the stabilization period to maintain a minimum pressure of five (5) psi greater than the hydrostatic pressure created by groundwater. g. After the stabilization period, when the pressure reaches exactly five (5) psi greater than the hydrostatic pressure created by groundwater, the stopwatch must be started, and when the pressure reaches three and a half (3 1/2) psi greater than the hydrostatic pressure created by groundwater, the watch must be stopped. The portion of the line being tested will be acceptable if the time for the air pressure to decrease within the stated range is greater than the time shown in Table 1. If the pipe length is between the specified lengths in Table 1, the time must be based on the next greater length. h. Safety Precautions During Air Test (1) The air test may be dangerous if, because of ignorance or carelessness, a line is improperly prepared. It is extremely important that the various slugs be installed and braced in such a way as to prevent blowouts. Contractor should realize the sudden expansion of a poorly installed plug could be dangerous. Likewise, a plug that is partially deflated before the pipe pressure is released can be equally as dangerous. (2) As a safety precaution, pressurizing equipment should include a regulator set at ten (10) psi to avoid over pressurizing and damaging an otherwise acceptable line. (3) No one is allowed in the manhole during testing.

3.03 Sewer Water Tightness Testing

A. All closed bottom air/vacuum release, clean-out and flow monitoring/measuring manholes must be vacuum tested after installation, repair or modification. B. ENGINEER reserves the right to vacuum test any 1 & A septic tank. Tests may be performed at the manufacturer's production site, at time of delivery, upon installation prior to final backfilling or upon installation after final backfilling. The intent of the test is to ensure water tight septic tanks under high groundwater conditions. C. ENGINEER also reserves the right to vacuum test any 1 & A septic tank for structural integrity. This vacuum test will be performed prior to installation of the riser. The test will consist of placing airtight plugs in the inlet, outlet and manhole openings, and then subjecting the tank to a vacuum equal to four (4) inches of mercury. Measurements must be taken of the height, width and length of the tank. Changes in either the height, width or length of the tank by more than two (2) inches of five (5) minutes and while the tank is still under vacuum constitutes structural failure and is cause for rejection. D. ENGINEER may require additional vacuum tests if the manhole coating is not bonded to the structure prior to the test. E. Manhole boots must be secured to prevent movement while the vacuum is drawn. F. Installation and operation of vacuum equipment and indicating devices must be in accordance with manufacturer's recommendations and performance specifications that have been provided by the manufacturer and accepted by ENGINEER. G. With the vacuum tester set in place: 1. Inflate the compression tank to forty (40) psi to effect a seal between the vacuum base and the structure. 2. Connect the vacuum pump to the outlet port with the valve open. 3. Draw a vacuum of ten (10) inches of mercury and close the valve. H. Acceptance standards for leakage will be established from the stepped line for a negative pressure change from ten (10) inches to nine (9) inches of mercury. The maximum allowable leakage rate for a four (4) foot diameter manhole must be in accordance with the following:

Table with 2 columns: Manhole Depth, Pressure Change of 1 inch Mercury. Values: 10 ft or less: 60 seconds; >10 feet but <15 feet: 75 seconds; >15 feet but <25 feet: 90 seconds.

For manholes five (5) feet in diameter, add an additional fifteen (15) seconds and for manholes six (6) feet in diameter, add an additional thirty (30) seconds to the time requirements for four (4) foot diameter manholes. For all manholes deeper than twenty-five (25) feet, ENGINEER will determine the applicable minimum elapsed time. I. If the manhole fails the test, necessary repairs must be made and the vacuum test and repairs must be repeated until the manhole passes the test. J. If manhole joints are pulled out during the vacuum test, the manhole must be disassembled and the joints replaced. K. Manholes will be subject to visual inspection with all visual leaks being repaired.

3.04 Cleaning

A. Flush interiors of SANITARY SEWER FACILITIES with water of sufficient velocity and quantity that will dislodge sediment or dirt that has accidentally entered the system. B. Remove surplus/waste materials, including but not limited to, earth, trash, rubbish, unsightly materials and other such residues from the PROJECT site.

PART 4 - MANHOLES, PIPING, VALVES & FITTINGS

4.01 General Requirements

Under general laying conditions, force mains can be any one of the pipe materials specified in these SPECIFICATIONS provided, the material is that type and size indicated on the CONSTRUCTION PLANS. A. Fittings 1. Pipe, fittings and valves must be clearly marked in accordance with the various standards under which they are manufactured. All pipe must be marked with a date printing according to ASTM/AWWA requirements. 2. A marking must be provided on the end of each pipe utilizing high points to indicate when the pipe is driven home. B. 1.02 Polyethylene (PE) Pipe A. Materials used for the manufacture of PE pipe and fittings must be extra high molecular weight, high density PE 3408 polyethylene resin. The pipe must be extruded from a high resin meeting the specifications of ASTM D 3500 with a minimum cell wall thickness of PE 3454/4C. Fittings must be manufactured from the same resin and cell classification as the pipe itself. 2. The pipe and fittings must contain no recycled components except that generated in the manufacturer's own plant from resin of the same raw material. 3. The material must be listed by PPI (Plastic Pipe Institute), a division of the Society of the Plastics Industry) in its pipe grade registry (technical report TR-4) with a seventy-three (73) degree Fahrenheit hydrostatic strength basis of one thousand six hundred (1,600) psi and a one hundred fifty (150) degree Fahrenheit hydrostatic strength basis of eight hundred (800) psi. 4. The manufacturer must conform to ISO 9001. B. Pipe and Fittings 1. Pipe supplied must be a nominal iron pipe size inside diameter. 2. Pipe having a diameter of three (3) inches and over must be made to the dimensions and tolerances specified in ASTM F 714 with a cell class of PE 3454/4C. Pipe with diameters less than three (3) inches must be made to the dimensions and tolerances specified in ASTM D 3501 with a cell class of PE 3408. 3. Fittings must be manufactured in accordance with ASTM D 3251. Fittings must be manufactured by injection molding, a combination of extrusion and machining, or fabricated from PE pipe conforming to this specification. 4. Fittings must be fully pressure tested and possess a working pressure equal to that of the adjacent pipe with included length (2) to one (1) safety factor. 5. The pipe and fittings must be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity. 6. The pipe and fittings for horizontal directional drilling must be a minimum DR of 9. 7. Pipe and fittings used in deep water applications must be a minimum DR of 11. C. Joints 1. No person may join PE pipe unless the ENGINEER has approved that person. 2. The butt fusion process should be used to join sections of PE pipe into continuous lengths above ground at the job site. The joining method must be by the heat fusion method and must be performed in strict accordance with the pipe manufacturer's recommendations. The joining equipment used in the joining procedure must be capable of meeting the conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment and interfacial fusion pressure. 3. Properly annotated electrofusion fittings may be used. 4. Socket fusion, extrusion welding, hot gas welding or threading and gluing of PE pipe will not be accepted. 5. All adapters are required to mechanically connect PE pipe to man the valves three (3) inches or larger. Two (2) inch valves and smaller must be connected by compression fittings. 6. Refer to the manufacturer's recommendations for proper installation procedures. 7. Fused segments of pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections. D. Precautions 1. During the heat fusion process the equipment and pipe product may reach temperatures in excess of four hundred (400) degrees Fahrenheit. Caution should be taken to prevent fire. 2. Static electricity charges are generated on PE pipe during friction, particularly during the handling of pipe in storage, shipping and installation. The flow of air or gas containing dust or scale will also build up significant static charges. It will the flow of dry materials through the pipe. These charges are a safety hazard, particularly in areas where there is leaking gas or a flammable/explosive atmosphere. 3. Cooled PE pipe may contain energy as in a spring. Unchecked release by cutting stoplogs can result in dangerous uncontrolled force. Exercise appropriate safety precautions and use proper equipment. 4. Hitting PE pipe with an instrument, such as a hammer, may result in uncontrolled force. E. All final connections to MANHOLES must not be completed until all PE materials have reached equilibrium conditions (average ground temperature, etc.).

4.02 Manhole Testing

A. All closed bottom air/vacuum release, clean-out and flow monitoring/measuring manholes must be vacuum tested after installation, repair or modification. B. ENGINEER reserves the right to vacuum test any 1 & A septic tank. Tests may be performed at the manufacturer's production site, at time of delivery, upon installation prior to final backfilling or upon installation after final backfilling. The intent of the test is to ensure water tight septic tanks under high groundwater conditions. C. ENGINEER also reserves the right to vacuum test any 1 & A septic tank for structural integrity. This vacuum test will be performed prior to installation of the riser. The test will consist of placing airtight plugs in the inlet, outlet and manhole openings, and then subjecting the tank to a vacuum equal to four (4) inches of mercury. Measurements must be taken of the height, width and length of the tank. Changes in either the height, width or length of the tank by more than two (2) inches of five (5) minutes and while the tank is still under vacuum constitutes structural failure and is cause for rejection. D. ENGINEER may require additional vacuum tests if the manhole coating is not bonded to the structure prior to the test. E. Manhole boots must be secured to prevent movement while the vacuum is drawn. F. Installation and operation of vacuum equipment and indicating devices must be in accordance with manufacturer's recommendations and performance specifications that have been provided by the manufacturer and accepted by ENGINEER. G. With the vacuum tester set in place: 1. Inflate the compression tank to forty (40) psi to effect a seal between the vacuum base and the structure. 2. Connect the vacuum pump to the outlet port with the valve open. 3. Draw a vacuum of ten (10) inches of mercury and close the valve. H. Acceptance standards for leakage will be established from the stepped line for a negative pressure change from ten (10) inches to nine (9) inches of mercury. The maximum allowable leakage rate for a four (4) foot diameter manhole must be in accordance with the following:

Table with 2 columns: Manhole Depth, Pressure Change of 1 inch Mercury. Values: 10 ft or less: 60 seconds; >10 feet but <15 feet: 75 seconds; >15 feet but <25 feet: 90 seconds.

For manholes five (5) feet in diameter, add an additional fifteen (15) seconds and for manholes six (6) feet in diameter, add an additional thirty (30) seconds to the time requirements for four (4) foot diameter manholes. For all manholes deeper than twenty-five (25) feet, ENGINEER will determine the applicable minimum elapsed time. I. If the manhole fails the test, necessary repairs must be made and the vacuum test and repairs must be repeated until the manhole passes the test. J. If manhole joints are pulled out during the vacuum test, the manhole must be disassembled and the joints replaced. K. Manholes will be subject to visual inspection with all visual leaks being repaired.

A. Connections from plain and HDPE pipe to other pipe materials or mechanical joint fittings shall be properly restrained by the following method: If HDPE transitions to a spigot pipe joint product, the CONTRACTOR shall restrain the gasket joint pipe with the recommended joint restraint. A minimum of three (3) feet immediately after the transition. B. A polyethylene thrust anchor fitting such as a branch socket or thrust anchor manufactured by Central Plastics Inc. shall also be attached to the outside diameter of the HDPE carrier pipe by ball fusion or electrofusion. The or shall be encased in concrete not more than the (3) feet before the transition and as indicated in the Contract drawings.

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THOUVENOT, WADE & MOERCHEN, INC. ENGINEERS • SURVEYORS • PLANNERS TWM CORPORATE OFFICE 4940 OLD COLINSVILLE RD. SWANSEA, ILLINOIS 62226 TEL (618) 624-4488 FAX (618) 624-6688 corp@twm-inc.com WATERLOO OFFICE 113 SOUTH MAIN STREET WATERLOO, ILLINOIS 62298 TEL (618) 939-5050 FAX (618) 939-3338 waterloo@twm-inc.com ST. LOUIS OFFICE 1001 CRAIG ROAD, SUITE 260 ST. LOUIS, MISSOURI 63146 TEL (314) 236-5052 FAX (314) 872-2194 stlouis@twm-inc.com

Table with 2 columns: PROFESSIONAL REGISTRATIONS, LICENSE NO. ILLINOIS PROFESSIONAL DESIGN FIRM: 184-001220; PROFESSIONAL ENGINEERING CORP.: 62-05370; PROFESSIONAL STRUCTURAL ENGR. CORP.: 81-002602; ILLINOIS PROF. LAND SURVEYING CORP.: 049-000029; MISSOURI PROFESSIONAL ENGR. CORP.: NC 001528; MISSOURI LAND SURVEYING CORP.: NC 000146



Signature: [Signature] Date: 12/21/05 Expiration Date: 12/31/16 STATEMENT OF RESPONSIBILITY I hereby confirm that the document herein to be authorized by my seal is restricted to this sheet, and I hereby disclaim any responsibility for all other drawings, specifications, estimates, reports or other documents or instruments relating to or intended to be utilized for any other part of the architectural, engineering or survey project.

PROJECT NOTES AND SPECIFICATIONS PROJECT: C.C.S. SANITARY SEWER EXTENSION ST. CHARLES COUNTY, MISSOURI TITLE: [Blank]

Table with 3 columns: REV, DATE, DESCRIPTION. Row 1: 1, 3/22/05, CHANGE TO GRAVITY SYSTEM

DRAWN BY: RPM SHEET: S2 PROJECT NUMBER: 107000565B OF 7 SHEETS



# LEGEND

|                                     |     |
|-------------------------------------|-----|
| EXISTING ACCESS LINE                |     |
| EXISTING BASE LINE                  |     |
| EXISTING OVERHEAD CABLE             | DHC |
| EXISTING UNDERGROUND CABLE          | UC  |
| EXISTING CENTER                     |     |
| EXISTING DITCH LINE                 |     |
| EXISTING EASEMENT                   |     |
| EXISTING OVERHEAD ELECTRIC          | OHE |
| EXISTING UNDERGROUND ELECTRIC       | UE  |
| EXISTING FENCE                      | FM  |
| EXISTING FORCEMAIN                  | G   |
| EXISTING GAS LINE                   |     |
| EXISTING GUARD RAIL                 |     |
| EXISTING IDOT PROPERTY LINE         |     |
| EXISTING PETROLEUM LINE             |     |
| EXISTING RIGHT-OF-WAY               |     |
| EXISTING RAILROAD LINE              |     |
| EXISTING SANITARY SEWER LINE        | SAN |
| SECTION LINE                        |     |
| QUARTER SECTION LINE                |     |
| QUARTER QUARTER SECTION LINE        |     |
| EXISTING SETBACK LINE               |     |
| EXISTING SHEETPILE                  | ST  |
| EXISTING STEAM LINE                 |     |
| EXISTING STORM LINE                 |     |
| EXISTING FIBER OPTIC LINE           | FO  |
| EXISTING OVERHEAD TELEPHONE LINE    | OHT |
| EXISTING UNDERGROUND TELEPHONE LINE | UT  |
| EXISTING TOE OF SLOPE               |     |
| EXISTING TREE LINE                  |     |
| EXISTING DOMESTIC WATER LINE        | DW  |
| EXISTING EDGE OF WATER              |     |
| EXISTING FIRE PROTECTION LINE       | FW  |
| EXISTING WATER LINE                 | W   |
| PROPOSED ACCESS LINE                | AC  |
| PROPOSED BASE LINE                  |     |
| PROPOSED OVERHEAD CABLE             | DHC |
| PROPOSED UNDERGROUND CABLE          | UC  |
| PROPOSED CENTER                     |     |
| PROPOSED DITCH LINE                 |     |
| PROPOSED EASEMENT                   |     |
| PROPOSED OVERHEAD ELECTRIC          | OHE |
| PROPOSED UNDERGROUND ELECTRIC       | UE  |
| PROPOSED EROSION CONTROL BARRIER    | X   |
| PROPOSED FENCE                      | XXX |
| TEMPORARY FENCE                     | FM  |
| PROPOSED FORCEMAIN                  | G   |
| PROPOSED GAS LINE                   |     |
| PROPOSED GUARD RAIL                 |     |
| PROPOSED IDOT EASEMENT LINE         |     |
| PROPOSED PETROLEUM LINE             |     |
| PROPOSED RIGHT-OF-WAY               |     |
| PROPOSED RAILROAD LINE              |     |
| PROPOSED SANITARY SEWER LINE        | SAN |
| PROPOSED SETBACK LINE               |     |
| PROPOSED SHEETPILE                  | ST  |
| PROPOSED STEAM LINE                 |     |
| PROPOSED STORM LINE                 |     |
| PROPOSED FIBER OPTIC LINE           | FO  |
| PROPOSED OVERHEAD TELEPHONE LINE    | OHT |
| PROPOSED UNDERGROUND TELEPHONE LINE | UT  |
| PROPOSED TOE OF SLOPE               |     |
| PROPOSED TREE LINE                  |     |
| PROPOSED DOMESTIC WATER LINE        | DW  |
| PROPOSED EDGE OF WATER              |     |
| PROPOSED FIRE PROTECTION LINE       | FW  |
| PROPOSED WATER LINE                 | W   |

| ITEM                     | EXISTING | PROPOSED |
|--------------------------|----------|----------|
| BENCHMARK                |          |          |
| BRIDGE                   |          |          |
| GEOTECHNICAL BORES       |          |          |
| MAINTENANCE              |          |          |
| PERCOLATION TEST         |          |          |
| RAILROAD CROSSING GATE   |          |          |
| RAILROAD SIGNALS         |          |          |
| REFLECTORS               |          |          |
| ROAD                     |          |          |
| ROAD SIGNS               |          |          |
| TRAFFIC SIGNAL           |          |          |
| TRAFFIC SIGNAL VAULT     |          |          |
| TRAFFIC SIGNAL BOX       |          |          |
| TREES - GENERAL          |          |          |
| BUSHES                   |          |          |
| TREES, EVERGREEN         |          |          |
| WELL                     |          |          |
| CABLE BOX                |          |          |
| ELECTRIC RISER           |          |          |
| CUT WIRE                 |          |          |
| GRIP PILE                |          |          |
| HAND HOLE                |          |          |
| HEAVY DUTY HAND HOLE     |          |          |
| LIGHT POLE               |          |          |
| ORNAMENTAL LIGHT POLE    |          |          |
| HIGH MAST LIGHT POLE     |          |          |
| LIGHT UNIT 1             |          |          |
| LIGHT UNIT COMB.         |          |          |
| PULL POINT               |          |          |
| ELECTRIC MANHOLE         |          |          |
| ELECTRIC METER           |          |          |
| ELECTRIC JUNCTION BOX    |          |          |
| CONTROLLER               |          |          |
| GROUND                   |          |          |
| POWER POLE               |          |          |
| TRANSFORMER              |          |          |
| AIR CONDITIONER          |          |          |
| NATURAL GAS VALVE        |          |          |
| NATURAL GAS RISER        |          |          |
| NATURAL GAS METER        |          |          |
| PETROLEUM PIPE LINE SIGN |          |          |
| MANHOLE, TELEPHONE       |          |          |
| TELEPHONE RISER          |          |          |
| TELEPHONE RISER          |          |          |
| PAY PHONE                |          |          |

| ITEM                       | EXISTING | PROPOSED |
|----------------------------|----------|----------|
| CATCH BASIN                |          |          |
| CULVERT FLARED END SECTION |          |          |
| HEADWALL                   |          |          |
| DITCH CHECK                |          |          |
| DITCH CHECK (TEMPORARY)    |          |          |
| SUMMIT                     |          |          |
| DIRECTION OF FLOW          |          |          |
| INLET                      |          |          |
| INLET, AREA INLET          |          |          |
| INLET, BEEHIVE             |          |          |
| INLET, OPEN                |          |          |
| STORM JUNCTION BOX         |          |          |
| STORM JUNCTION BOX         |          |          |
| WATER SURFACE INDICATOR    |          |          |
| AIR RELEASE VALVE, SEWER   |          |          |
| LIFT STATION               |          |          |
| VALVE VAULT                |          |          |
| CLEAN OUT                  |          |          |
| SANITARY SEWER MANHOLE     |          |          |
| AIR RELEASE VALVE, WATER   |          |          |
| BLOW-OFF HYDRANT           |          |          |
| BUTTERFLY VALVE            |          |          |
| CURB BOX                   |          |          |
| FIRE HYDRANT               |          |          |
| GATE VALVE                 |          |          |
| WATER METER                |          |          |
| VALVE VAULT                |          |          |
| IRON PIPE                  |          |          |
| MONUMENT                   |          |          |
| ROW MARKER                 |          |          |
| SAME OWNERSHIP             |          |          |
| STONE                      |          |          |
| BRASS PLUG                 |          |          |
| CUT "X"                    |          |          |
| SECTION CORNER             |          |          |
| SECTION CORNER             |          |          |
| NORTHWEST QUARTER CORNER   |          |          |
| SOUTHEAST QUARTER CORNER   |          |          |
| COMBINATION LEFT           |          |          |
| COMBINATION RIGHT          |          |          |
| LEFT TURN                  |          |          |
| RIGHT TURN                 |          |          |
| THRU                       |          |          |

| ITEM                   | EXISTING | PROPOSED |
|------------------------|----------|----------|
| COMBINATION LEFT ONLY  |          |          |
| COMBINATION RIGHT ONLY |          |          |
| LEFT TURN ONLY         |          |          |
| RIGHT TURN ONLY        |          |          |
| THRU ONLY              |          |          |
| RAILROAD CROSSING      |          |          |
| STOP LINE              |          |          |

| ITEMS TO BE ADJUSTED                | SYMBOL |
|-------------------------------------|--------|
| DOMESTIC SERVICE BOX TO BE ADJUSTED |        |
| FRAME AND GRATE TO BE ADJUSTED      |        |
| FRAME AND LID TO BE ADJUSTED        |        |
| ITEM TO BE ABANDONED                |        |
| ITEM TO BE MOVED                    |        |
| ITEM TO BE RELOCATED                |        |
| SPECIAL ADJUSTMENT                  |        |
| STRUCTURE TO BE ADJUSTED            |        |
| STRUCTURE TO BE CLEANED             |        |
| STRUCTURE TO BE FILLED              |        |
| STRUCTURE TO BE RECONSTRUCTED       |        |
| STRUCTURE TO BE REMOVED             |        |
| VALVE VAULT TO BE ADJUSTED          |        |

# ABBREVIATIONS

|       |                               |        |  |          |   |        |                                 |
|-------|-------------------------------|--------|--|----------|---|--------|---------------------------------|
| A/C   | ACCESS CONTROL                | FIN    | FOUNDATION                               | NOAA     | NATIONAL OCEANIC                              | TBS    | TO BE SAVED                     |
| ABV   | ABOVE                         | FE     | FIELD ENTRANCE                           | OD       | ATMOSPHERE ADMINISTRATION                     | TD     | TOE                             |
| AC    | ACRE                          | FES    | FLARED END SECTION                       | NW       | NORTHWEST                                     | TEL    | TELEPHONE                       |
| ADJ   | ADJUST                        | FIN FL | FINISHED FLOOR                           | OHC      | OVERHEAD CABLE                                | TEMP   | TEMPORARY                       |
| AGG   | AGGREGATE                     | FH     | FIRE HYDRANT                             | OD       | OUTER DIAMETER                                | TP     | TANGENT POLE                    |
| AGS   | AUXILIARY GAS VALVE (SERVICE) | FIN GR | FINISH GRADE                             | OHE      | OVERHEAD ELECTRIC                             | T.R.   | TANGENT RUNOUT DISTANCE         |
| AH    | AHEAD                         | FL     | FLOW LINE                                | OLD      | OPEN LID                                      | TR     | TOWNSHIP ROAD                   |
| AI    | AREA INLET                    | FM     | FORCE MAIN                               | OHT      | OVERHEAD TELEPHONE                            | TRANS  | TRANSFORMER                     |
| APT   | APARTMENT                     | FO     | FIBER OPTIC                              | OWS      | OWS OIL WARNING SIGN                          | TRN    | TURN                            |
| ARV   | AIR RELEASE VALVE             | FP     | FENCE POST                               | P        | PETROLEUM                                     | TRVL   | TRAVEL                          |
| ASPH  | ASPHALT                       | FR     | FRAME                                    | P.C.     | PROPERTY CORNER                               | TRVS   | TRANSVERSE                      |
| AVE   | AVENUE                        | FRWY   | FREEWAY                                  | PAT      | PATTERN                                       | TS     | TRAFFIC SIGNAL                  |
| AX    | AXIS OF ROTATION              | FT     | FEET                                     | IB       | PULL BOX                                      | TSC    | TRAFFIC SIGNAL CENTER           |
| BARR  | BARRICADE                     | FW     | FIRE PROTECTION WATER LINE               | P.C.     | PROJECT CORNER                                | TSCB   | TRAFFIC SIGNAL CONTROL BOX      |
| B/C   | BACK OF CURB                  | G      | GAS                                      | PC       | POINT OF CURVATURE                            | TWP    | TOWNSHIP                        |
| B-B   | BACK TO BACK                  | GAL    | GALLON                                   | PCC      | PORTLAND CEMENT CONCRETE                      | TYP    | TYPICAL                         |
| BBOX  | BUFFALO BOX                   | GALV   | GALVANIZED                               | PE       | PRIVATE ENTRANCE                              | UC     | UNDERGROUND CABLE TV            |
| BGN   | BEGIN                         | GDP    | GUARD POST                               | PLD      | PEDESTAL                                      | UNDGND | UNDERGROUND                     |
| BIND  | BINDER                        | GI     | GRADED INLET                             | PI       | POINT OF INTERSECTION                         | UE     | UNDERGROUND ELECTRIC            |
| BIT   | BITUMINOUS                    | GL     | GUTTER LINE                              | PL       | POINT OF HORIZONTAL CURVE                     | UP     | UNDERGROUND PETROLEUM           |
| BLDG  | BUILDING                      | GM     | GAS METER                                | PM       | PAVEMENT MARKING                              | USEL   | UPSTREAM ELEVATION              |
| BLVD  | BOULEVARD                     | GMH    | GRADED MANHOLE                           | PNT      | POINT   | USFL   | UPSTREAM FLOW LINE              |
| BM    | BENCHMARK                     | GND    | GROUND                                   | PP       | POWER POLE OR PRINCIPAL POINT                 | USG    | UNITED STATES GEOLOGICAL SURVEY |
| BRK   | BRICK                         | GP     | GATE POST                                | PR       | PROPOSED                                      | UT     | UNDERGROUND TELEPHONE           |
| BS    | BOTH SIDES                    | GR     | GRATE                                    | PRC      | POINT OF REVERSE CURVATURE                    | UTIL   | UTILITY                         |
| BTM   | BOTTOM                        | GRAN   | GRANULAR                                 | PRM      | PRIME   | YBOX   | VALVE BOX                       |
| C-C   | CENTER TO CENTER              | GRG    | GRATING                                  | PROF     | PROFILE GRADELINE                             | VC     | VERTICAL CURVE                  |
| C&G   | CURB & GUTTER                 | GUT    | GUTTER                                   | PROJ     | PROJECT                                       | VEH    | VEHICLE                         |
| CATV  | CABLE TV                      | GV     | GAS VALVE                                | PROP     | PROPOSED                                      | VERT   | VERTICAL                        |
| CB    | CATCH BASIN                   | GW     | GAS WARE                                 | PSF      | POUNDS PER SQUARE FOOT                        | VLT    | VAULT                           |
| CC    | COMMERCIAL ENTRANCE           | OWS    | GAS WARNING SIGN                         | PSI      | POUNDS PER SQUARE INCH                        | VP     | VENT PIPE                       |
| CE    | CERTIFIED                     | HA     | HATCHING                                 | PST      | PUMP STATION                                  | VPC    | VERTICAL POINT OF CURVATURE     |
| CH    | COUNTY HIGHWAY                | HD     | HEAD                                     | POLYETH  | POLYETHYLENE                                  | VPI    | VERTICAL POINT OF INTERSECTION  |
| CHSLD | CHISELED                      | HDU    | HEAVY DUTY                               | PT       | POINT OF TANGENCY                             | VPT    | VERTICAL POINT OF TANGENCY      |
| CI    | CAST IRON PIPE                | HW     | HEADWALL                                 | PVC      | POLYVINYL CHLORIDE                            | W      | VALVE VAULT                     |
| CL    | CENTERLINE                    | HH     | HANDHOLE                                 | PVD      | PAVED   | W      | WEST, WATER                     |
| CL-E  | CENTERLINE TO EDGE            | HORIZ  | HORIZONTAL                               | PWT      | PAVEMENT                                      | W/     | WITH                            |
| CL-F  | CENTERLINE TO FACE            | HSE    | HOUSE                                    | WR       | WEAR  | W/     | WESTBOUND                       |
| CLID  | CLOSED LID                    | HT     | HEIGHT                                   | RC       | REMOVE CROWN                                  | WM     | WILDFLOWERS                     |
| CLSD  | CLOSED                        | HWAC   | HEATING VENTILATION, AIR CONDITIONING    | RCCP     | REINFORCED CONCRETE CULVERT PIPE              | WO     | WITHOUT                         |
| CMP   | CORRUGATED METAL PIPE         | HWY    | HIGHWAY                                  | RD       | ROAD  | WV     | WATER VALVE                     |
| CNTY  | COUNTY                        | I      | INTERSTATE                               | REF      | REFLECTIVE                                    | WMAIN  | WATERMAIN                       |
| COL   | COLUMN                        | IWC    | ILLINOIS AMERICAN WATER COMPANY          | REIN     | REINFORCEMENT                                 | XSECT  | CROSS SECTION                   |
| COMB  | COMBINATION                   | ID     | INNER DIAMETER                           | RCM      | REMOVAL                                       | YL     | YARD LIGHT                      |
| CONC  | CONCRETE                      | IDOT   | ILLINOIS DEPARTMENT OF TRANSPORTATION    | REP      | REPLACEMENT                                   |        |                                 |
| CONST | CONSTRUCT                     | IDS    | ILLINOIS DESIGN STUDIES                  | RES      | RESTAURANT                                    |        |                                 |
| CONT  | CONTINUOUS                    | IEPA   | ILLINOIS ENVIRONMENTAL PROTECTION AGENCY | RESURF   | RESURFACING                                   |        |                                 |
| CONTD | CONTINUED                     | IL     | ILLINOIS                                 | RET      | RETAINING                                     |        |                                 |
| COR   | CORNER                        | IMP    | IMPROVEMENT                              | ROW      | RIGHT OF WAY                                  |        |                                 |
| CORR  | CORRUGATED                    | IN     | INCH                                     | RPS      | REFERENCE POINT STAKE                         |        |                                 |
| CP    | CLAY PIPE                     | IN DIA | INCH DIAMETER                            | RR       | RAILROAD                                      |        |                                 |
| CS    | CITY STREET                   | INL    | INLET                                    | RRS      | RAILROAD SPIKE                                |        |                                 |
| CSE   | COURSE                        | INST   | INSTALLATION                             | RT       | ROUTE   |        |                                 |
| COAT  | COAT                          | INVT   | INVERT                                   | RTE      | ROUTE   |        |                                 |
| CU YD | CUBIC YARD                    | IP     | IRON PIPE                                | SAN      | SANITARY SEWER                                |        |                                 |
| CULV  | CULVERT                       | IR     | IRON ROD                                 | SB       | SOUTHBOUND                                    |        |                                 |
| D     | DEGREE OF CURVE               | JB     | JUNCTION BOX                             | SBI      | STATE BOUND ISSUE                             |        |                                 |
| DBL   | DOUBLE                        | JT     | JOINT                                    | S.E. RUN | SUPERELEVATION RUNOFF                         |        |                                 |
| DC    | DEPRESSED CURB                | KG     | KILOGRAM                                 | SE       | SOUTHEAST                                     |        |                                 |
| DCT   | DUCT                          | KM     | KILOMETER                                | SEC      | SECTION                                       |        |                                 |
| DET   | DETECTOR                      | L      | LITER OR CURVE LENGTH                    | SEED     | SEEDING                                       |        |                                 |
| DI    | DRAINAGE INLET OR DROP INLET  | L SUM  | LUMP SUM                                 | SD       | SPECIAL DITCH                                 |        |                                 |
| DIA   | DIAMETER                      | LC     | LONG CHORD                               | SHT      | SHEET   |        |                                 |
| DIM   | DIMENSION                     | LE     | LINEAL FEET OR LINEAR FEET               | SHP      | SHARPING                                      |        |                                 |
| DIP   | DUCTILE IRON PIPE             | LGT    | LIGHTING                                 | SHLD     | SHOULDER                                      |        |                                 |
| DIST  | DISTRICT                      | LH     | LANE                                     | SG       | SIGNAL  |        |                                 |
| DOM   | DOMESTIC                      | LANG   | LONGITUDINAL                             | SM       | SOLID MEDIUM, STATE OF ILLINOIS SURVEY MARKER |        |                                 |
| DSEL  | DOWNSTREAM ELEVATION          | LP     | LIGHT POLE                               | SMX      | SURVEY MARKER                                 |        |                                 |
| DSL   | DOWNSTREAM FLOWLINE           | LS     | LANDSCAPING                              | SOD      | SODDING                                       |        |                                 |
| DRV   | DRIVEWAY                      | LSTA   | LIFT STATION                             | SP       | SUMP PUMP                                     |        |                                 |
| DS    | DOWNSPOUT                     | L      |  |          |   |        |                                 |





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| ILLINOIS PROF. LAND SURVEYING CORP. | 048-000029  |
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Signature Date: 3/31/05  
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**TITLE**  
SANITARY SEWER PLAN + PROFILE

**PROJECT**  
C.C.S. SANITARY SEWER EXTENSION  
ST. CHARLES COUNTY, MISSOURI

| REV | DATE    | DESCRIPTION                    |
|-----|---------|--------------------------------|
| 1   | 3/22/05 | CHANGE TO GRAVITY SYSTEM       |
| 2   | 3/31/05 | REVISIONS PER PWSO #2 COMMENTS |

**DRAWN BY:** RPM **SHEET**

**DESIGNED BY:**

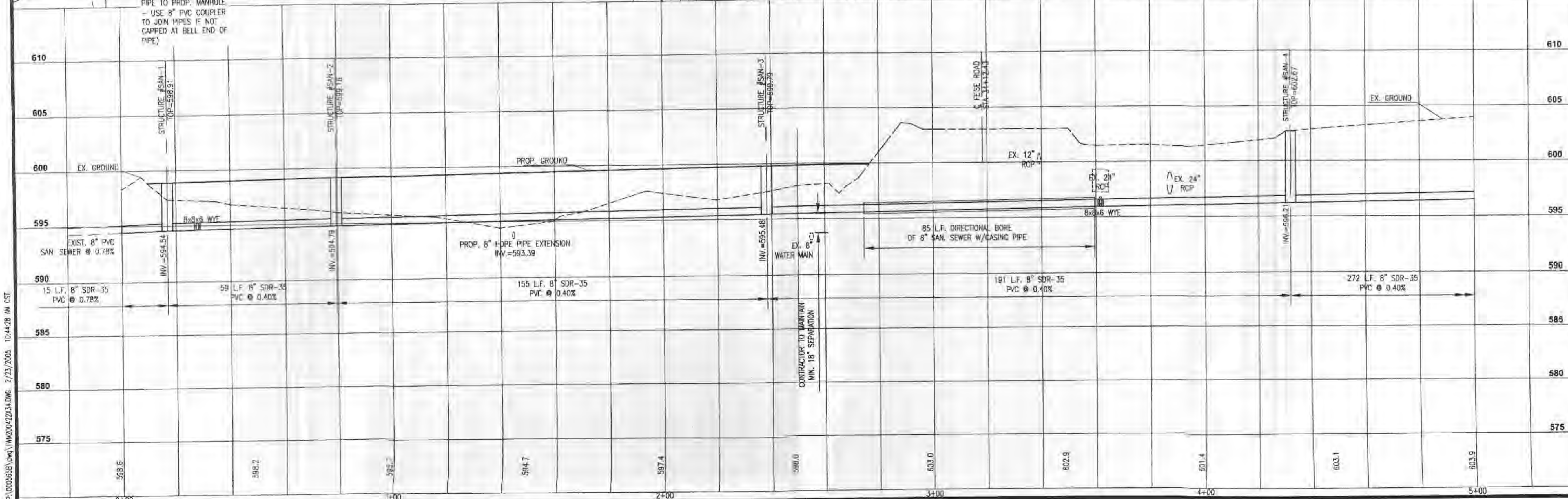
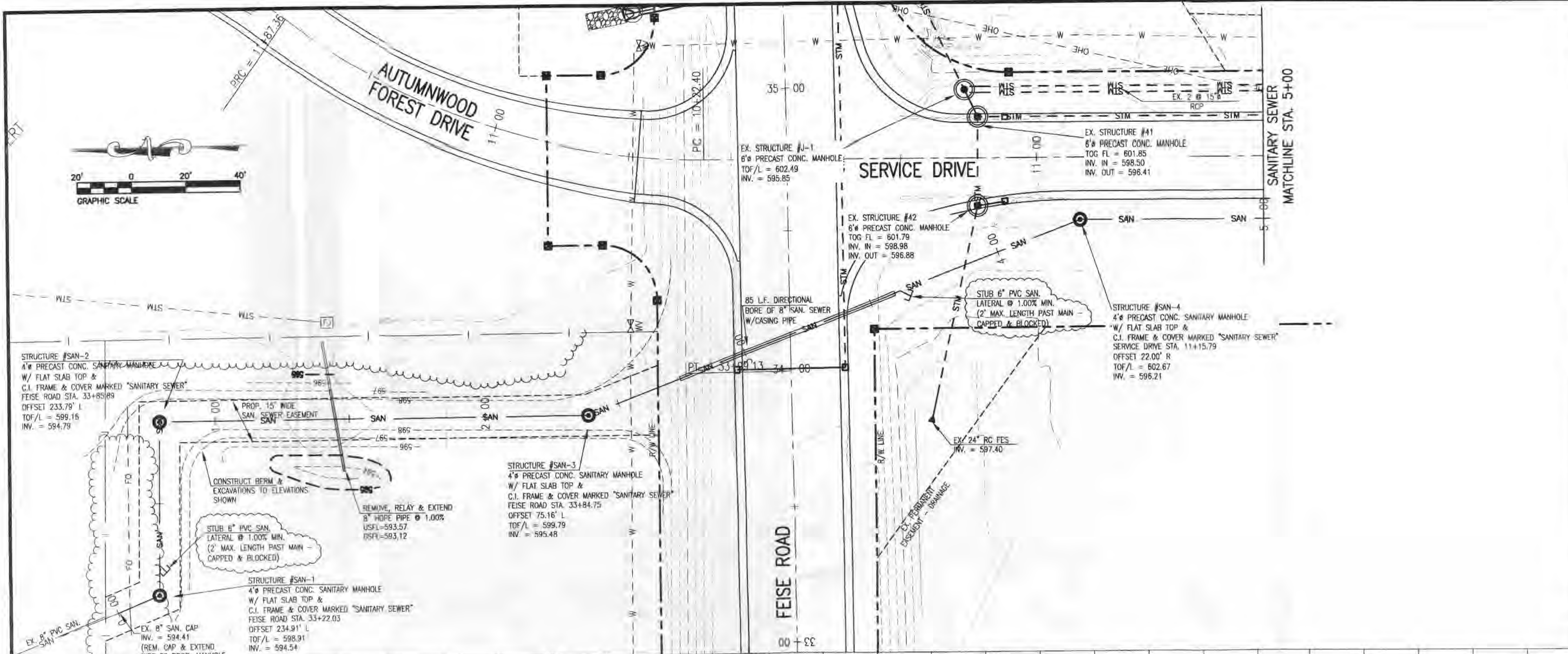
**CHECKED BY:**

**APPROVED BY:**

**PROJECT NUMBER:** T070005658 **OF 7 SHEETS**

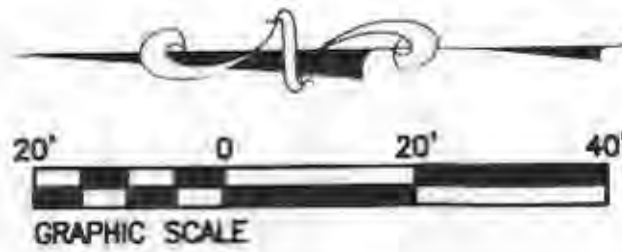
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STRUCTURE #SAN-7  
4" PRECAST CONC. SANITARY MANHOLE  
C.I. FRAME & COVER MARKED "SANITARY SEWER"  
SERVICE DRIVE STA. 14+47.78  
OFFSET 131.13' L  
TOP/L = 609.12  
INV. = 598.66  
598.46

NOTE: CONTRACTOR TO MAINTAIN 10' MIN. HORIZONTAL SEPARATION BETWEEN SANITARY SEWER AND EXISTING WATER MAIN

EX. STRUCTURE #J-3  
6" PRECAST CONC. MANHOLE  
TOP/L = 607.00  
INV. = 599.77

STRUCTURE #SAN-6  
4" PRECAST CONC. SANITARY MANHOLE  
C.I. FRAME & COVER MARKED "SANITARY SEWER"  
SERVICE DRIVE STA. 14+48.22  
OFFSET 52.89' L  
TOP/L = 610.65  
INV. = 597.69

EX. STRUCTURE #J-2  
6" PRECAST CONC. MANHOLE  
TOP/L = 611.43  
INV. = 599.58

STRUCTURE #SAN-5  
4" PRECAST CONC. SANITARY MANHOLE  
C.I. FRAME & COVER MARKED "SANITARY SEWER"  
SERVICE DRIVE STA. 13+91.65  
OFFSET 22.00' R  
TOP/L = 609.92  
INV. = 597.31

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MISSOURI PROFESSIONAL ENGR. CORP. MC 001528  
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Expiration Date: 12/31/2006

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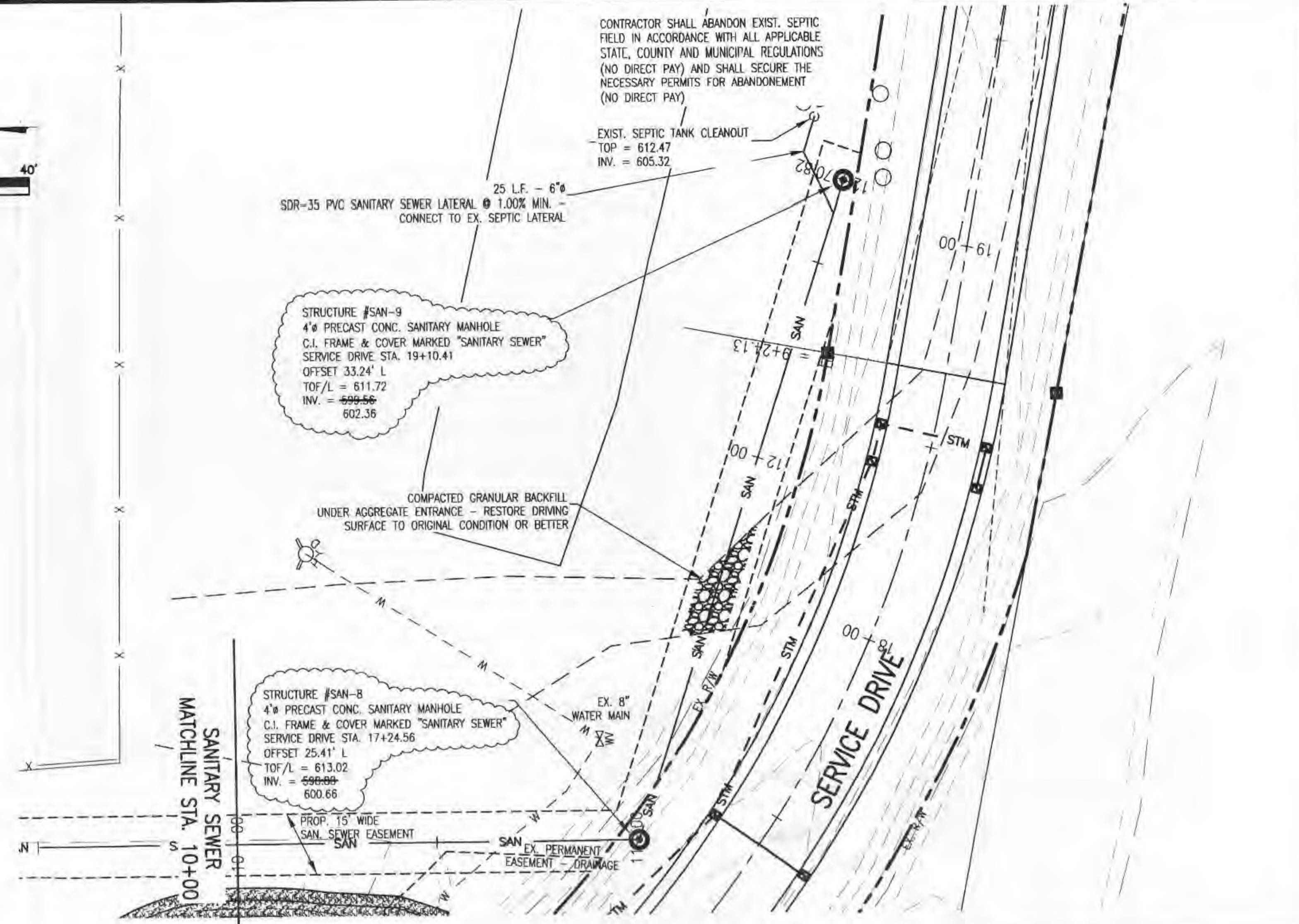
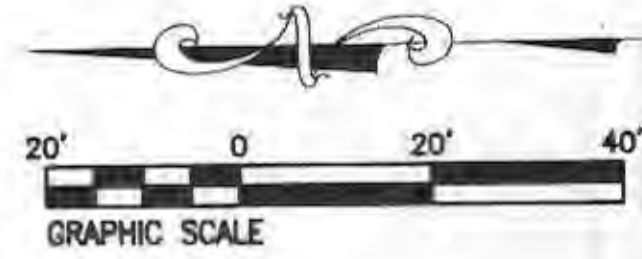
TITLE: **SANITARY SEWER PLAN + PROFILE**  
PROJECT: **C.C.S. SANITARY SEWER EXTENSION ST. CHARLES COUNTY, MISSOURI**

| REV | DATE    | DESCRIPTION                   |
|-----|---------|-------------------------------|
| 1   | 3/22/05 | CHANGE TO GRAVITY SYSTEM      |
| 2   | 3/31/05 | REVISIONS PER PWS# 2 COMMENTS |

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| DESIGNED BY: [Name]                                   |   | <b>S5</b> |
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| APPROVED BY: [Name]                                   |   |           |
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NOTE: CONTRACTOR TO MAINTAIN 10' MIN. HORIZONTAL AND 18" VERTICAL SEPARATION BETWEEN SANITARY SEWER AND EXISTING WATER MAIN

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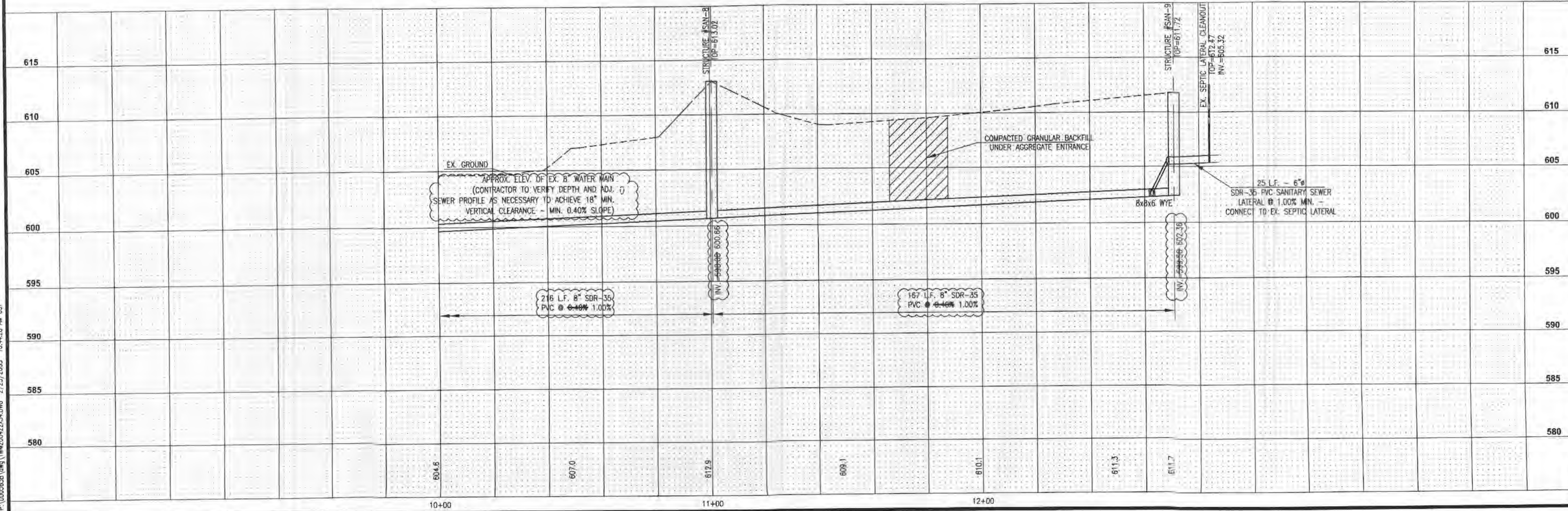
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TITLE: SANITARY SEWER PLAN + PROFILE

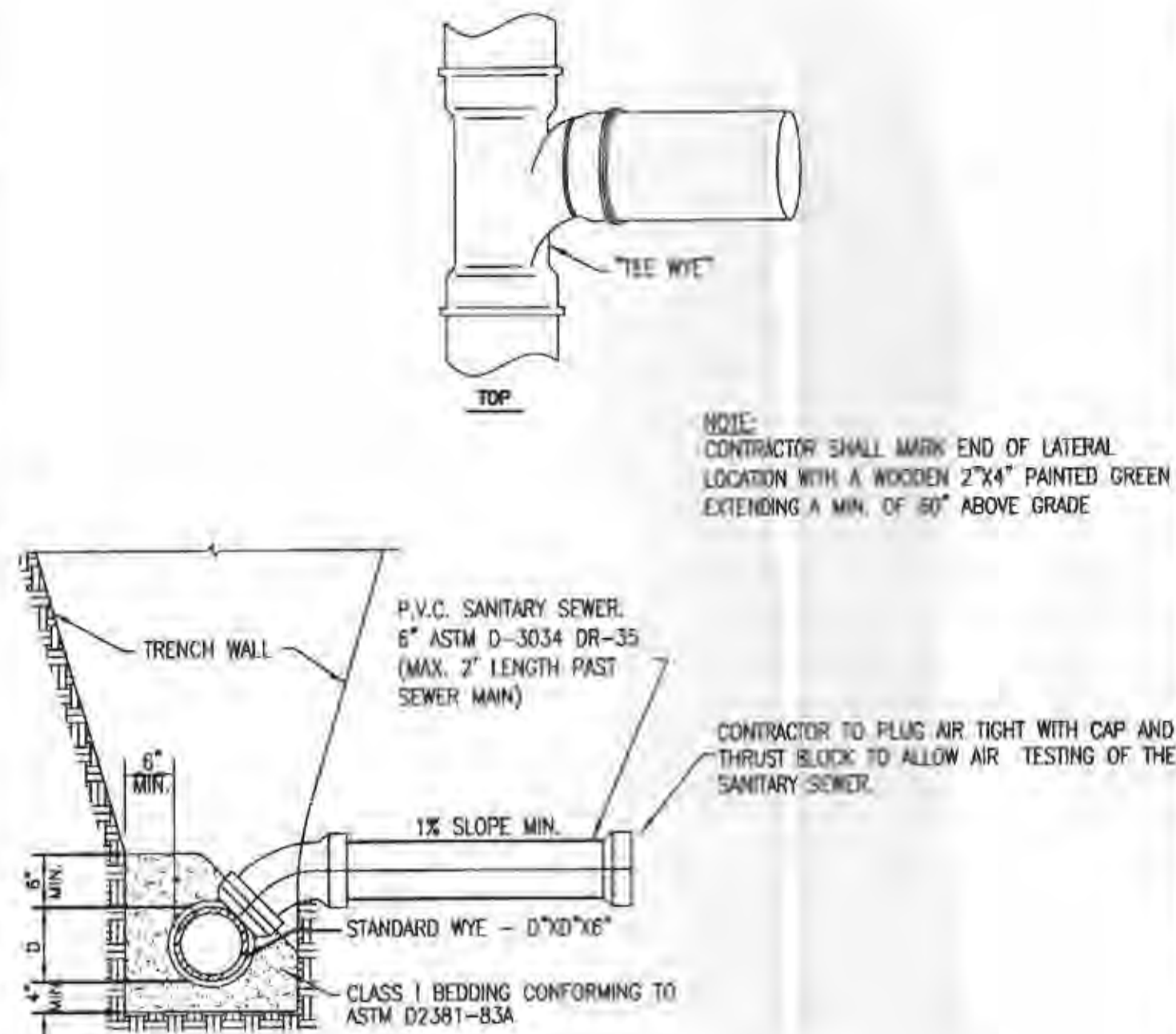
PROJECT: C.C.S. SANITARY SEWER EXTENSION ST. CHARLES COUNTY, MISSOURI

| REV. | DATE    | DESCRIPTION                    |
|------|---------|--------------------------------|
| 1    | 3/22/05 | CHANGE TO GRAVITY SYSTEM       |
| 2    | 3/31/05 | REVISIONS PER PWSO #2 COMMENTS |

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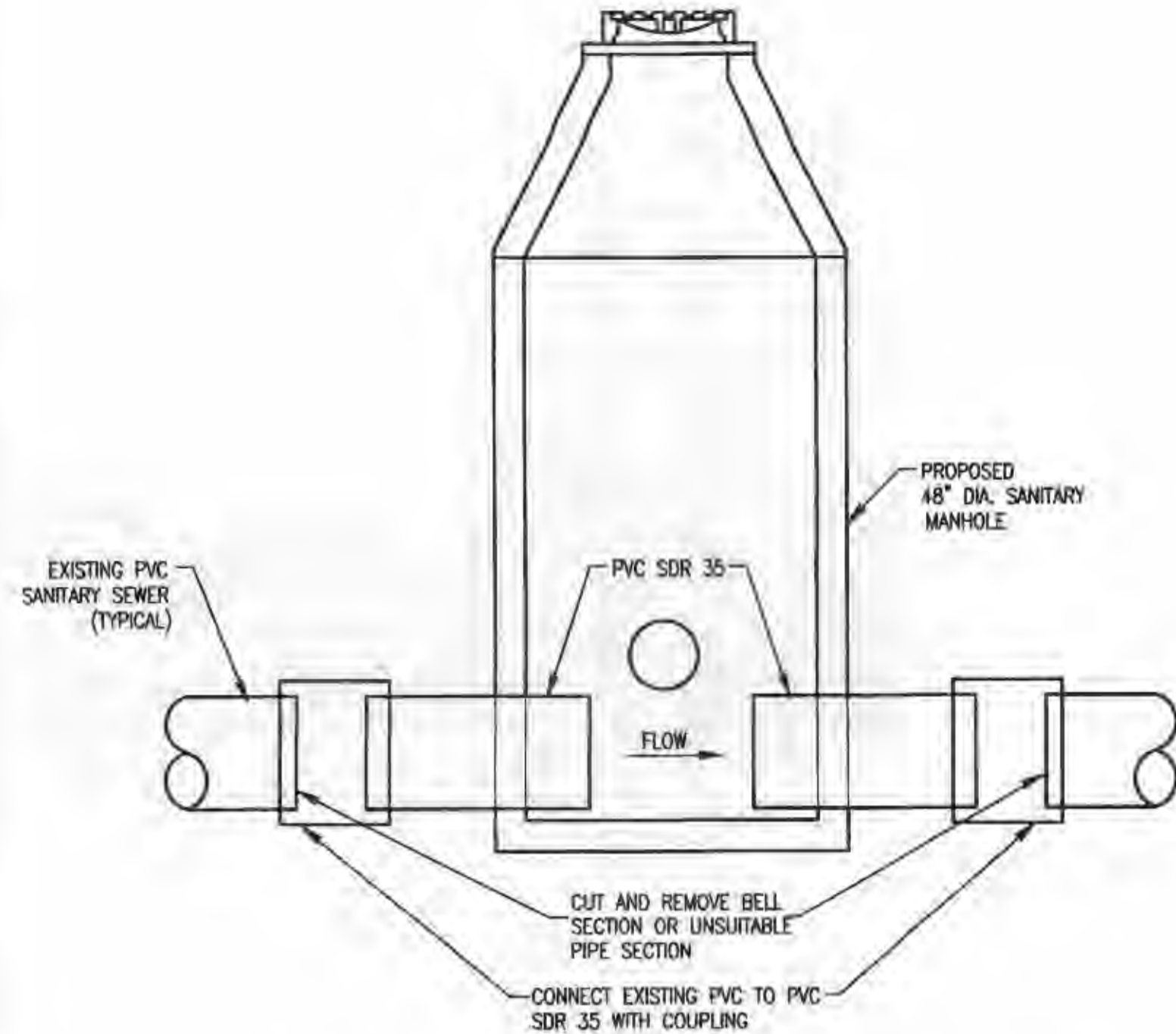
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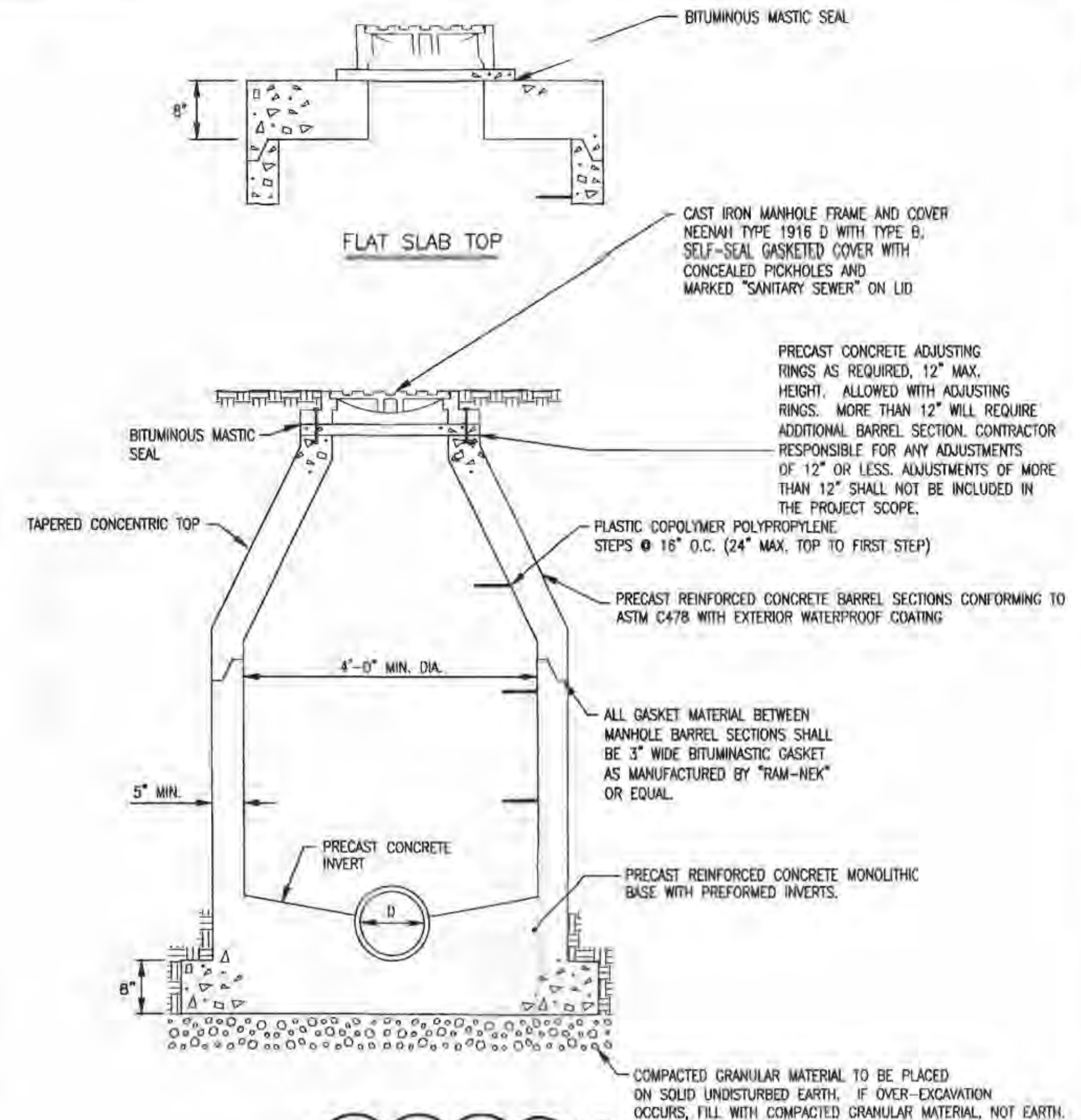
TYPICAL SANITARY SEWER LATERAL DETAIL

NO SCALE



TYPICAL CONNECTION TO EXIST. SANITARY SEWER MAIN

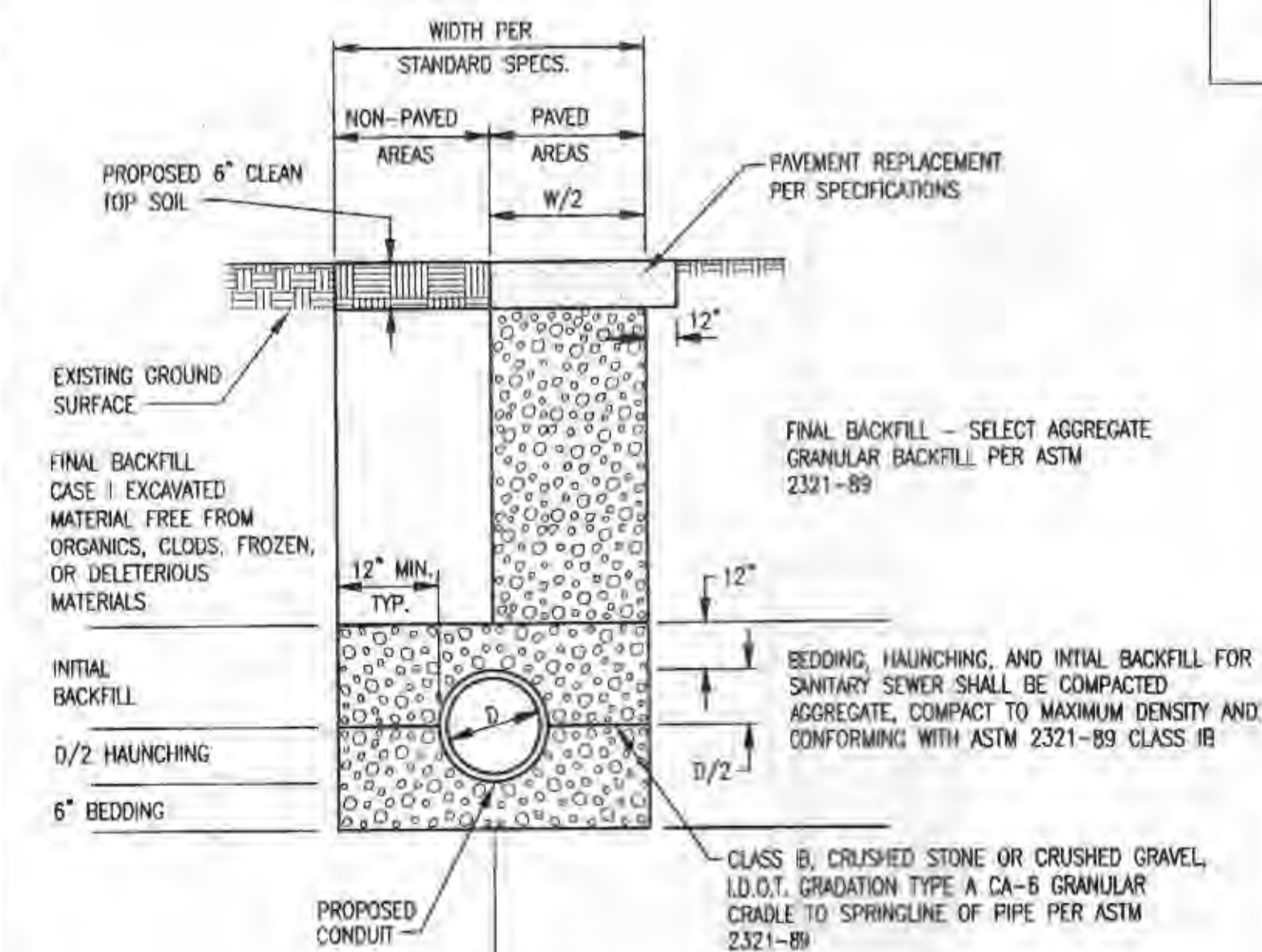
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SANITARY SEWER MANHOLE

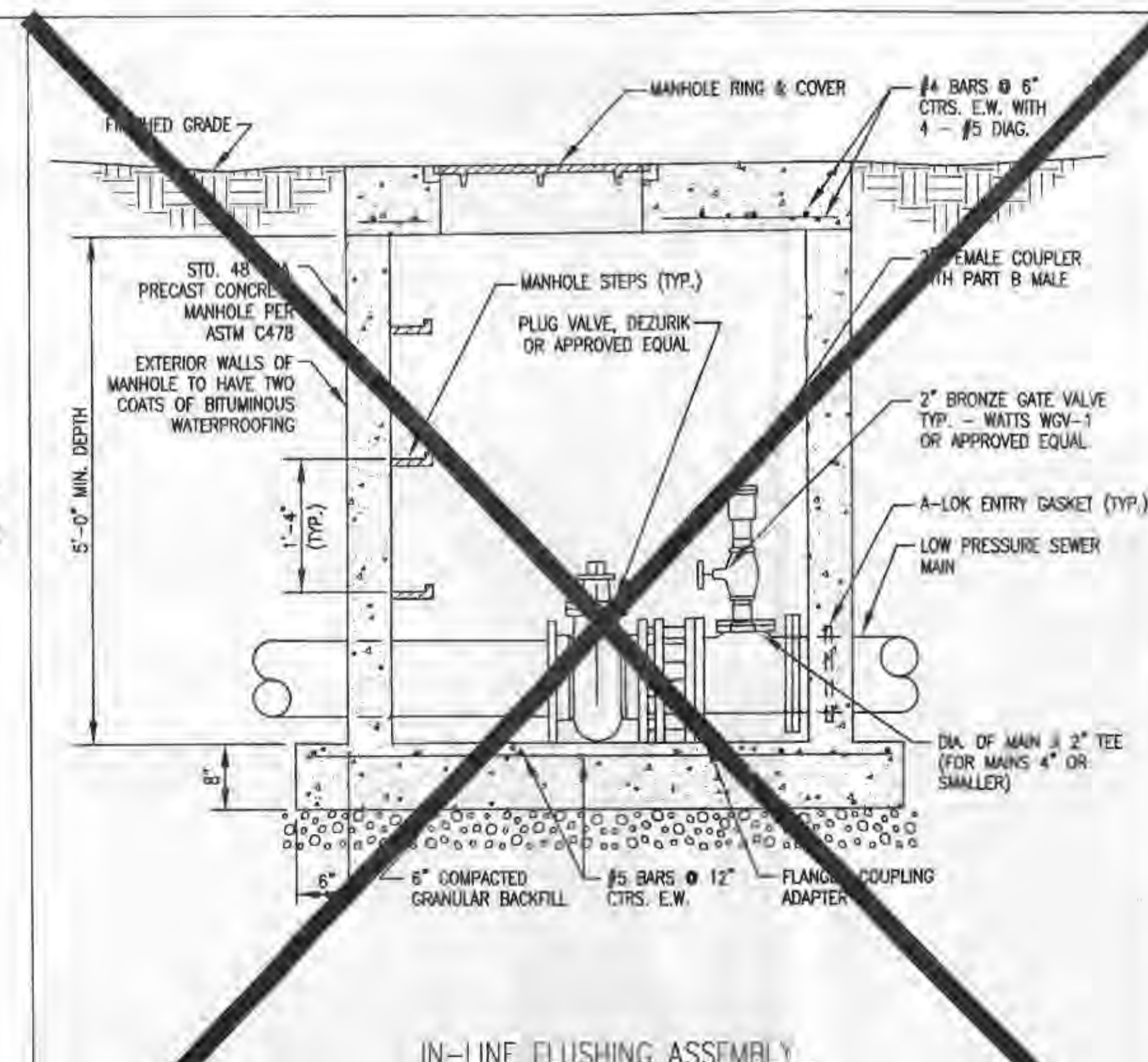
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NOTE: ALL MANHOLES TO BE PROVIDED WITH A-LOCK GASKETS INSTALLED BY THE PRECAST SUPPLIER



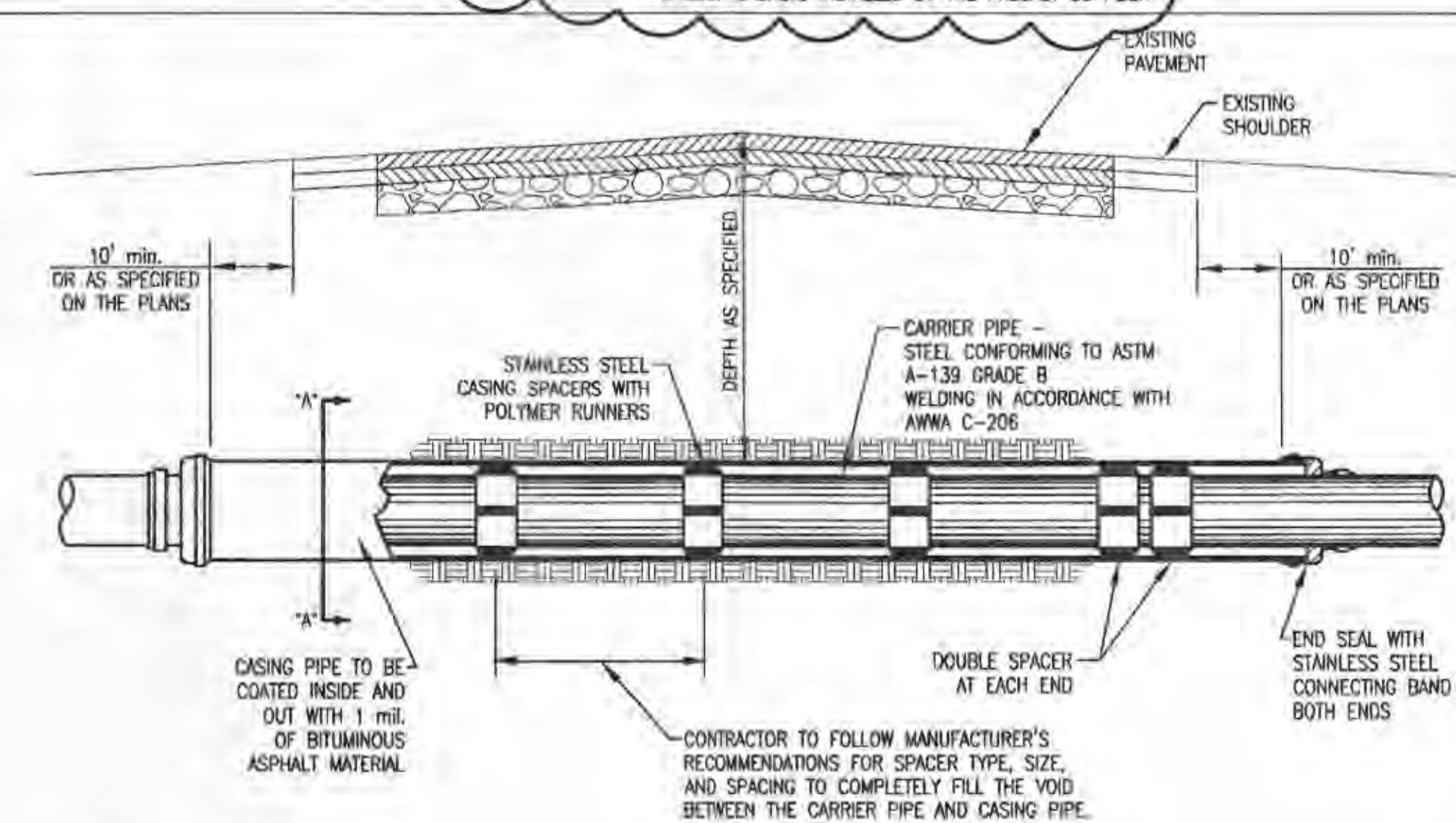
TYPICAL SANITARY SEWER TRENCH DETAIL

NO SCALE



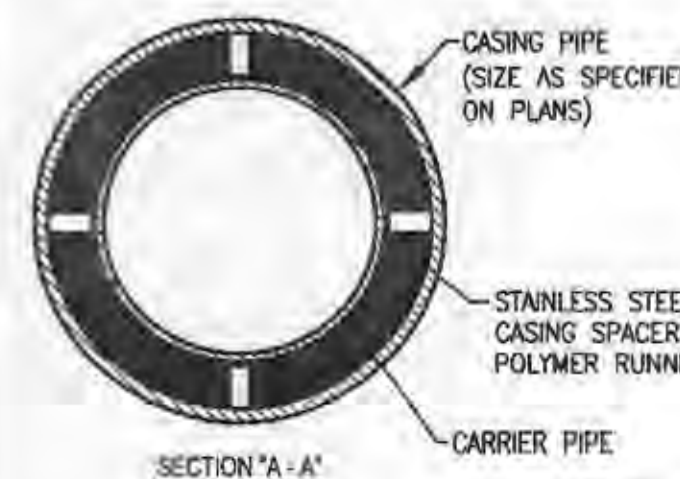
IN-LINE FLUSHING ASSEMBLY

NO SCALE



STEEL PIPE CASING ROADWAY BORE W/PVC CARRIER PIPE

NO SCALE



| CASING PIPE   |                |
|---------------|----------------|
| PIPE DIAMETER | WALL THICKNESS |
| 0" - 26"      | .25 INCH       |
| 27" - 42"     | .375 INCH      |
| 43" - 48"     | .50 INCH       |

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PROJECT: C.C.S. SANITARY SEWER EXTENSION  
ST. CHARLES COUNTY, MISSOURI

| REV.    | DATE | DESCRIPTION                    |
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