

SECTION 01731 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other Work and subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting and patching" is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes upon written instructions of the Engineer.
- C. Cutting and patching is performed during the manufacture of products, or during the initial fabrication. Erection or installation processes are not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".
- D. "Cutting and Patching" includes removal and replacement of Work not conforming to requirements of the Contract Documents, removal and replacement of defective Work, and uncovering Work to provide for installation of ill-timed Work.
- E. No Work shall be endangered by cutting or altering Work or any part of it.

1.02 RELATED DOCUMENTS

- A. Drawing and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to Work of this Section.

1.03 SUBMITTALS

- A. Prior to cutting which affects structural safety of Project, submit written notice to the Engineer, requesting consent to proceed with cutting, including:
 - 1. Identification of Project.
 - 2. Description of affected work.
 - 3. Necessity for cutting.
 - 4. Effect on structural integrity of Project.
 - 5. Description of proposed work. Designate:
 - a. Scope of cutting and patching.
 - b. Trades to execute work.
 - c. Products proposed to be used.

- d. Extent of refinishing.
- 6. Alternatives to cutting and patching.
- B. Should conditions of work, or schedule, indicate change of materials or methods, submit written recommendation to the Engineer, including:
 - 1. Conditions indicating change.
 - 2. Recommendations for alternative materials or methods.
 - 3. Submittals as required for Substitutions.
- C. Submit written notice to the Engineer, designating time Work will be uncovered, to provide for observation.

1.04 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural Work in a manner that would result in a reduction of load-carrying capacity or of load-deflection ratio.
- B. Operational and Safety Limitations: Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in the manner intended, including energy performance, or that would result in increased maintenance, or decreased operational life or decreased energy.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. For replacement of work removed, comply with Specifications for type of work to be done.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Before cutting, examine the surfaces to be cut and patched and the conditions under which the Work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the Work.

3.02 PREPARATION

- A. Temporary Support: To prevent failure, provide temporary support of Work to be cut. Provide shoring, bracing and support as required to maintain structural integrity of project.
- B. Protection: Protect other Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be

exposed during cutting and patching operations. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching Work. Except as otherwise indicated or as approved by the Engineer, proceed with cutting and patching at the earliest feasible time and complete Work without delay.
- B. Cutting: Cut the Work using methods that are least likely to damage work to be retained or adjoining Work. Where possible, review proposed procedures with the original installer; comply with original installer's recommendations.
 - 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
 - 2. Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.
 - 3. By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in wall or partitions to be removed. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.
- C. Patching: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the Work.
 - 1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
 - 2. Restore exposed finishes of patched areas and where necessary, extend finish restoration into retained adjoining Work in a manner which will eliminate evidence of patching and refinishing.
 - 3. Execute fittings and adjustment of products to provide finished installations to comply with specified tolerances.
 - 4. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.
 - 5. Refinish entire surfaces as necessary to provide an even finish.
 - a. Continuous Surfaces: To nearest intersection.
 - b. Assembly: Entire refinishing.

3.04 CLEANING

- A. Thoroughly clean areas and spaces where Work is performed or used as access to work. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01740 - CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. Maintain premises free from accumulations of waste, debris, and rubbish.
- B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces. Leave project clean and ready for occupancy.

1.02 RELATED DOCUMENTS

- A. Cutting and Patching: Section 01731.
- B. Project Closeout: Section 01770.
- C. Cleaning for Specific Products of Work: Specification Section for that work.

1.03 SAFETY REQUIREMENTS

- A. Hazards Control:
 - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of violative noxious substances.
- B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on project site.
 - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- C. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site containers for collection of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.
- F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.02 FINAL CLEANING

- A. Employ experienced workmen, or professional cleaners, for final cleaning.
- B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior or exterior finished surfaces; polish surfaces so designated to shine finish.
- D. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- E. Broom clean paved surfaces; rake clean other surfaces of grounds.
- F. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION

SECTION 01770 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Liquidated Damages: Supplemental General Conditions
- B. Cleaning: Section 01740.
- C. Project Record Documents: Section 01785.

1.02 SUBSTANTIAL COMPLETION

- A. In order to initiate project closeout procedures, the Contractor shall submit the following:
 - 1. Written certification to Engineer that project is Substantially Complete.
 - 2. List of major items to be completed or corrected.
- B. Engineer will make an inspection within seven (7) days after receipt of certification, together with Owner's Representative.
- C. Should Engineer consider that work is Substantially Complete:
 - 1. Contractor shall prepare, and submit to Engineer, a list of items to be completed or corrected, as determined by the inspection.
 - 2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:
 - a. Date of Substantial Completion.
 - b. Contractor's list of items to be completed or corrected, verified and amended by Engineer.
 - c. The time within which Contractor shall complete or correct work of listed items.
 - d. Time and date Owner will assume possession of work or designated portion thereof.
 - e. Responsibilities of Owner and Contractor for:
 - (1) Insurance
 - (2) Utilities
 - (3) Operation of Mechanical, Electrical, and Other Systems.
 - (4) Maintenance and Cleaning.

- (5) Security.
 - f. Signatures of:
 - (1) Engineer
 - (2) Contractor
 - (3) Owner
 - 3. Owner occupancy of Project or Designated Portion of Project:
 - a. Contractor shall:
 - (1) Obtain certificate of occupancy.
 - (2) Perform final cleaning in accordance with Section 01740.
 - b. Owner will occupy Project, under provisions stated in Certificates of Substantial Completion.
 - 4. Contractor: Complete work listed for completion or correction, within designated time.
- D. Should Engineer consider that work is not Substantially Complete:
- 1. He shall immediately notify Contractor, in writing, stating reasons.
 - 2. Contractor: Complete work, and send second written Engineer, certifying that Project, or designated portion of Project is substantially complete.
 - 3. Engineer will reinspect work.
- E. Should Engineer consider that work is still not finally complete:
- 1. He shall notify Contractor, in writing, stating reasons.
 - 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send third written notice to the Engineer certifying that the work is complete.
 - 3. Engineer and Owner will reinspect work at Contractor's expense.

1.03 FINAL INSPECTION

- A. Contractor shall submit written certification that:
- 1. Contract Documents have been reviewed.
 - 2. Project has been inspected for compliance with Contract Documents.
 - 3. Work has been completed in accordance with Contract Documents.
 - 4. Equipment and systems have been tested in presence of Owner's Representative and are operational.

5. Project is completed, and ready for final inspection.
- B. Engineer will make final inspection within seven (7) days after receipt of certification.
- C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.
- D. Should Engineer consider that work is not finally complete:
 1. He shall notify Contractor in writing, stating reasons.
 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Engineer certifying that work is complete.
 3. Engineer will reinspect work.

1.04 CLOSEOUT SUBMITTALS

- A. Project Record Documents: To requirements of Section 01785.
- B. Guarantees, Warranties and Bonds: To requirements of particular technical Specifications and Section 01782.

1.05 INSTRUCTION

- A. Instruct Owner's personnel in operation of all systems, mechanical, electrical, and other equipment.

1.06 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit final applications in accordance with requirements of General Conditions.

1.07 FINAL CERTIFICATE FOR PAYMENT

- A. Engineer will issue final certificate in accordance with provisions of general conditions.
- B. Should final completion be materially delayed through no fault of Contractor, Engineer may issue a Semi-Final Certificate for Payment.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01782 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Submit to Engineer for review and transmittal to Owner.

1.02 RELATED DOCUMENTS

- A. Bid Bond: Instructions to Bidders.
- B. Performance and Payment Bonds: General Conditions and Supplemental General Conditions.
- C. Guaranty: General Conditions and Supplemental General Conditions.
- D. General Warranty of Construction: General Conditions.
- E. Project Closeout: Section 01770.
- F. Warranties and Bonds required for specific products: As listed in technical specifications in these Contract Documents herein.
- G. Provisions of Warranties and Bonds, Duration: Respective specification sections for particular products.

1.03 SUBMITTALS REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Furnish two (2) original signed copies.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product, equipment or work item.
 - 2. Firm name, address and telephone number.
 - 3. Scope

4. Date of beginning of warranty, bond or service and maintenance contract.
5. Duration of warranty, bond or service and maintenance contract.
6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
7. Contractor name, address and telephone number.

1.04 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 1. Size 8-1/2 in. x 11 in., punch sheets for 3-ring binder.
 - a. Fold larger sheets to fit into binders.
 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS." List:
 - a. Title of Project
 - b. Name of Contractor
- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.05 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during progress of construction:
 1. Submit documents within 10 days after inspection and acceptance.
- B. Otherwise make submittals within 10 days after date of substantial completion, prior to final request for payment.
- C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

1.06 SUBMITTALS REQUIRED

- A. Submit warranties, bonds, service and maintenance contracts as specified in the respective sections of the Specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01785 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 MAINTENANCE OF DOCUMENTS

- A. Maintain at job site, one copy of:
 - 1. Contract Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Reviewed Shop Drawings
 - 5. Change Orders
 - 6. Other Modifications to Contract
- B. Store documents in approved location, apart from documents used for construction.
- C. Provide files and racks for storage of documents.
- D. Maintain documents in clean, dry, legible condition.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by Engineer and Owner.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Shop Drawings, Product Data, and Samples: Section 01340.

1.03 MARKING DEVICES

- A. Provide colored pencil or felt-tip marking pen for all marking.

1.04 RECORDING

- A. Label each document "PROJECT RECORD" in 2-inch high printed letters.
- B. Keep record documents current.
- C. Do not permanently conceal any work until required information has been recorded.
- D. Contract Drawings: Legibly mark to record actual construction:
 - 1. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.

2. Location of internal utilities and appurtenances concealed in construction, as referenced to visible and accessible features of structure.
 3. Field changes of dimension and detail.
 4. Changes made by Change Order or Field Order.
 5. Details not on original Contract Drawings.
- E. Specifications and Addenda: Legibly mark up each section to record:
1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 2. Changes made by Change Order or Field Order.
 3. Other matters not originally specified.
- F. Shop Drawings: Maintain as record documents; legibly annotate shop drawings to record changes made after review. Coordinate and confirm with Engineer that electronic media versions of all shop drawings have been provided to Engineer.

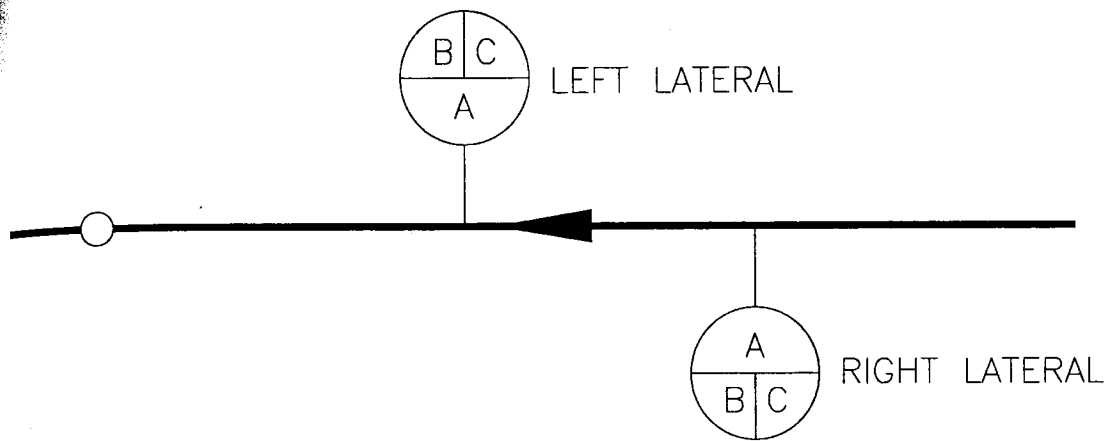
1.05 SUBMITTALS

- A. At completion of project, deliver record documents to Engineer.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
1. Date.
 2. Project Title and Number.
 3. Contractor's Name and Address.
 4. Title and Number of each Record Document.
 5. Certification that each Document as Submitted is Complete and Accurate.
 6. Signature of Contractor, or His Authorized Representative.

1.06 STANDARD PROCEDURE FOR AS CONSTRUCTED LOCATION OF LATERAL SERVICE CONNECTIONS

- A. See Exhibit 1:

Exhibit 1 – Standard Procedure for as constructed location of lateral service connections.



EXPLANATION

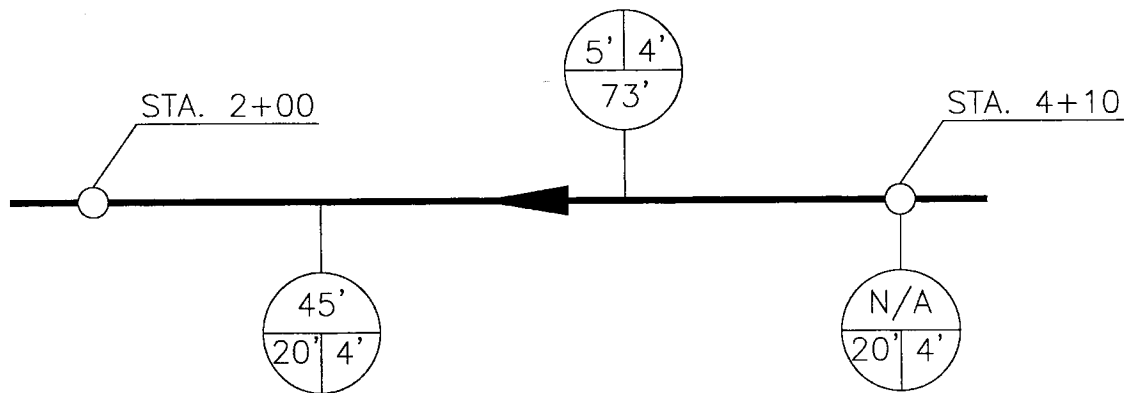
A. Laterals for service connections shall be located with reference to the nearest downstream manhole. The distance from the downstream manhole to the tee is measured along the centerline of the main sewer and noted as "A" in the circle diagram.

When the lateral is out of manhole, "A" is noted as "N/A" (not Applicable).

B. Distance from main sewer to the end of lateral is measured at right angles to the main sewer from centerline of tee to the end of lateral. Distance is shown as "B" in circle diagram. When only one length of pipe is installed, distance is given as 5-feet.

C. Depth at end of lateral is from top of ground to top of lateral and shown as "C" in circle diagram.

TYPICAL EXAMPLE



PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

DIVISION 2

SITE WORK

SECTION 02220 - DEMOLITION & SALVAGE

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for demolition as shown on the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 02300

1.03 PROCEDURE

- A. The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for review. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.
- B. It is the responsibility of the Contractor to visit the site to familiarize himself with the amount of Work that is included under this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 DUST CONTROL

- A. The amount of dust resulting from the demolition shall be controlled to prevent the spread of and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

3.02 DISCONNECTION OF UTILITY SERVICES

- A. Utilities shall be disconnected at the points indicated by the Owner or Engineer and left in a safe condition.
- B. All overhead service, power poles, guy wires, etc shall be removed from the site.

3.03 BURNING

- A. The use of burning at the project site for the disposal of refuse and debris will not be permitted, unless authorized in writing by the Owner.

3.04 PROTECTION OF EXISTING WORK

- A. Existing work to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work.

3.05 BACKFILL OF STRUCTURES

- A. The portion of the demolished structures remaining below grade shall be backfilled with concrete, masonry, etc., from the demolition or any backfill material which is acceptable to the Engineer. The top two (2) feet of the backfill shall be made up of topsoil and graded to match the existing ground. It shall be free of any of the demolition material. The entire backfill shall be compacted in such a manner as to prevent settlement.
- B. It is the responsibility of the Contractor to dispose of all excess demolition material from the site as soon as practicable.
- C. Site shall be restored to grass following backfill of pump station site.

3.06 SALVAGE MATERIAL

- A. All equipment, pumps, controls, valves, piping, etc., is the property of the Owner and care shall be taken in its removal so not to damage it in any way. Such salvage material shall be removed and delivered to the Owner to a site designated by him. The Owner has the right to refuse any salvage material, and in such cases it is the responsibility of the Contractor to dispose of the unwanted material.

END OF SECTION

SECTION 02225

EXCAVATING, BACKFILLING, AND COMPACTING FOR SEWERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Excavating of trenches.
- B. Bedding of pipe.
- C. Backfilling trenches.
- D. Installing Identification Tape.

PART 2 - PRODUCTS

2.01 BEDDING AND BACKFILLING STONE

- A. Crushed Stone material shall conform to the Kentucky Transportation Cabinet's Standard Specifications for Road and Bridge Construction, Current Edition, latest revision.
- B. Bedding Stone: No. 9 Crushed Stone.
- C. Backfill Stone: No. 9 Crushed Stone.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Trenching may be accomplished by means of a backhoe, trenching machine or by hand depending on the construction area. At the Contractor's option, trenching by a trenching machine or by backhoe is acceptable except as noted below:
 - 1. Where the pipe line parallels a state highway and is being installed within the limits of the shoulder, a trenching machine must be used whenever practicable.
 - 2. Where the pipe line is being constructed close to other utilities, structures, building, or large trees, and it is reasonable to anticipate possible damage from the use of a backhoe, then trenching shall be made by hand methods.
- B. Clearing - All trees, stumps, bushes, shrubbery, and abandoned concrete or masonry structures within the limits of the trench shall be removed by the Contractor and disposed of in a manner satisfactory to the land owner and in accordance with federal, state, and local regulations. All clearing work shall be considered as incidental to the cost of laying pipe.
- C. Bracing and Sheeting - In areas of unstable soils, bracing and sheeting shall be provided to adequately protect the workers during pipe line installation.
 - 1. All requirements of the Occupational Safety and Health Act (OSHA) shall be met during trenching and backfill operations.

2. When sheeting and bracing are required, the trench width shall not be less than specified herein. As backfill is placed, the sheeting shall be withdrawn in increments not exceeding one (1) foot and the void left by the withdrawn sheeting shall be filled and compacted.
 3. The Engineer will not be responsible for determining requirements for bracing or sheeting.
- D. Excavated materials shall be piled in a manner that will not endanger the Work and will avoid obstructing driveways and sidewalks. Gutters shall be kept clear or other satisfactory provisions made for street drainage.

3.02 TRENCHING

A. General:

1. The Contractor shall perform all excavation of every description and of whatever substances encountered, including clearing over the pipe line route. All excavations for the pipe line shall be open-cut except at paved city and county roads, state and federal highways, railroads and blacktop or concrete driveways which shall be bored unless otherwise approved by Engineer. Banks of excavations shall be kept as nearly vertical as possible.
2. Trench widths at the top of the pipe shall not be less than or greater than that given in the following table:

ALLOWABLE TRENCH WIDTHS		
Pipe Diameter (inches)	Minimum Width (inches)	Maximum Width (inches)
4 & less	16	28
6	18	30
8	20	32
10	22	34
12	24	36
14	26	38
16	28	40
18	30	42
20	32	44

B. Trench Depth:

1. The trench shall be excavated to a depth sufficient to provide 48 inches of cover over the pipe. In addition, excavation shall be carried to a minimum of six (6) inches below pipe grade in rock.
- C. Blasting for excavation will be permitted only when proper precautions are taken for the protection of persons and property. Any damage caused by the blasting shall be repaired by the Contractor at his expense. The Contractor's methods of blasting and procedure shall conform to federal, state, and local laws and municipal ordinances. The Engineer will not be responsible, nor direct in any way, blasting practices of the Contractor.

3.03 FORCE MAIN BEDDING

- A. Refer to LFUCG Standard Drawings.
- B. The trench shall be excavated to a depth to allow a minimum of 48 inches cover over the top of the pipe.
- C. When the subgrade is found to be unstable or to include ashes, cinders, refuse, organic material, or other unsuitable material, such material shall be removed to the depth ordered by the Engineer and replaced under the directions of the Engineer with clean, stable backfill material. When the bottom of the trench or the subgrade is found to consist of material that is unstable to such a degree that, in the judgment of the Engineer it cannot be removed, a foundation for the pipe and/or appurtenance shall be constructed using piling, concrete, or other materials at the direction of the Engineer.

3.04 FORCE MAIN BACKFILLING

- A. Refer to LFUCG Standard Drawings

3.05 GRAVITY SEWER PIPE BEDDING

- A. Refer to LFUCG Standard Drawings.
- B. When the subgrade is found to be unstable or to include ashes, cinders, refuse, organic material, or other unsuitable material, such material shall be removed to the depth ordered by the Engineer and replaced under the directions of the Engineer with clean, stable backfill material. When the bottom of the trench or the subgrade is found to consist of material that is unstable to such a degree that, in the judgement of the Engineer it cannot be removed, a foundation for the pipe and/or appurtenance shall be constructed using piling, concrete, or other materials at the direction of the Engineer.

3.06 GRAVITY SEWER PIPE BACKFILLING

- A. Refer to LFUCG Standard Drawings.
 - 1. Final backfill beneath existing driveways, and beneath existing and proposed roads, shall be No. 9 Crushed Stone up to the subgrade of vehicular traffic surface courses. This does not apply to driveways in subdivisions under construction, because the location of driveways is unknown at the time the sewer is constructed.

3.07 INSTALLING IDENTIFICATION TAPE

- A. Detectable underground marking tape shall be installed over all utility lines. Care shall be taken to insure that the buried marking tape is not broken when installed and shall be Lineguard brand encased aluminum foil, Type III. The identification tape is manufactured by Lineguard, Inc., P.O. Box 426, Wheaton, IL 60187.
- B. The identification tape shall bear the printed identification of the plastic utility line below it, such as "Caution - Buried Below." Tape shall be reverse printed; surface printing will not be acceptable. The tape shall be visible in all types and colors of soil and provide maximum color contrast to the soil. The tape shall meet the APWA color code, and shall be two (2) inches in width. Colors are green for sewer and brown for force main.

- END OF SECTION -

SECTION 02240 - DEWATERING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor and equipment required to dewater all excavations.
- B. Dewatering of all excavations shall be the responsibility of the Contractor, and no additional compensation will be allowed for same unless specifically included as a bid item.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork is included in Section 02300.
- B. Erosion and sedimentation control is included in Section 02371.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL

- A. Dewatering equipment shall be of adequate size and quantity to assure maintaining proper conditions for installing pipe, concrete, backfill or other material or structure in the excavation.
- B. Dewatering shall include proper removal of any and all liquid, regardless of its source, from the excavation and the use of all practical means available to prevent surface runoff from entering any excavation.
- C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the ground water level at least two (2) feet below the base of the excavation during all stages of construction operations. The ground water table shall be lowered in advance of excavation and maintained a minimum of two (2) feet below the lowest excavation subgrade made until the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.
- D. Dewatering operations should not discharge into the sanitary sewer system, or into any ditch, pipe or other conveyance that leads to a regulated water body, except as authorized by a KPDES permit.

END OF SECTION

DEWATERING

02240-1

SECTION 02260 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section includes, but is not limited to, the following:
 - 1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
 - 2. Maintenance of shoring and bracing.
 - 3. Removal of shoring and bracing, as required.
- B. Types of shoring and bracing systems include, but are not limited to, the following:
 - 1. Steel H-section (soldier) piles.
 - 2. Timber lagging.
 - 3. Steel sheet piles.
 - 4. Portable Steel Trench Box.
- C. Building excavation is specified in another Division 2 Section.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Section 01340.
- B. Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified professional engineer. System design and calculations must be acceptable to local authorities having jurisdiction.

1.04 QUALITY ASSURANCE

- A. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located, and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.

- B. Supervision: Engage and assign supervision of excavation support system to a qualified professional engineer foundation consultant.
- C. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

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1.05 JOB CONDITIONS

- A. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.
- B. Survey adjacent structures and improvements, employing qualified professional engineer, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
- C. During excavation, resurvey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident.

1.06 EXISTING UTILITIES

- A. Protect existing active sewer, water, gas, electricity and other utility services and structures.
- B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.
- B. Structural Steel: ASTM A 36.
- C. Steel Sheet Piles: ASTM A 328.
- D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick, unless otherwise indicated.
- E. Portable Steel Trench Box shall be OSHA approved.

PART 3 - EXECUTION

3.01 SHORING

- A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.
- B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.02 BRACING

- A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.
- B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.
- C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
- D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
- F. Repair or replace, as acceptable to Engineer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION

SECTION 02300 - EARTHWORK

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all materials, labor, equipment and services necessary to do all clearing and grubbing, excavation, backfilling, providing of additional fill material and topsoil, control of surface drainage and ground water, finished site grading and erosion control required to construct the work as shown.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. State and local code requirements shall control the disposal of trees and shrubs.
- B. All burning shall be controlled by applicable local regulations.
- C. Excavation Support and Protection – Section 02260
- D. Erosion and Sedimentation Control – Section 02371

1.03 JOB CONDITIONS

- A. Weather: Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained on account of rain, snow, ice, drought or other adverse weather conditions.
- B. Existing Utilities: Prior to commencement of work, the Contractor shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
- C. Use of Explosives: The Contractor (or any of his Subcontractors) shall not bring explosives onto site or use in work without prior written permission from the Owner. All activities involving explosives shall be in compliance with the rules and regulations of the State Department of Mines, and Minerals, Division of Explosives and Blasting. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.
- D. Protection of Persons and Property:
 - 1. Barricade open excavations occurring as part of this work and post with warning lights.
 - a. Operate warning lights as recommended by authorities having jurisdiction.
 - b. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

- E. Dust Control: Use all means necessary to control dust on or near the project site which such dust is caused by the Contractor's operations or directly results from conditions controlled by the Contractor.

1.04 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

All activities involving utility line construction covered under NATIONWIDE PERMIT # 12 shall meet the following conditions:

- A. The general Water Quality Certification is limited to the crossing of intermittent and perennial streams by utility lines.
- B. The construction of permanent or temporary access roads will impact less than 300 linear feet of intermittent and perennial streams and less than one acre of jurisdictional wetlands.
- C. Utility lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGA 7 ½ minute topographic map except where the utility line alignment crosses the stream. Utility lines that cross streams shall be constructed by methods that maintain normal stream flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the utility line excavation shall not be allowed to enter the flowing portion of the stream.
- D. The activities shall not result in any permanent changes in preconstruction elevation contours in waters or wetlands or stream dimension, pattern or profile.
- E. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.
- F. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
- G. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regrading and reseeded will be accomplished within 14 days after disturbance.
- H. To the maximum extent practicable, all in stream work under this certification shall be performed during low flow.
- I. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such in stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
- J. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.

- K. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.
- L. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling 800/928-2380.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Definitions:
 - 1. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, SP, GC, SC, ML, and CL.
 - 2. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MH, CH, OL, OH and PT. The Contractor shall notify the Engineer if these soil materials are encountered.
 - 3. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
 - 4. Drainage Fill: Washed, evenly graded mixture of crushed stone, or uncrushed gravel, with 100 percent passing a 1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.
 - 5. Backfill and Fill Materials: Satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter.

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

- A. Work shall consist of cutting and removing designated trees, stumps, brush, logs, removal of fences, or other loose and projecting material. Unless otherwise specified, it shall also include the grubbing of stumps, roots, and other natural obstructions which, in the opinion of the Engineer, must be removed to execute properly the construction work and operate properly the facility upon the completion of construction.
- B. Trees, bushes, and all natural vegetation shall only be removed with the approval of the Engineer. No cleared or grubbed materials shall be used in backfills or embankment fills. All stumps, roots, and other objectionable material shall be grubbed up so that no roots larger than 3 inches in diameter remain less than 18 inches below the ground surface. All holes and depressions left by grubbing operations shall be filled with suitable material and compacted to grade, as recommended in Paragraph 3.06.
- C. Disposal shall be by burning or other methods satisfactory to the Engineer; however, burning will be permitted only when the Contractor has obtained written permission from the local regulatory agency.

- D. The Contractor shall also remove from the site and satisfactorily dispose of miscellaneous rubbish including, but not limited to, masonry, scrap metal, rock, pavement, etc., that is under the fill or to be removed as shown on the Drawings specified herein, or directed by the Engineer.
- E. Existing improvements, adjacent property, utility and other facilities, and trees, plants, and brush that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations.
- F. Trees and shrubs, designated to remain or that are beyond the clearing and grubbing limit, which are injured or damaged during construction operations shall be treated or replaced at the Contractor's expense by experienced tree surgery personnel.

3.02 EROSION CONTROL

- A. Temporary measures shall be applied throughout the construction period to control and to minimize siltation to adjacent properties and waterways. Such measures shall include, but not be limited to, the use of berms, silt barriers, gravel or crushed stone, mulch, slope drains and other methods.
- B. These temporary measures shall be applied to erodible material exposed by any activity associated with the construction of this project.
- C. Refer to Section 02371, Erosion and Sedimentation Control for requirements.

3.03 EXCAVATION

- A. Excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the Drawings. All excavation shall be performed in the manner and sequence as required for the work.
- B. All excavated materials that meet the requirements for fill, subgrades or backfill shall be stockpiled within the site for use as fill or backfill, or for providing the final site grades. Where practicable, suitable excavated material shall be transported directly to any place in the fill areas within the limits of the work. All excavated materials that are not suitable for fill, and any surplus of excavated material that is not required for fill shall be disposed of by the Contractor.
- C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the ground water level at least two (2) feet below the base of the excavation during all stages of construction operations. The ground water table shall be lowered in advance of excavation and maintained a minimum of two (2) feet below the lowest excavation subgrade made until the excavation is backfilled or the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.

- D. Excavations for concrete structural slabs on grade shall extend two (2) feet below the indicated bottom of slabs. The over-excavation shall be backfilled with 18 inches, compacted thickness, of over lot fill material or suitable material as herein specified. The remaining six (6) inches of over-excavation shall be backfilled with porous fill material. The porous fill layer shall extend beyond the limits of the concrete slab a minimum of two (2) feet on all sides as indicated on the Drawings. The porous fill shall be crushed stone or gravel and shall have the following U.S. Standard Sieve gradation:

Sieve	1-1/2	1	3/4	1/2	3/8
% Passing	Min 100	95±5	58±17	Max 15	Max 5

- E. Excavations for the construction shall be carefully made to the depths required. Bottoms for footings and grade beams shall be level, clean and clear of loose material, the lower sections true to size. Bottoms of footings and grade beams, in all locations, shall be at a minimum depth of 30 inches below adjacent exterior finished grade or 30 inches below adjacent existing grade, whichever is lower, whether so indicated or not. Footings and grade beam bottoms shall be inspected by the Engineer before any concrete is placed thereon.
- F. In excavations for structures where, in the opinion of the Engineer, the ground is spongy or otherwise unsuitable for the contemplated foundation, the Contractor shall remove such unsuitable material and replace it with suitable material properly compacted.
- G. Sheeting and shoring shall be provided as necessary for the protection of the work and for the safety of the personnel. The clearances and types of the temporary structures, insofar as they affect the character of the finished work, will be subject to the review of the Engineer, but the Contractor shall be responsible for the adequacy of all sheeting, bracing and cofferdamming. All shoring, bracing and sheeting shall be removed as the excavations are backfilled in a manner such as to prevent injurious caving; or, if so directed by the Engineer, shall be left in place. Sheeting left in place shall be cut off 18 inches below the surface.
- H. Excavation for structures which have been carried below the depths indicated without specific instructions shall be refilled to the proper grade with suitable material properly compacted, except that in excavation for columns, walls or footings, the concrete footings shall extend to this lower depth. All work of this nature shall be at the Contractor's expense.

3.04 FILL

- A. All existing fill below structures and paved areas must be stripped. The upper six (6) inches of the natural subgrade below shall be scarified and recompactd at optimum moisture to at least ninety-five percent (95%) of Standard Proctor Density ASTM D 698 (latest revision).
- B. All vegetation, such as roots, brush, heavy sods, heavy growth of grass and all decayed vegetable matter, rubbish and other unsuitable material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. In no case will such objectionable material be allowed to remain in or under the fill area. Existing fill from excavated areas on site shall be used as fill for open and/or planted areas. Additional fill stockpiled at the site can be used for structural fill if approved by the Engineer. Any additional material necessary for establishing the indicated grades shall be furnished by the Contractor and approved by the Engineer. All fill material shall be

free from trash, roots and other organic material. The best material to be used in fill shall be reserved for backfilling pipe lines and for finishing and dressing the surface. Material larger than 3 inches maximum dimension shall not be permitted in the upper 6 inches of the fill area. Fill material shall be placed in successive layers and thoroughly tamped or rolled in a manner approved by the Engineer, each layer being moistened or dried such that the specified degree of compaction shall be obtained. No fill shall be placed or compacted in a frozen condition or on top of frozen material. No fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed and no compaction of fill will be permitted with free water on any point of the surface of the fill to be compacted.

- C. Where concrete slabs are placed on earth, all loam and organic or other unsuitable material shall be removed. Where fill is required to raise the subgrade for concrete slabs to the elevations as indicated on the Drawings or as required by the Engineer, such fill shall consist of suitable material and shall be placed in layers. Each layer shall be moistened or dried such that the specified degree of compaction shall be obtained. All compaction shall be accomplished in a manner and with equipment as approved by the Engineer. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for adjacent fill.

3.05 BACKFILLING

- A. After completion of footings, grade beams and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall be as specified for suitable material, placed and compacted as specified hereinafter. Backfill shall be placed in horizontal layers of the thickness specified and shall have a moisture content such that the required degree of compaction is obtained. Each layer shall be compacted by mechanical tampers or by other suitable equipment approved by the Engineer to the specified density. Special care shall be taken to prevent wedging action or eccentric loading upon or against the structure. Trucks and machinery used for grading shall not be allowed within 45 degrees above the bottom of the footings or grade beams.
- B. The trenches shall be backfilled following visual inspection by the Engineer and prior to pressure testing. The trenches shall be carefully backfilled with the excavated materials approved for backfilling, or other suitable materials, free from large clods of earth or stones. Each layer shall be compacted to a density at least equal to that of the surrounding earth and in such a manner as to permit the rolling and compaction of the filled trench with the adjoining earth to provide the required bearing value, so that paving, if required, can proceed immediately after backfilling is completed.

3.06 COMPACTION

- A. Suitable material as hereinbefore specified shall be placed in maximum 8" horizontal layers. Compaction shall be performed by rolling with approved tamping rollers, pneumatic-tired rollers, three wheel power rollers or other approved equipment. The degree of compaction required is expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D-698. Laboratory moisture density tests shall be performed on all fill material. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction. Compaction requirements shall be as specified below:

Fill Utilized For	Required Density (%)	Maximum Permissible Lift Thickness As Compacted, Inches
Backfill & Utility Trenches Under Foundations & Pavements	95-100	8
Backfill Around Structures	95-100	8
Field and Utility Trench Backfill Under Sidewalks and Open Areas	90-100	8

- B. Field density tests shall be performed in sufficient number to insure that the specified density is being obtained. Tests shall be in accordance with ASTM Standards D 1556 or D 2922/D 3017 and shall be performed as authorized by the Engineer. Payment for field density tests shall be by the Contractor. Contractor shall provide suitable notification for coordination of testing. Delays due to the lack of adequate advance notification shall be the responsibility of the Contractor.

3.07 SITE GRADING

- A. Where indicated or directed, topsoil shall be removed without contamination with subsoil and spread on areas already graded and prepared for topsoil, or transported and stockpiled convenient to areas for later application, or at locations specified. Topsoil shall be stripped to full depth and, when stored, shall be kept separate from other excavated materials and piled free of roots, stones, and other undesirable materials.
- B. Following stripping, fill areas shall be scarified to a minimum depth of six (6) inches to provide bond between existing ground and the fill material. Material should be placed in successive horizontal layers not exceeding twelve (12) inches uncompacted thickness. In general, layers shall be placed approximately parallel to the finished grade line.
- C. In general and unless otherwise specified, the Contractor may use any type of earth moving equipment he has at his disposal, provided such equipment is in satisfactory condition and of such type and capacity that the work may be accomplished properly and the grading schedule maintained. During construction, the Contractor shall route equipment at all times, both when loaded and empty, over the layers as they are placed, and shall distribute the travel evenly over the entire area.
- D. The material in the layers shall be of the proper moisture content before rolling or tamping to obtain the prescribed compaction. Wetting or drying throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the fill thus affected shall be delayed until the material has dried to the required moisture content. If the material is too dry, it shall be sprinkled with water and manipulated to obtain the uniform moisture content required throughout a layer before it is compacted.
- E. Each layer of the fill shall be compacted by rolling or tamping to the standard specified in Paragraph 3.06 and not less than 90% maximum density at optimum moisture content as determined by field density tests made by the Standard Proctor method. In general and unless otherwise specified, the Contractor may use any type of compaction equipment such as sheepfoot rollers, pneumatic rollers, smooth rollers and other such equipment he has at his disposal, provided such equipment is in satisfactory condition and is of such design, type, size, weight, and quantity to obtain the required density in the embankment. If at any time the required density is not being obtained with the equipment then in use by

the Contractor, the Engineer may require that different and/or additional compaction equipment be obtained and placed in use at once to obtain the required compaction.

- F. The Contractor shall be responsible for the stability of all embankments and shall repair any portion which, in the opinion of the Engineer, has become displaced due to carelessness or negligence on the part of the Contractor.

3.08 TOPSOIL

- A. Provide all labor, materials, equipment and services required for furnishing and placing topsoil. Samples of topsoil shall be submitted to the Engineer for review before topsoil is placed. The material shall be good quality loam and shall be fertile, friable, mellow; free from stones larger than one (1) inch, excessive gravel, junk metal, glass, wood, plastic articles, roots and shall have a liberal amount of organic matter. Light sand loam or heavy clay loam will not be acceptable.
- B. The topsoil shall be 3 inches thick in all areas to be seeded. No topsoil shall be placed until the area to be covered is excavated or filled to the required grade. Imported backfill material will be stockpiled on site for structure backfilling and top soiling.

END OF SECTION

ION 02372 - LFUCG EROSION AND SEDIMENTATION CONTROL-KPDES
REQUIREMENTS

ART 1 - GENERAL

SCOPE OF WORK

- A. Furnish all labor, materials, and equipment required for erecting, maintaining and removing temporary erosion and sedimentation controls as shown on the Drawings and as specified herein and as recommended by state and local regulatory agencies.
- B. The contractor shall at all times minimize disturbance and the period of time that the disturbed area is exposed without stabilization practices. In "critical areas" (within 25 feet of a stream) erosion prevention measures such as erosion control mats/blankets, mulch, or straw blown in and stabilized with tackifiers or by treading, etc shall be implemented on disturbed areas within 24 hours or "as soon as practical" after completion of disturbance/grading or following cessation of activities.
- C. Temporary erosion controls include, but are not limited to grassing, mulching, seeding, providing erosion control and turf reinforcement mats on all disturbed surfaces including waste area surfaces and stockpile and borrow area surfaces; scheduling work to minimize erosion and providing interceptor ditches at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.
- D. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances on sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.
- E. Contractor is responsible for providing and maintaining effective temporary erosion and sediment control measures prior to and during construction or until final controls become effective.
- F. The Contractor shall be responsible for placement of erosion and sedimentation controls. Prior to construction, the Contractor shall develop a Stormwater Pollution Prevention Plan per state regulations. Prior to excavation, fill or grade work, the Contractor shall place controls in locations required by the plan. If during the course of construction, the state and/or local regulatory agency determines additional controls are required, the Contractor shall furnish, install and maintain additional mulching, blankets and/or sediment barriers to control erosion and sedimentation to the satisfaction of the regulatory agency.
- G. The Contractor shall inspect and repair all erosion and sedimentation controls every seven (7) days and after each rainfall of 0.5 inch or greater.
- H. Bare soil areas must be seeded, mulched, or covered after 14 days if no work will be done in the area within the next 7 days. **If areas are to be left bare for more than 14 days, erosion controls and sediment barriers are required to be installed.**
- I. **Erosion Control prevention measures shall be installed prior to removal of vegetation and/or stripping of topsoil.**

- J. The Contractor is responsible for preparing and submitting the Notice of Intent attachments and obtaining permit approval prior to the beginning of any construction activities.

1.02 PERMITS AND NOTIFICATION REQUIREMENTS

- A. The Contractor shall submit a Notice of Intent Specifically for Construction Activities (NOI-SWCA) before beginning any site disturbance, and shall implement erosion control measures as may be required by state, local and federal agencies. Contractor shall submit a signed Notice of Intent form and required attachments to the Division of Water at least seven (7) days, if an electronic submittal or thirty (30) days if a written submittal, prior to beginning of construction activity. See Paragraph 3.07 in this section for detailed requirements.
- B. A grading permit shall be required from the Lexington-Fayette Urban County Government.
- C. The Contractor shall comply with all additional requirements of the local regulatory agency. It is the Contractor's responsibility to provide evidence to the Owner that all permits have been obtained prior to initiation of construction.

1.03 RELATED WORK

- A. Dewatering is included in this Division, Section 02240.
- B. Final erosion protection measures where required are included in this Section.
- C. Utility Line Stream Crossings – Division 2.

PART 2 – PRODUCTS

2.01 SEED

- A. The seed mixture to be sown shall be in the following proportions:

<u>Common Name</u>	<u>Proportion By Weight</u>	<u>% of Purity</u>	<u>% of Germination</u>
Kentucky 31 Tall Fescue	75	90	85
Italian Rye Grass	10	90	85
Red Top	10	90	85
White Clover	5	95	90

- B. All seed shall be fresh and clean and shall be delivered mixed, in unopened packages, bearing a guaranteed analysis of the seed mixture.
- C. Seed for temporary stabilization shall be annual rye grass, oats or wheat.

FERTILIZER

- A. Just prior to the planting of turf, evenly broadcast 15 pounds per thousand square feet of fertilizer, 10-10-10 (nitrogen, phosphorus, potassium). Disc or harrow fertilizer 2 to 4 inches into the soil.
- B. Fertilizer shall be delivered to the site in the original unopened container bearing the manufacturer's guarantee analysis. Any fertilizer that becomes caked or damaged making it unsuitable for use, will not be accepted.

2.03 SOD

- A. Sod shall be at least 70% Bluegrass, strongly rooted and free of weeds.
- B. It shall be mowed to a height not to exceed 3" before lifting, and shall be of uniform thickness with ½" to 1- ½" of soil.

2.04 MULCH

- A. Mulch for seeded areas shall be Conwed Hydro Mulch, Silva-Fiber, or equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment. The moisture content shall be 9-15%, and mulch shall have an organic matter content of minimum 98%.
- B. Clean straw is acceptable as mulch. It shall be spread at the rate of one (1) bale per 1,000 feet (approximately 2" loose depth).
- C. Mulch on slopes greater the 4:1 shall be held in place with erosion control netting.
- D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with erosion control netting.

2.05 EROSION CONTROL BLANKETS

- A. Erosion Control Blanket shall be made up of biodegradable and/or photodegradable products such as jute, wood fiber, coconut fiber, straw and degradable plastic netting. They shall degrade at a rate of approximately 6 months to 24 months.
- B. Erosion Control Blanket shall be installed on slopes greater than 4:1 and in all ditches and drainage channels, and where otherwise indicated on the Contract Drawings or directed by regulatory agencies.

2.06 TURF REINFORCEMENT MAT

- A. Where indicated on the Contract Drawings or as described in the Specifications, Turf Reinforcement Mat shall be installed for permanent erosion control.

- B. Turf Reinforcement Mat shall consist of top and bottom heavy weight netting on a biodegradable matrix such as coconut fiber or aspen curled wood excelsior.
- C. Where slope and hydraulic conditions are severe, a synthetic matrix may be used, based on manufacturer's recommendations.

2.07 SILT FENCE

- A. Temporary Silt Fence shall consist of woven geotextile fabric attached to 2" X 2" X 48" tall hardwood stakes.
 - 1. Fabric shall be 48" tall, with top being even with top of stakes. Bottom 12" shall be buried in trench as shown on the Detail Drawings.
 - 2. Stakes shall be at 6' centers unless stated otherwise on Contract Documents.
- B. Temporary Reinforced Silt Fence
 - 1. For areas of steep slopes and high flows, where indicated on the Contract Drawings, or as directed by state or local regulations, Reinforced Silt Fence shall be installed.
 - 2. Fabric shall be woven monofilament geotextile attached to 11 gauge steel fencing of 2" X 4" grid.
 - 3. Stakes shall be 5" tall steel and shall be installed on 4' centers.
 - 4. Fabric and fencing shall be buried in trench as shown on the Detail Drawings.
- C. Spacing of Silt Fences on slopes shall be according to the following table, or as directed by state or local regulatory agencies:

Slope Angle	Soil Type		
	Silty	Clays	Sandy
Very Steep (1:1)	50 ft.	75 ft.	100 ft.
Steep (2:1)	75 ft.	100 ft.	125 ft.
Moderate (4:1)	100 ft.	125 ft.	150 ft.
Slight (10:1)	125 ft.	150 ft.	200 ft.

- D. If runoff flows along the uphill side of the silt fence, Contractor shall install "J-hooks" every 40 to 80 feet. These are curved sections of silt fence above the continuous fence that serve as small dams to stop and hold the flow to allow sediment to settle.

2.08 FIBER ROLLS

- A. On long slopes less than 10:1, and where indicated on the Contract Drawings or recommended by the regulatory agency, Fiber Rolls shall be installed.

- B. Fiber Rolls shall be made of wood shavings, coconut fiber or other similar material encased in heavy duty netting.
- C. Wooden stakes at 4'-0" on center shall be used to anchor the Fiber Rolls along the contours of the slope.

AGGREGATE SILT CHECKS

- A. Where needed to slow flow velocity, to cause ponding or to protect storm water inlet structures, Aggregate Silt Checks shall be installed.
- B. Aggregate Silt Checks shall consist of rock of various sizes ranging from 2" to 6" contained in or placed on geotextile filter fabric. Pea-stone or gravel-filled bags are acceptable for temporary silt checks in low-flow conditions.

2.10 RIP RAP

- A. Rip Rap shall be installed at the outlets of storm drains and on channel banks as noted on the Contract Drawings and/or recommended by state and local regulatory agencies.
- B. Rip Rap shall have no less than 80%, by volume, of individual stones that range in size from 0.0247 to 1.483 cubic feet.

2.11 CONSTRUCTION ENTRANCE PAD

- A. Contractor shall construct entrance pads at all locations where vehicles will enter or exit the site.
- B. Pad shall be a minimum of 20 feet wide, 50 feet long and 6" thick, and consist of No. 2 stone laid on top of filter fabric.

PART 3 - EXECUTION

3.01 GENERAL

- A. Erosion and sediment control practices shall be consistent with the requirements of the state and local regulatory agencies and in any case shall be adequate to prevent erosion of disturbed and/or regraded areas.
- B. Contractor is responsible for notifying the state regulatory agency concerning inclusion under the KPDES General Permit for Storm Water Discharges From Construction Activities.
- C. Gravity sewer lines, force mains and water lines that cross streams shall be constructed by methods that maintain normal stream flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to reentering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the line excavation shall not be allowed to enter the flowing portion of the stream. The provisions of this condition shall apply to all types of utility line stream crossings.

F. The following table is a guide to schedule seeding and mulching:

Stabilization Practice	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEPT	OCT	NOV
Permanent Seeding			A								
Dormant Seeding	B										B
Temporary Seeding			G					D			
Sodding			F								
Mulching	G										

— Seed and Mulch:

A = Fescue, Clover, Ryegrass Mixture: 160 lbs/acres or 4 lbs/1,000 s.f. plus 2 tons mulch per acre

B = Fescue, Clover, Ryegrass Mixture: 160 lbs/acres or 4 lbs/1,000 s.f. plus 2 tons mulch per acre

C = Oats: 120 lbs/acre

D = Wheat or Rye: 120 lbs/acre

E = Perennial Ryegrass: 40 lbs/acre or 1 lb/1,000 s.f.

F = Install Sod

G = Mulch 2 tons per acre

■ Irrigation Needed: May through August and October and two to three weeks after installing sod in March or April

3.03 SOD

- A. To install, bring soil to final grade and clear of trash, wood, rock, and other debris. Apply topsoil, fertilizer at approximately 1000 lbs per acre.
- B. Use sod within 36 hours of cutting. Lay sod in straight lines. Butt joints tightly, but do not overlap joints or stretch sod. Stagger joints in adjacent rows in a brickwork type pattern. Use torn or uneven pieces on the end of the row.
- C. Notch into existing grass. Anchor sod with pins or stakes if placed on slopes greater than 3:1. Roll or tamp sod after installation and water immediately. Soak to a depth of 4 to 6 inches. Replace sod that grows poorly. Do not cut or lay sod in extremely wet or cold weather. Do not mow regularly until sod is well established.

3.04 INSTALLATION OF EROSION AND SEDIMENT CONTROL DEVICES

- A. All erosion and sediment control products and materials shall be installed per manufacturer's recommendations and in accordance with the Kentucky Erosion Prevention and Sediment Control Field Guide.
- B. Contractor shall pay special attention to the trenching-in of the bottoms of silt fence, the staking of sediment barriers, and the stapling of erosion control blankets.

05

MAINTENANCE OF EROSION AND SEDIMENT CONTROL DEVICES

- A. Erosion and sedimentation controls shall be inspected weekly and after rain events of 0.5 inch or greater. Replace silt fencing as needed, filter stone which is dislodged, erosion control blanket which is damaged, and make other necessary repairs.
- B. Remove sediment from fences and barriers when it accumulates to half the height of the barrier, or more often as needed.

3.06 CLEAN UP

- A. Upon completion of the project and/or establishment of satisfactory turf, vegetation or permanent erosion control structures, Contractor shall remove all temporary devices and properly dispose of such.

3.07 KPDES GENERAL PERMIT FOR STORM WATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

- A. The Contractor is responsible for filing the appropriate Notice of Intent (NOI-SWCA) letter at least seven (7) days prior to start of construction activity for an electronic submittal, and at least thirty (30) days prior to start for a paper submittal. The Notice of Intent (NOI) is a Kentucky Pollution Discharge Elimination System (KPDES) permit application as provided by the Kentucky Revised Statutes, Chapter 224. This application is required to be submitted for construction projects that disturb one or more acres of land. A permit application form is included at the end of this section.
- B. The NOI requires the inclusion of the descriptions of (but is not limited to) the following items:
 - 1. Names and designated uses of any receiving waters
 - 2. Anticipated number and locations of discharge points
 - 3. Identification of planned construction in or along a water body

A Topographic map showing project boundaries, areas to be disturbed, locations of anticipated discharge points and receiving waters is also required to be submitted with the NOI.

- C. If the construction site is near a designated "High Quality/Impaired Waters" or a "Cold Water Aquatic Habitat Waters, Exceptional Waters, Outstanding National/State Resource Waters", additional items and/or individual permits will be required.
- D. The NOI form requires an SIC code. The link to the SIC codes is <http://www.osha.gov/pls/imis/sicsearch.html>. The following are the typical construction SIC codes utilized:
 - 1542 – Building Construction, nonresidential, except industrial and warehouses
 - 1623 – Water Main Construction, Sewer Construction
 - 1629 – Water and Wastewater Treatment Plant Construction
 - 1711 – Water Pump Installation
 - 1781 – Drilling Water Wells

- E. The Contractor is responsible for developing, implementing and continuously updating the Stormwater Pollution Prevention Plan (SWPPP) before commencement of any site disturbance. The SWPPP should include erosion prevention measures and sediment control measures which are installed and maintained to minimize discharges of sediment and other pollutants from a 2-year, 24-hour storm event. The SWPPP must be kept at the site and available for review by State officials, and must be updated as necessary throughout the course of the construction project.
- F. A description of procedures to maintain erosion and sediment control measures during the period of construction.
- G. The identification of each contractor and subcontractor who will install each SWPPP erosion and sediment control measure.
- H. The signing by each contractor and subcontractor of a statement certifying the awareness of the requirements of the KPDES Stormwater Permit for the site.
- I. The Contractor should receive notification from the Kentucky Division of Water of permit coverage within seven (7) days of an electronic submittal, and thirty (30) days of a paper submittal. At that time, site disturbance is considered permitted by the Kentucky Division of Water.
- J. The inspection by qualified personnel, provided by the Contractor, of the site at least once every seven calendar days and within 24 hours of the end of a storm of 0.5" or greater. The Contractor is responsible for completing and maintaining the required Self-Inspection Forms. A sample is included at the end of this specification section.
- K. Upon completion of the project and establishment of all permanent erosion and sediment control structures and devices, the Contractor shall submit the Notice of Termination (NOT) form to the Division of Water. This form is included at the end of this specification section.
- L. All subcontractors are required to comply with the requirements of the Permit and the Stormwater Pollution Prevention Plan (SWPPP).
- M. Where to submit:
 - a. Submit Notice of Intent (NOI) Form to: Operational Permits Section, SWP Branch, Division of Water, 200 Fair Oaks Lane, Frankfort, Kentucky 40601.
 - b. For an electronic submittal, go to:
<https://dep.gateway.ky.gov/eForms/Default.aspx?FormID=3>
 - c. Do not initiate work until receiving approval for the Kentucky Division of Water.
 - d. A complete copy of the NOI submittal shall also be provided to:

Division of Engineering
 Lexington-Fayette Urban County Government
 101 E. Vine St.
 4th Floor

3.08 LFUCG GRADING PERMIT

A. The Contractor shall obtain a grading permit from the LFUCG Division of Engineering, after the LFUCG Division of Engineering accepts the Stormwater Pollution Prevention Plan (SWPPP). The site grading plan shall show the original and finish grade contours. The grading plan shall be in conformance with the SWPPP.

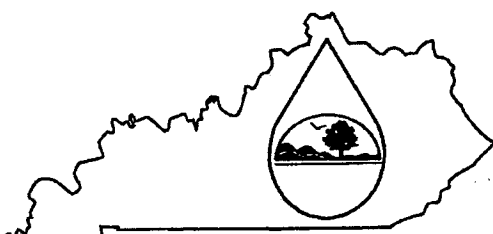
B. Where to obtain:

Division of Engineering
Lexington-Fayette Urban County Government
101 E. Vine St.
4th Floor
Lexington, KY 40507
(859) 258-3410
Att: Grading Permit Section

C. The LFUCG shall inspect site for compliance to the SWPPP prior to issuing a Grading Permit. All BMP's shall be in place prior to approval.

D. All excess earthen/rock materials hauled off the site to a location in Fayette County must be hauled to a site permitted by the Kentucky Division of Water and the LFUCG. The haul site must be permitted in accordance with these specifications.

FORM NOI-SWCA

	<p>KENTUCKY POLLUTION DISCHARGE ELIMINATION SYSTEM (KPDES)</p> <p>Notice of Intent (NOI) for coverage of Storm Water Discharges Associated with Construction Activities Under the KPDES Storm Water General Permit KYR100000</p>
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This is an application for:

New construction activity.

Modification of coverage for additional area in same watershed.

Modification of coverage for additional area in different watershed.

If Modification is checked, state reason for Modification:

For Agency Use	Permit No. (Leave Blank)	K	Y	R	1	0				
For Agency Use	AI ID (Leave Blank)									

SECTION I – FACILITY OPERATOR INFORMATION

Operator Name(s)*:	Phone:*
Mailing Address:*	Status of Owner/Operator: <input type="checkbox"/> Private <input type="checkbox"/> State <input type="checkbox"/> Federal <input type="checkbox"/> Public (other than state or federal)
City:*	State:* Zip Code:*

SECTION II – FACILITY/SITE LOCATION INFORMATION

Name of Project:*	Physical Address:*	City:*
State:*	Zip Code:*	County:*
Latitude (decimal degrees):*	Longitude (decimal degrees):*	SIC Code:*

SECTION III – SITE ACTIVITY INFORMATION

For single projects provide the following information

Total Number of acres in project:*	Total Number of acres to be disturbed:*	Start date:	Completion date:
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For common plans of development projects provide the following information

Total Number of acres in project:*	Number of individual lots in development:	Number of lots to be developed:
Total acreage intended to be disturbed:*		Number of acres intended to be disturbed at any one time:
Start date:	Completion date:	List Contractors:

SECTION IV – DISCHARGE TO A WATER BODY

Name of Receiving Water:*	Anticipated number of discharge points:
Location of anticipated discharge points: Latitude (decimal degrees):*	Longitude (decimal degrees):*
Receiving Water Body Stream Use Designation	<input type="checkbox"/> Cold Water Aquatic Habitat <input type="checkbox"/> Domestic Water Supply <input type="checkbox"/> Outstanding State Resource Water <input type="checkbox"/> Secondary Contact Recreation <input type="checkbox"/> Primary Contact Recreation <input type="checkbox"/> Warm Water Aquatic Habitat
Antidegradation Categorization	<input type="checkbox"/> Outstanding National Resource Water <input type="checkbox"/> Exceptional Water <input type="checkbox"/> High Quality Water <input type="checkbox"/> Impaired Water
Name of Receiving Water:*	Anticipated number of discharge points:
Location of anticipated discharge points: Latitude (decimal degrees):*	Longitude (decimal degrees):*
Receiving Water Body Stream Use Designation	<input type="checkbox"/> Cold Water Aquatic Habitat <input type="checkbox"/> Domestic Water Supply <input type="checkbox"/> Outstanding State Resource Water <input type="checkbox"/> Secondary Contact Recreation <input type="checkbox"/> Primary Contact Recreation <input type="checkbox"/> Warm Water Aquatic Habitat
Antidegradation Categorization	<input type="checkbox"/> Outstanding National Resource Water <input type="checkbox"/> Exceptional Water <input type="checkbox"/> High Quality Water <input type="checkbox"/> Impaired Water

FORM NOI-SWCA

SECTION V – DISCHARGE TO AN MS4

Name of MS4:	Date of application /notification to the MS4 for construction site coverage.
Number of discharge points:	Location of each discharge point: Latitude (decimal degrees):* Longitude (decimal degrees):*

SECTION VI – CONSTRUCTION ACTIVITIES IN OR ALONG A WATER BODY

Will the project require construction activities in a water body or the riparian zone: <input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, describe scope of activity:	
Is a Clean Water Act 404 permit required: <input type="checkbox"/> Yes <input type="checkbox"/> No	Is a Clean Water Act 401 Water Quality Certification required: <input type="checkbox"/> Yes <input type="checkbox"/> No

SECTION VII – NOI PREPARER INFORMATION

First Name:*	Last Name:*	Phone :*	eMail Address:*
Mailing Address:*	City:*	State:*	Zip Code:*

SECTION VIII – ATTACHMENTS

Attach a full size color USGS 7½-minute quadrangle map with the facility site clearly marked. USGS maps may be obtained from the University of Kentucky, Mines and Minerals Bldg. Room 106, Lexington, Kentucky 40506. Phone number (859) 257-3896.

SECTION IX – CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature:*	First Name:*	Last Name:*
Phone:*	eMail Address:	Date:*

This completed application form and attachments should be sent to: SWP Branch, Division of Water, 200 Fair Oaks, Frankfort, Kentucky 40601. Questions should be directed to: SWP Branch, Operational Permits Section at (502) 564-3410.

KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM FORM NOI-SWCA – INSTRUCTIONS

WHO MUST FILE A NOTICE OF INTENT (NOI) FORM

Federal law at 40 CFR Part 122 prohibits point source discharges of stormwater associated with industrial activity to a water body of the Commonwealth of Kentucky without a Kentucky Pollutant Discharge Elimination System (KPDES) permit. The operator of an industrial activity that has such a discharge must submit a NOI to obtain coverage under the KPDES Storm Water General Permit. If you have questions about whether you need a permit under the KPDES Storm Water program, or if you need information as to whether a particular program is administered by the state agency, call the Storm Water Contact, Operational Permits Section, Kentucky Division of Water at (502) 564-3410.

WHERE TO FILE NOI FORM

NOIs must be sent to the following address or submitted in on-line at <https://dep.gateway.ky.gov/eForms/Default.aspx?FormID=3>:

Operational Permits Section
SWP Branch, Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601

Electronic NOI-SWCAs are to be submitted a minimum of seven (7) working days prior to commencement of construction related activities. Paper NOI-SWCAs are to be submitted a minimum of thirty (30) working days prior to commencement of construction related activities.

COMPLETING THE FORM

Enter information in the appropriate areas only. (*) denotes a required field. Enter N/A (Not Applicable) for fields that are required but do not apply to your submission. If you have any questions regarding the completion of this form call the Storm Water Contact, Operational Permits Section, at (502) 564-3410.

SECTION I – FACILITY OPERATOR INFORMATION

Operator Name(s): Enter the name or names of all operators applying for coverage under KYR10 using this NOI.
Mailing Address, City, State, and Zip Code: Provide the mailing address of the primary operator
Phone No.: Provide the telephone numbers of the person who is responsible for the operation.
Status of Owner/Operator: Select the appropriate legal status of the operator of the facility from the dropdown list.

Federal
Public (other than federal or state)
State
Private

SECTION II – FACILITY/SITE LOCATION INFORMATION

Name of Project: Provide the name of the project.
Physical Address, City, State, Zip Code and County: Provide the physical address of the project.
Latitude/Longitude: Provide the general site latitude and longitude of the operation.
SIC Code: Enter the Standard Industrial Code for the project

SECTION III – SITE ACTIVITY INFORMATION

For single projects provide the following information:

Total number of acres in project: Indicate the total acreage of the project including both disturbed and undisturbed areas.
Total number of acres to be disturbed: Indicate the total number of acres of the project to be disturbed.
Anticipated start date: Indicate the approximate date of when construction activities will begin.
Anticipated completion date: Indicated the approximate date of when final stabilization will be achieved.

For common plans of development provide the following information:

Total number of acres in project: Indicate the total acreage of the project including both disturbed and undisturbed areas.
Number of individual lots in development, if applicable: Indicate the number of individual lots or unit in the common plan of development
Number of lots to be developed: Indicate the number of lots that you intend to develop.
Total acreage of lots intended to develop: Indicate the total acreage of the lots you intend to develop
Total acreage intended to disturb: Indicate the total acreage of the lots you intend to disturb
Number of acres intended to disturb at any one time: Indicate the maximum number of acres to be disturbed at any one time.
Anticipated start date: Indicate the approximate date of when construction activities will begin.
Anticipated completion date: Indicated the approximate date of when final stabilization will be achieved.
List of contractors: Provide the names of all known contractors that will be working on site.

**KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM
FORM NOI-SWCA - INSTRUCTIONS**

SECTION IV - IF THE PERMITTED SITE DISCHARGES TO A WATER BODY THE FOLLOWING INFORMATION IS REQUIRED

Name of Receiving Water: Provide the names of the each water body receiving discharges from the site. Provide only official USGS names do not provide local names

Anticipated number of discharge points: Indicate the number of discharge points to each receiving water body.

Location of anticipated discharge points: Provide the latitude and longitude of each discharge point. Add points as necessary.

Receiving Water Body Stream Use Designation: Check all appropriate boxes

Antidegradation Categorization: Select from the drop down box one of the following:

Outstanding National Resource Water

Exceptional Water

High Quality Water

Impaired Water

SECTION V - IF THE PERMITTED SITE DISCHARGES TO A MS4 THE FOLLOWING INFORMATION IS REQUIRED

Name of MS4: Provide the name of the MS4 to which the activity will discharge

Number of discharge points to the MS4: Indicate the number of discharge points

Location of each discharge point: Provide the latitude and longitude of each discharge point. Add points as necessary

Date of application/notification to the MS4 for construction site permit coverage: Indicate the date the MS4 has or will be notified.

SECTION VI - CONSTRUCTION ACTIVITIES IN OR ALONG A WATER BODY

Will the project require construction activities in a water body or the riparian zone: Select Yes or No from the drop down box.

If Yes, describe scope of activity: Provide a brief description of the activity (ies) that will take place in the water body or the riparian zone.

Is a Clean Water Act 404 permit required: Select Yes or No from the drop down box.

Is a Clean Water Act 401 Water Quality Certification required: Select Yes or No from the drop down box.

SECTION VII - NOI PREPARER INFORMATION

Provide the name, mailing address, telephone number and eMail address of the person preparing the NOI.

SECTION VIII - Attachments

Attach a USGS topographic map indicating the location of the activity and the proposed discharge points.

SECTION IX - CERTIFICATION

Provide the name, mailing address, telephone number and eMail address of the person who is responsible for the activity

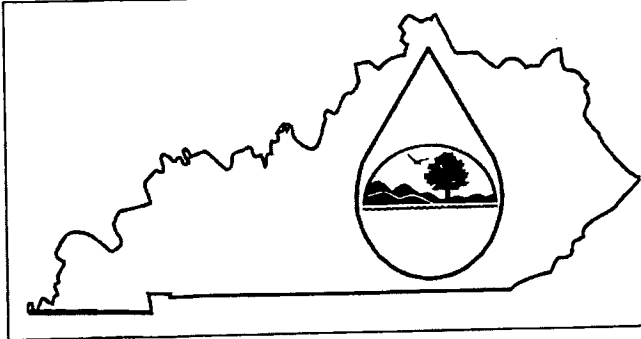
Signature: Provide full name of the responsibility party. This will constitute a signature.

The NOI must be signed as follows:

Corporation: by a principal executive officer of at least the level of vice president

Partnership or sole proprietorship: by a general partner or the proprietor respectively

KPDES FORM NOT-SW



Kentucky Pollutant Discharge
Elimination System (KPDES)

NOTICE OF TERMINATION
of Coverage Under the KPDES
General Permit for Storm Water
Discharges Associated with
Industrial Activity

Submission of this Notice of Termination constitutes notice that the party identified in Section II of this form is no longer authorized to discharge storm water associated with industrial activity under the KPDES program.

ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.
(Please see instructions on back before completing this form.)

I. PERMIT INFORMATION
KPDES Storm Water General Permit Number:
Check here if you are no longer the Operator of the Facility: <input type="checkbox"/>
Check here if the Storm Water Discharge is Being Terminated: <input type="checkbox"/>
II. FACILITY OPERATOR INFORMATION
Name:
Address:
City/State/Zip Code:
Telephone Number:
III. FACILITY/SITE LOCATION INFORMATION
Name:
Address:
City/State/Zip Code:

Certification: I certify under penalty of law that all storm water discharges associated with industrial activity from the identified facility that are authorized by a KPDES general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with industrial activity under this general permit, and that discharging pollutants in storm water associated with industrial activity of waters of the Commonwealth is unlawful under the Clean Water Act and Kentucky Regulations where the discharge is not authorized by a KPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Kentucky Revised Statutes.

NAME (Print or Type)	TITLE
SIGNATURE	DATE

Revised June 1999

INSTRUCTIONS
NOTICE OF TERMINATION (NOT) OF COVERAGE UNDER THE KPDES GENERAL PERMIT
FOR STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY

When to File a Notice of Termination (NOT) Form

Facilities who are presently covered under the Kentucky Pollutant Discharge Elimination System (KPDES) General Permit for Storm Water Discharges associated with Industrial Activity may submit a Notice of Termination (NOT) form when their facilities no longer have any storm water discharges associated with industrial activity as defined in the storm water regulations at 40 CFR 122.26 (b)(14), or when they are no longer the operator of the facilities.

Final stabilization measures, elimination of all storm water discharges associated with industrial activity occurs when disturbed soils at the construction site have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that storm water discharges associated with industrial activity from the construction site that are authorized by a KPDES general permit have otherwise been eliminated. Final stabilization means that all soil-disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

Where to File NOT Form

Send this form to the following address:

Section Supervisor
Inventory & Data Management Section
KPDES Branch, Division of Water
14 Reilly Road, Frankfort Office Park
Frankfort, KY 40601

Completing the Form

Type or print legibly in the appropriate areas and according to the instructions given for each section. If you have questions about this form, call the Storm Water Contact, Industrial Section, at (502) 564-3410.

Section I - Permit Information

Enter the existing KPDES Storm Water General Permit number assigned to the facility or site identified in Section III. If you do not know the permit number, call the Storm Water Contact, Industrial Section at (502) 564-3410.

Indicate your reason for submitting this Notice of Termination by checking the appropriate box:

If there has been a change of operator and you are no longer the operator of the facility or site identified in Section III, check the corresponding box.

If all storm water discharges at the facility or site identified in Section III have been terminated, check the corresponding box.

Section II - Facility Operator Information

Give the legal name of the person, firm, public organization, or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity which controls the facility's operation, rather than the plant or site manager. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Section III - Facility/Site Location Information

Enter the facility's or site's official or legal name and complete address, including city, state and ZIP code. If the facility lacks a street address, indicate the state, the latitude and longitude of the facility to the nearest 15 seconds, or the quarter, section, township, and range (to the nearest quarter section) of the approximate center of the site.

Section IV - Certification

Federal statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, State, Federal, or other public facility: by either a principal executive

Revised June 1999

KENTUCKY CONSTRUCTION SITE INSPECTION REPORT

Utility Line Project

KENTUCKY EROSION AND SEDIMENT CONTROL PERMIT COMPLIANCE INSPECTION REPORT

General Site Information:

Company:	County:
Site:	Date:

Permit Compliance Information:

	Yes	No
Copy Of Permit kept on site		
Copy of Best Management Practices (BMP) Plan kept on site		
Site specific description of project timing/phasing and implementation		
Adequate site map showing:		
• Drainage patterns indicated on plan		
• Receiving waters (stream, river, lake, wetland, etc.) named		
• Approximate slopes after major grading		
• Area of soil disturbance		
• Undisturbed areas and vegetative buffer zones		
• Location of structural and non-structural controls (BMPs)		
• Areas where stabilization practices are to be employed		
• Storm water discharge locations		

Specific Site Information:

Name of receiving stream:	
Total area of site:	
Area disturbed:	

Inspection Results:

Inspection Criteria:	S	M	U
Satisfactory, Marginal, Unsatisfactory			
Condition of receiving stream is BMP Plan adequately implemented?			
Timely seedling and mulching			
• Revegetation on cut/fill/cleared areas			
• Condition of slope areas			
Structural Controls			
• Drainage ditch protection/liners installed			
• Inlet protection for curb drains, etc.			
• Outlet protection – no erosion or scour			
• Silt fences below bare soil areas			
• Rock check dams in ditches			
• Sediment traps/ponds maintained			
• Other controls			

Other Controls			
• Secondary containment for fuel; maintenance area designated			
• Proper disposal of concrete wastes; wash in designated area			
• Other (non-storm water discharge, etc.)			
• Off-site tracking of sediment prevented			
Compliance with State and Local Regulations			
• Waste, fertilizer, paint, pesticide/herbicide storage and disposal			
• Proper sewage management			
Operation and Maintenance of BMPs			
• Maintenance plan incorporated into written BMP Plan			
• Maintenance plan followed			
• Maintenance documented			
• Inspections done as required and documented			
• Inspection reports completed and maintained on site, in file			
Contractor Certification on File			
Plan Certification on File			

Comments:

Inspector's Signature

Kentucky Best Management Practices Plan • Construction Site Inspection Report

Company:	Site:	County:
Site Operator:		Date:
Receiving Water:	Total Site Area (acres):	# Disturbed Acres:
Inspector Name:	Inspector Qualifications:	
Inspection Type: Weekly or ½ Inch Rain	Days Since Last Rainfall _____	# Inches of Last Rainfall: _____

Field Inspection Observations

BMP Category	Compliance			Field Indicators for Compliance
	Yes	No	N/A	
Project Operations				Notice of Intent (KPDES permit) and other local/state permits on file BMP Plan on site and available for review Project timing/schedule and activities following BMP Plan Weekly inspection and rain-event reports on BMPs available for review Diversions, silt checks/traps/basins, and silt fences/barriers installed prior to clearing Grading and clearing conducted in phases to minimize exposed soil areas No vegetation removal or operations in stream or sinkhole buffer area (25-50 ft min) Rock pad in place on all construction site exits leading to paved roads No sediment, mud, or rock on paved public roads in project area Dust control if needed when working in residential areas during dry conditions
Drainage Management				Upland runoff diverted around bare soil areas with vegetated/lined ditches/berms Drainage channels exiting the site are lined with grass/blanket/rock and stabilized Discharges from dewatering operations cleaned in silt fence enclosure or other filter No muddy runoff leaving site after rains up to 1½ inches
Erosion Protection				Exposed soil seeded/mulched after 2 weeks if no work is planned for the next 7 days Soils on steep slopes seeded/mulched/blanketed as needed to prevent rutting
Sediment Barriers				Silt fence, rock filter, or other sediment barrier below all bare soil areas on slopes Barrier installed across slope on the contour, trenched in, posts on downhill side Multiple sediment barriers at least 125 ft apart on unseeded slopes steeper than 4:1 J-hook interceptors along silt fence where heavy muddy flows run along fencing No visible undercutting or bypassing or blowout of sediment barrier Accumulated sediment is less than halfway to the top of sediment barrier
Slope Protection				Slopes tracked, disked, or conditioned after final grade is established Slopes seeded, mulched, or blanketed within 21 days, no unmanaged rills or gullyng Heavy downslope flows controlled by lined downdrain channels or slope drain pipes No muddy runoff from slopes into streams, rivers, lakes, or wetlands
Inlet Protection				Inlet dam/device or filtration unit placed at all inlets receiving muddy flows No visible undercutting, bypassing, or blowout of inlet protection dam or device Accumulated sediment is less than halfway to the top of the inlet protection dam/device
Outlet Protection				High flow discharges have rock or other flow dissipaters of adequate sizing at outlet Culvert outlets show no visible signs of erosion/scour, bank failure, or collapse
Ditch and Channel Stabilization				No unmanaged channel bank erosion or bottom scouring visible within or below site Ditches with slopes more than 3% have check dams spaced as needed, if not grassed Ditch check dams tied in to banks, with center 4" lower than sides, and no bypassing Ditches with slopes of up to 5% are thickly seeded with grass (minimum requirement) Ditches 5% to 15% are lined with thick grass and erosion control blankets as needed Ditches 15% to 33% are lined with thick grass and matting or other approved product Ditches exceeding 33% are paved or lined with rock or other approved product

SECTION 02400 - BORING AND JACKING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to furnish and install all bored and jacked carrier pipes in encasement pipes under railroad and highway crossings as shown on the Drawings and/or specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 02300
- B. Piping: Division 2

1.03 SUBMITTALS

- A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering.
- B. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Contract Drawings and Specifications.
- C. Comply with all requirements of Section 01340.

PART 2 - PRODUCTS

2.01 CARRIER PIPE

- A. Carrier pipe shall be as specified in the applicable Division 2 section unless otherwise noted.

2.02 CASING PIPE

- A. Casing pipe shall be steel, plain end, have a minimum yield point strength of 35,000 psi and conform to ASTM A 252 Grade 2 or ASTM A 139 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be in at least 18 foot lengths. The exterior of the casing pipe shall be coated with a VOC-compliant coal tar epoxy.

- B. The diameter of the casing pipe shall be as follows:

Carrier Pipe Nominal Diameter (Inches)															
4	6	8	10	12	14	15	16	18	20	21	24	27	30	33	36
Casing Pipe Nominal Diameter (Inches)															
10	12	16	18	20	24	24	30	30	30	36	36	42	48	50	50

For carrier pipe sizes greater than 36-inches nominal diameter, the casing pipe diameter size shall be determined by the Engineer or as shown on the Contract Drawings.

- C. The wall thickness of the casing pipe shall be as follows:

Casing Pipe Nominal Diameter (Inches)								
Under 20	20 & 22	24	30	36	38	42	48	50
Casing Pipe Nominal Thickness (Inches)								
.250	.281	.312	.406	.469	.500	.562	.625	.656

However, should casing pipe thickness be specified or required on Highway or Railroad permit approval sheets, said permit thickness requirement shall govern. Permit approval sheets will be made available to the Contractor.

2.03 CASING SPACERS

- A. **Stainless Steel Casing Spacers:** Stainless steel casing spacers shall be bolt-on style with a shell made in two (2) sections of heavy T-304 stainless steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090" thick with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of heavy T-304 stainless steel. The supports shall be mig welded to the shell and all welds shall be fully passivated. Stainless steel casing spacers shall be made by Cascade Waterworks Mfg. Co., or equal.
- B. **Solid Polyethylene Casing Spacers (to be used with PVC pipe only):** Solid polyethylene casing spacers shall be bolt-on style with a shell made in two (2) sections. Carrier pipe shall be wrapped with rubber strap inside casing space to prevent slippage. All nuts and bolts are to be 18-8 stainless steel. Solid polyethylene casing spacers shall be made by Calpico Inc., Advance Products & Systems, Inc., or equal.

2.04 CASING END SEALS

- A. **Wrap-around end seals -** Wrap-around end seals shall be made of a waterproof flexible coal tar membrane reinforced with fiberglass, or synthetic rubber. The two exposed edges of the wrap-around seal shall be adhesively bonded forming a watertight seal. The ends of the wrap shall be sealed on the casing and carrier pipe by stainless steel bands. Wrap-

around end seals shall be made by Calpico Inc., Advance Products & Systems, Inc., or equal.

- B. Upon approval the by Engineer, in lieu of wrap-around end seals, each end of the casing pipe and the carrier pipe shall be wrapped with two (2) layers of roofing felt.

ART 3 - EXECUTION

01 CROSSINGS - GENERAL

- A. Where designated on the drawings, crossings beneath state maintained roads, not to be disturbed shall be accomplished by boring and jacking a casing pipe.
- B. Steel casing pipe for crossings shall be bored and/or jacked (or open cut installed where indicated on the Drawings) into place to the elevations shown on the drawings. All joints between lengths shall be solidly butt-welded with a smooth non-obstructing joint inside. The casing pipe shall be installed without bends. The carrier pipe shall be installed after the casing pipe is in place, and shall extend a minimum of two (2) feet beyond each end of the casing to facilitate making joint connections. The carrier shall be braced and centered with casing spacers within the casing pipe to preclude possible flotation. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe within the casing pipe, within two (2) feet of each side of a pipe joint, and the rest evenly spaced. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least 0.75" from the casing pipe wall at all times. Manufacturer's recommendations may govern these requirements.
- C. At each end of the casing pipe, the carrier pipe shall be sealed with casing end seals. The end seals shall extend a minimum of 12 inches in each direction from the end of the casing pipe.
- D. Wood skids are not an acceptable method of supporting the carrier pipe.

3.02 BORING AND JACKING

- A. The Contractor shall excavate his own pits, as he may deem necessary, and will set his own line and grade stakes which shall be checked by the Engineer. Permits, as required, will be furnished or obtained by the Owner, but shall be in the Contractor's hands before any excavating is commenced.
- B. The boring method shall consist of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.
1. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that there will be no unsupported excavation ahead of the pipe.
 2. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. If the obstruction cannot be removed without excavation in advance of the pipe, the pipe shall be abandoned in place and immediately filled with grout.

3. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than 2 inch. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately 1 inch, grouting or other approved methods must be used to fill such voids.
 4. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.
 5. Any method which does not have this boring arrangement will not be permitted. Contractor's boring arrangement plans and methods must be submitted to, and approved by, the Engineer.
- C. In the event an obstruction is encountered in boring which cannot be removed and it becomes necessary to withdraw the casing and commence elsewhere, the hole from which the casing is withdrawn shall be completely backfilled with coarse sand rammed in.
 - D. Insurance to be furnished by the Contractor to cover this type of work shall be adequate to meet the requirements of the Railroad and/or State or County Highway Departments. Insurance shall consist of comprehensive general liability and automobile liability insurance.
 - E. Before award of the contract, the Contractor shall furnish a statement of his experience of such work, or if inexperienced, shall advise the Owner as to whom he will sublet the work and give a statement of the experience of the subcontractor, which shall be satisfactory to the Owner.

3.03 CONTRACTOR'S RESPONSIBILITIES

- A. Obtain a copy of the Highway Encroachment Permit before beginning construction.
- B. Attend a preconstruction meeting at the construction site with the City Inspector, Highway Inspector Engineer, and Contractor being present.

END OF SECTION

SECTION 02515 - VALVES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required to furnish and install all valves shown on the Drawings and/or specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.
- B. Piping is specified in Division 2 Specification sections.

1.03 SUBMITTALS

- A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering. Comply with provisions of Section 01340.
- B. At the time of submission, the Contractor shall, in writing, call Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.
- C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Valves	X	X			X							

PART 2 - PRODUCTS

2.01 PLUG VALVES

- A. All plug valves shall be eccentric plug valves unless otherwise specified.
- B. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall be to the AWWA Standard C111-64, grooved ends per AWWA C606-87. Screwed ends shall be to the NPT standard.
- C. Valve bodies shall be flushing body type and made of ASTM A126 Class B cast iron. Valves shall be furnished with a 1/8" welded overlay seat of not less than 95% pure nickel. Seat area shall be raised, with raised surface completely covered with weld to insure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable.
- D. Plugs shall be made of ductile iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be resilient faced with neoprene or hycar, suitable for use with sewage.
- E. Valves shall have replaceable sleeve type bearings and grit seals at the upper and lower journals.
- F. Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
- G. Valve pressure ratings shall be 175 psi through 12" and 150 psi for 14" through 72". Each valve shall be given a hydrostatic and seat test with test results being certified when required by the specifications.
- H. Buried valves shall be manually operated with 2-inch square operating nuts in vertical position for use in a valve box unless otherwise indicated on the plans. Buried valves shall have extension stems that bring the 2-inch square operating nut to within 2 feet of finished grade. Each buried valve shall be supplied with a tee wrench that allows the valve to be operated with the tee handle at waist height. All valves 6-inch and larger shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft shall be stainless steel and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. All exposed nuts, bolts, washers and appurtenances shall be stainless steel.
- I. Valves and gear actuators for buried or submerged service shall have seals for all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs, washers and appurtenances shall be stainless steel.

- J. Cylinder actuators shall be equipped with a 2-inch operating nut to allow manual valve operation in case of supply failure.
- K. Valves shall provide drip tight shutoff up to the full pressure rating. Valves shall be provided with adjustable limit stops and rotate 90 degrees from fully opened to fully closed.
- L. Valves shall have rectangular port openings for throttling service, and shall open to 100% of the corresponding pipe diameter.
- M. All buried service plug valves shall have mechanical joint ends and have all exterior surfaces shop painted with two coats of Fed. Spec. TT-C-494A Asphalt Varnish.
- N. All valves and actuators shall be as manufactured by DEZURIK or approved equal.

2.02 CHECK VALVES

- A. The valve is a counterweighted, rubber seated check valve with attached cushion chamber whose function is to permit flow in only one direction, close tightly when its discharge side pressure exceeds its inlet pressure, and to close without a slam or bang.
- B. The swing check valve shall be constructed with heavy cast iron or cast steel body with a bronze or stainless steel seat ring, a non-corrosive shaft for attachment of weight and lever, and complete non-corrosive shockless chamber.
- C. It shall absolutely prevent the return of water, oil or gas back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be tight seating, and must be shockless in operation. The seat ring must be renewable.
- D. The cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be operated without any hammering action. The shock absorption shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.
- E. The valve disc shall be of cast iron or cast steel and shall be suspended from a non-corrosive shaft which will pass through a stuffing box and be connected to the cushion chamber on the outside of the valve.
- F. All material and workmanship shall be first class throughout and the purchaser reserves the right to inspect this valve before shipment.
- G. The valves will be Golden-Anderson Industries, Inc. Fig. No. 250-D, 125# or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All valves shall be installed in accordance with details on the Contract Drawings and with

the manufacturer's recommendations.

- B. All valves shall be anchored in accordance with the details on the Contract Drawings.

END OF SECTION

SECTION 02531 - SEWAGE FORCE MAINS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork: Section 02300
- B. Valves: Section 02515

1.03 SUBMITTALS

- A. Submit manufacturer's data and shop drawings for all materials and as specified herein. Comply with all requirements of Section 01340.
- B. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 01340.

1.04 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

All activities involving utility line construction covered under NATIONWIDE PERMIT # 12 shall meet the following conditions:

- A. The general Water Quality Certification is limited to the crossing of intermittent and perennial streams by utility lines.
- B. The construction of permanent or temporary access roads will impact less than 300 linear feet of intermittent and perennial streams and less than one acre of jurisdictional wetlands.
- C. Utility lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGA 7 ½ minute topographic map except where the utility line alignment crosses the stream. Utility lines that cross streams shall be constructed by methods that maintain normal stream flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the utility line excavation shall not be allowed to enter the flowing portion of the stream.
- D. The activities shall not result in any permanent changes in preconstruction elevation contours in waters or wetlands or stream dimension, pattern or profile.
- E. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.

couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

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

2.04 DETECTABLE UNDERGROUND UTILITY WARNING TAPES

- A. Detectable underground utility warning tapes which can be located from the surface by a pipe detector shall be installed directly above nonmetallic (PVC, polyethylene, concrete) pipe.
- B. The tape shall consist of a minimum thickness 0.35 mils solid aluminum foil encased in a protective inert plastic jacket that is impervious to all know alkalis, acids, chemical reagents and solvents found in the soil.
- C. The minimum overall thickness of the tape shall be 5.5 mils and the width shall not be less than 2" with a minimum unit weight of 2-1/2 pounds/1" x 1,000'. The tape shall be color coded and imprinted with the message as follows:

<u>Type of Utility</u>	<u>Color Code</u>	<u>Legends</u>
Sewer	Safety Green	Caution Buried Sewer Line Below

- D. Detectable underground tape shall be "Detect Tape" as manufactured by Allen Systems, or equal.
- E. Installation of detectable tapes shall be per manufacturer's recommendations and shall be as close to the grade as is practical for optimum protection and detectability. Allow a minimum of 18" between the tape and the line.
- F. Payment for detectable tapes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.05 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

- A. Where indicated on the Drawings, required by the specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed. Concrete shall be 3000 psi, and reinforcing bars shall be as installed as indicated on the details.

PART 3 - EXECUTION

3.01 EXCAVATION FOR PIPELINE TRENCHES

- A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ASTM-D-2321 except as modified herein.

- B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.
- C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.
- D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.
- E. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.
- F. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.
- G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.
- H. Minimum cover of 48" shall be provided for all pipelines.

3.02 PIPE BEDDING

- A. All sewer pipe shall be supported on a bed of granular material unless the trench has been prepared in accordance with Paragraph 3.01B. In no case shall pipe be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from large rock, foreign material, frozen earth, and shall be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel.

- B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.
- C. Where flexible pipe is used, the bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the pipe. Granular bedding shall be Size #9-m or ASTM C 33, Size #7 crushed stone, fine gravel, or sand, and is not a separate pay item.
- D. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.
- E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.
- F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

3.03 SPECIAL GRANULAR FILL

- A. As noted in Paragraph 3.02E, granular material for " Special Granular Fill " when directed by the Engineer shall be Department of Transportation crushed limestone, Size #9. Payment for " Special Granular Fill " must have approval from the Engineer prior to installation.

3.04 LAYING PIPE

- A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.
- B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.
- C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure it's being cleaned. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.

- D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02 "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.
- E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.
- F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.
- G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

3.05 BACKFILLING PIPELINE TRENCHES

- A. Backfilling of pipeline trenches shall be accomplished with the requirements set forth in "Earthwork" Section 02300 as shown on the Drawings and with details set forth hereinafter.

- B. Backfilling in rock or soil trench

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12" above the top of the pipe, shall be backfilled with #9M limestone pipe bedding. This material shall be placed in a manner approved by the Engineer, and shall be carefully compacted to avoid displacement of the pipe. (Zone 1)
2. From 12" above the pipe to 12" below the surface, the upper portion of the trench shall be backfilled with material which is free from rock larger than 6" in diameter. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer. (Zone 4).
3. The upper 12" of the trench shall be backfilled with topsoil. No rock allowed. (Zone 5)

- C. Backfilling Under City Streets, Roads, Paved Surfaces:

Backfilling of pipeline trenches under any paved surface:

1. The lower portion of the trench from the pipe bedding to a point 12" above the top of sewer line shall be backfilled with #9M limestone pipe bedding. (Zone 1)
2. The middle portion of the trench, from a point 12" above top of sewer line to a point 6" below the asphalt/concrete pavement with #9M limestone. (Zone 2).
3. From 6" below the pavement to the bottom of the pavement design shall be backfilled and compacted DGA.

4. All paving shall either match existing trench or in accordance with the drawings.
- D. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.
- E. In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

3.06 SETTLEMENT OF TRENCHES

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

3.07 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASEMENT

- A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the specifications, or as directed by the Engineer.
- B. For cradle and encasement, concrete shall be 2000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.
- C. For thrust blocks and anchors, concrete shall be 2000 psi, and shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.
- D. When tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.

3.08 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

- A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Prior to trenching, the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.
- C. Backfilling of the trench in paved driveways or private roads shall be in accordance with, as described hereinbefore. Base course for the paving shall be dense graded crushed

limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge Construction of the Department of Transportation, to a depth of six (6) inches.

- D. A subslab of reinforced concrete shall be placed for state maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 2500 psi, in accordance with the Details shown on the Drawings.

3.09 REMOVING AND REPLACING CONCRETE CURB AND GUTTER

- A. The Contractor shall remove the curb and gutter when encountered when required for laying the sewer. Only that portion of the curb and gutter needed to lay the sewer line shall be removed. Where concrete curb and gutter removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than which existed prior to the Contractor's operation.

3.10 REPLACEMENT OF EXISTING MAIL BOXES, CULVERTS, CLOTHES LINE POSTS, FENCES AND OTHER SUCH FACILITIES

- A. Existing mail boxes, drainage culverts, clothes line posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.
- B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

3.11 PORTLAND CEMENT CONCRETE DRIVEWAY REPLACEMENT

- A. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.
- B. The existing concrete paving shall be sawed or cut to straight edges 12-inches outside the edges of the trench or broken out to an existing joint, as directed by the Engineer. The concrete pavement shall be equal to the existing pavement thickness but not less than 6-inches in thickness for driveways.
- C. Pavement shall be reinforced with 6 x 6 #10-10 wire mesh and shall be constructed with 3000 psi concrete.

3.12 RIP-RAP STREAM BANK SLOPE PROTECTION

- A. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Engineer. Rip-rap slope protection shall be 12-inches thick and shall meet State D.O.T. Standard Specifications.

3.13 TESTING

- A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test to be tested at the lowest level of the pipeline. Loss of pressure during the test shall not exceed 10 psi in a 4 hour period and 5 psi in a 24 hour period. Any test results that do not meet either of these requirements shall constitute a failure of the pressure test.
- B. Leakage in pipelines, when tested under the hydrostatic test described above, shall not exceed 10 gallons per 24 hours per inch of diameter per mile of pipe.
- C. Contractor shall furnish a recording gauge and water meter for measuring water loss during leakage test and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-hour spring wound clock, designed for 9-inch charts, and shall be approved by the Engineer.
- D. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.
- E. Duration of test shall be not less than four (4) hours where joints are exposed and not less than 24 hours where joints are covered.
- F. Where leaks are visible at exposed joints, evident on the surface where joints are covered, and/or identified by isolating a section of pipe, the joints shall be repaired and leakage must be minimized, regardless of total leakage as shown by test.
- G. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.
- H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.
- I. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.
- J. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.
- K. The cost of testing of pressure piping is incidental and is to be included in the Contractor's unit Contract Price.

3.14 CLEAN UP

- A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

END OF SECTION

SECTION 02608

MANHOLES

PART 1 - GENERAL

1.01 SUMMARY

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

1.02 DEFINITIONS

- A. **Standard Manhole:** A standard manhole is defined as any manhole that is greater than 5 feet in depth, as measured from the invert of the manhole base at its center to the top (rim) of the manhole cover.
- B. **Shallow Manhole:** A shallow manhole is defined as any manhole that is 5 feet or less in depth, as measured in the preceding sentence.

PART 2 - PRODUCTS

2.01 CONCRETE MANHOLES - GENERAL

- A. Manholes shall conform in shape, size, dimensions, materials, and other respects as shown on the Drawings or specified herein.
- B. All concrete manholes shall have precast reinforced concrete developed bases. No other type of base will be allowed. Invert channels shall be factory constructed when the base is made. Sloping invert channels shall be constructed whenever the difference between the inlet and outlet elevation is 2 feet or less.
- C. The concrete manhole walls (barrels and cones) shall be precast concrete sections. The top of the cone shall be built of reinforced concrete adjustment rings to permit adjustment of the frame to meet the finished surface. Minimum strength of the concrete for the precast sections shall be 4,000 psi at the time of shipment.
- D. For concrete manholes, the inverts of the developed bases shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerlines of adjoining pipelines.
- E. For concrete manholes, the cast iron frames and covers shall be the standard frame and cover as indicated on the Drawings and specified herein.
- F. Manholes shall be manufactured by Kentucky Precast, or approved equal.

2.02 PRECAST CONCRETE SECTIONS

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

- B. The base section shall be monolithic for 4-foot diameter manholes. Manholes with diameter of 5 feet or larger shall have base slab.
- C. The wall sections shall be not less than 5 inches thick.
- D. Type II cement shall be used except as otherwise permitted.

2.03 CONCRETE MANHOLE - FRAMES AND COVERS

- A. The Contractor shall furnish all cast iron manhole frames and covers conforming to the Drawings or as specified herein.
- B. The castings shall be of good quality, strong, tough, evengrained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.
- C. All casting shall be thoroughly cleaned and subject to a careful hammer inspection.
- D. Castings shall be at least Class 25 conforming to the ASTM Standard Specifications for Gray Iron Casting, Designation A48, latest revision.
- E. Unless otherwise specified, manhole covers shall be 22-3/4 inches in diameter, weighing not less than 350 pounds per frame and cover. Manhole covers shall set neatly in the rings, with contact edges machined for even bearings and tops flush with ring edge. They shall have sufficient corrugations to prevent slipperiness. The covers shall have two (2) pick holes about 1-1/4 inches wide and 1/2 inch deep with 3/8-inch undercut all around. Covers shall not be perforated. Frames and covers shall be J.R. Hoe and Sons, Mc-350, or approved equal.
- F. All covers shall be marked in large letters "SANITARY SEWER".

2.04 MANHOLE STEPS (CONCRETE MANHOLES)

Manholes steps shall be the polypropylene plastic type reinforced with a 1/2 inch diameter deformed steel rod. The step shall be 10-3/4 inches wide and extend 5-3/4 inches from the manhole wall. Steps shall line up over the downstream invert of the manhole. The steps shall be embedded into the manhole wall a minimum of 3-3/8 inches. Steps shall be uniformly spaced at 12-inch to 16-inch intervals.

2.05 PREMOLDED ELASTOMERIC-SEALED JOINTS

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

2.06 POLYETHYLENE DIAPHRAGM

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

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- B. The body of the manhole insert shall be made of high density polyethylene copolymer material meeting ASTM Specification D 1248, Class A, Category 5, Type III (the insert shall have a minimum impact brittleness temperature of -180 degrees Fahrenheit). The thickness shall be uniform 1/8 inch or greater. The manhole insert shall be manufactured to dimensions as shown on the Drawings to allow easy installation within the manhole frame.
 - C. Gaskets shall be made of closed cell neoprene. The gasket shall have a pressure sensitive adhesive on one side and shall be placed under the weight bearing surface of the insert by the manufacturer. The adhesive shall be compatible with the manhole insert material so as to form a long lasting bond in either wet or dry conditions.
 - D. Lift strap shall be attached to the rising edge of the bowl insert. The lift strap shall be made of 1 inch wide woven polypropylene web and shall be seared on all cut ends to prevent unraveling. The lift strap shall be attached to the manhole insert by means of a stainless steel rivet. Location of the lift strap shall provide easy visual location.
 - E. Standard ventilation shall be by means of a valve or vent hole. Vent holes shall be on the side wall of the manhole insert approximately 3/4 inch below the lip. The valve or vent hole will allow a maximum release of 10 gallons per 24 hours when the insert is full.
 - F. The manhole insert shall be manufactured to fit the manhole frame rim upon which the manhole cover rests. The Contractor is responsible for obtaining specific measurements of each manhole cover to insure a proper fit. The manhole frame shall be cleaned of all dirt, scale and debris before placing the manhole insert on the rim.

2.07 CLEANOUTS

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

2.08 DROP CONNECTIONS

Drop connections shall be installed in the manhole as shown on the Drawings. The pipe material inside the drop manhole shall be of the same material as the sanitary sewer line. Any deviation from the standard drawing shall be approved by the Division of Engineering and the Division of Water Quality.

PART 3 - EXECUTION

3.01 FABRICATION - PRECAST SECTIONS

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- A. Manhole sections shall contain manhole steps accurately positioned and embedded in the concrete when the section is cast.
 - B. Sections shall be cured in an enclosed curing area and shall attain a strength of 4,000 psi prior to shipment.
 - C. Knuckle hooks are preferred.
 - D. Flat slab tops shall have a minimum thickness of 6 inches and reinforcement in accordance with ASTM C478.

- E. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the precast sections.
- F. Acceptance of the sections will be on the basis of material tests and inspection of the completed product and test cylinders if requested by the Engineer.
- G. Cones shall be precast sections of similar construction.

3.02 SETTING PRECAST MANHOLE SECTIONS

- A. Refer to Standard Drawings.
- B. Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.
- C. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose.

3.03 ADJUSTING MANHOLE FRAMES AND COVERS TO GRADE

- A. Except where shown on the Drawings, the top of the precast concrete eccentric cone of a standard manhole or the top of the flat slab of a shallow manhole shall terminate 4 inches below existing grade in an unpaved non-traffic area except in a residential yard and 13 inches below existing grade in a paved or unpaved traffic area and in a residential yard. The remainder of the manhole shall be adjusted to the required grade as described hereinafter in paragraphs B and C of this article.
- B. When a manhole is located in an unpaved non-traffic area other than in a residential yard, the frame and cover shall be adjusted to an elevation 3 inches to 5 inches above the existing grade at the center of the cover. If field changes have resulted in the installed manhole invert elevation to be lower than the invert elevation shown on the Drawings, the adjustment to an elevation of 3 inches to 5 inches above existing grade shall be accomplished by the use of precast concrete adjusting rings. If field changes have resulted in the completed manhole invert to be greater than the invert shown on the Drawings and the cover higher than 5 inches above existing grade, then the top of the eccentric cone, when used, or the top of the barrel section, when used, shall be trimmed down so that the manhole cover, after installation, is no greater than 5 inches above existing grade at the center of the cover. The area around the adjusted frame and cover shall be filled with the required material, sloping it away from the cover at a grade of 1 inch per foot.
- C. When a manhole is located in a bituminous, concrete, or crushed stone traffic area, or in a residential yard, the frame and cover shall be adjusted to the grade of the surrounding area by the use of precast concrete adjusting rings. The adjusted cover shall conform to the elevation and slope of the surrounding area. If field changes have resulted in the installed manhole invert elevation to be so much higher than the invert elevation shown on the Drawings that the top of the eccentric cone, when used, or the top of the flat slab, when used, is less than the thickness of the frame and cover 7 inches from the grade of the surrounding area, then the top of the cone or barrel section shall be trimmed down enough to permit the cover, after installation, to conform to the elevation and slope of the surrounding area. After installation, the inside and outside surfaces shall receive a waterproofing bitumastic coating.
 - 1. The Contractor shall coordinate elevations of manhole covers in paved streets with the LFUCG. If resurfacing of the street in which sewers are laid is expected within

twelve (12) months, covers shall be set 1-1/2 inches above the existing pavement surface in anticipation of the resurfacing operations.

3.04 ADJUSTING SECTIONS

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

3.05 SETTING MANHOLE FRAMES AND COVERS

- A. Manhole frames shall be set with the tops conforming to the required elevations set forth hereinbefore. Frames shall be set concentric with the top of the concrete and in a full bead of butyl mastic sealant so that the space between the top of the masonry and the bottom flange of the frame shall be completely watertight.
- B. Manhole covers shall be left in place in the frames on completion of other work at the manholes.

3.06 VACUUM TESTING (ASTM C1244)

A. Scope

- 1. This test method covers procedures for testing precast concrete manhole sections when using the vacuum test method to demonstrate the integrity of the installed materials and the construction procedures. This test method is used for testing concrete manhole sections utilizing mortar or mastic joints.
- 2. This test method is intended to be used as a preliminary test to enable the installer to demonstrate the condition of the concrete manholes prior to backfill. It may also be used to test manholes after backfilling; however, testing should be correlated with the connector supplier.
- 3. This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.
- 4. This test method is the companion to metric Test Method C 1244M; therefore, no SI equivalents are shown in this test method.

B. References, ASTM Standards:

- 1. C 822 Terminology Relating to Concrete Pipe and Related Products.
- 2. C 924 Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
- 3. C 969 Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

C. Terminology

For definitions of terms relating to manholes, see Terminology C 822.

D. Summary of Practice

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

E. Significance and Use

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

F. Preparation of the Manhole

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

G. Procedure

1. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.
2. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury.
3. The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values indicated in the table below.
4. Vacuum test time shall be a minimum of one minute.

**Minimum Test Times for Various Manhole Diameters
(seconds)**

Depth (ft)	Diameter (inches)								
	30	33	36	42	48	54	60	66	72
1	1	2	2	2	2	3	3	4	4
2	3	3	4	4	5	6	7	7	8
3	4	5	5	6	7	9	10	11	12
4	6	6	7	9	10	12	13	15	16
5	7	8	9	11	12	14	16	18	20
6	8	10	11	13	15	17	20	22	24
7	10	11	12	15	17	20	23	26	28
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	28	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	58	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	69	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

4. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.
5. Use or failure of this vacuum test shall not preclude acceptance by appropriate water infiltration or exfiltration testing, (see Practice C 969), or other means.

H. Precision and Bias

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

- END OF SECTION -

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SECTION 02732

SEWAGE COLLECTION LINES

PART 1 - GENERAL

1.01 SUMMARY

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

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

- A. Ductile Iron (DI) Pipe:
- B. Scope: This article covers the design and manufacture of ductile iron centrifugally cast on metal molds and ductile iron fittings.

Specific Requirements: Ductile iron pipe shall be furnished cement lined unless otherwise noted on the drawings or in other sections of these specifications. Ductile iron pipe shall be furnished with rubber gasket push-on joints except as may otherwise be noted on the drawings or in difficult working areas and with approval of the Engineer.

1. Pressure class shall be 250 psi for pipe sizes 20 inches or smaller and pressure class 200 psi for pipe sizes larger than 20 inches for mechanical and push-on joint pipe.
2. Thickness design of ductile iron shall conform in all aspects to the requirements of ANSI/AWWA C150/A 21.50 latest revision.
3. Manufacture and testing of ductile iron pipe shall conform in all aspects to the requirements of ANSI/AWWA C151/A 21.51 latest revisions .
4. Pipe Coatings
 - a. Interior Lining

(1) Condition of Ductile Iron Prior to Surface Preparation

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

(2) Lining Material

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

- (a) A permeability rating of 0.00 when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of 30 days.
- (b) The following test must be run on coupons from factory lined ductile iron pipe:
 - (b1) ASTM B-117 Salt Spray (scribed panel) – Results to equal 0.0 undercutting after two years.
 - (b2) ASTM G-95 Cathodic Disbondment 1.5 volts @ 77°F. Results to equal no more than 0.5mm undercutting after 30 days.
 - (b3) Immersion Testing rated using ASTM D-714-87.
 - 20% Sulfuric Acid – No effect after two years.
 - 25% Sodium Hydroxide – No effect after two years.
 - 160°F Distilled Water – No effect after two years.
 - 120°F Tap Water (scribed panel) – 0.0 undercutting after two years with no effect.
- (c) An abrasion resistance of no more than 4 mils (.10mm) loss after one million cycles – European Standard EN 598: 1994 section 7.8 Abrasion resistance.

(3) Application

(a) Applicator

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

(b) Surface Preparation

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

(c) Lining

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

(d) Coating of Bell Sockets and Spigot Ends

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

(e) Number of Coats

The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. **No material shall be used**

for lining which is not indefinitely recoatable with itself without roughening of the surface.

(f) Touch-Up and Repair

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

(4) Inspection and Certification

(a) Inspection

(a1) All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 Film Thickness Rating.

(a2) The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500-volt test. Any defects found shall be repaired prior to shipment.

(a3) Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

(b) Certification

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

(5) Handling

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

b. Exterior Coating

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

5. Fittings and gaskets for mechanical and push-on joint ductile and cast iron pipe shall conform to the latest revisions of ANSI/AWWA C110/A 21.10 for

mechanical and push-on joint fittings, ANSI/AWWA C111/A 21.11 for gaskets, and ANSI/AWWA C153/A 21.53 for mechanical and push-on joint compact fittings. Mechanical and push-on joint fittings shall have pressure class rating of 250 psi for sizes 20 inches and smaller and 200 psi for sizes larger than 20 inches.

6. All ductile and cast iron fittings shall be ductile iron grade 80-60-03 in accordance with ASTM A339-55.
7. Flanged ductile iron pipe shall conform to the latest revisions of ANSI/AWWA C115/A 21.15. Bolt pattern of flange shall be in accordance with ANSI/AWWA C115/A 21.15 (which is equivalent to ASME/ANSI B16.1, Class 125 flange bolt pattern). Pipe shall have pressure class 250 rating. Gaskets shall be synthetic rubber ring gaskets with a thickness of 1/8 inch. Nuts and bolts shall be in accordance with ASME/ANSI B18.2.1, ASME/ANSI B18.2.2, ASME/ANSI B1.1, and ASTM A307.
8. Flanged fittings shall conform to the latest revisions of ANSI/AWWA C110/A 21.10 or ANSI/AWWA C153/A 21.53 (compact fittings). Gaskets shall be in accordance with ANSI/AWWA C111/A 21.11. Fittings shall have pressure class rating of 250 psi. Bolt pattern of flange shall be in accordance with ANSI/AWWA C115/A 21.15 (which is equivalent to ASME/ANSI B16.1, class 125 flange bolt pattern).
9. Restrained joint pipe and fittings shall be a boltless system equal to "Field-Lok" restraining gaskets or "TRFLEX Joint" as manufactured by U.S. Pipe & Foundry Company. All pipe inside of casing pipe shall have restraining gaskets.
10. Ball and socket restrained joint pipe and fittings shall be a boltless system equal to USIFLEX manufactured by U.S. Pipe & Foundry Company or FLEX-LOK manufactured by American Pipe Company. Pipe shall have a working pressure rating of 250 psi and have a maximum joint deflection of 15°. Nominal laying lengths shall be in range of 18 feet 6 inches to 20 feet 6 inches.
11. Manufacturers

Pipe shall be as manufactured by U.S. Pipe & Foundry Company, Clow, American Cast Iron Pipe Company, or equal.
12. Marking

Pipe or fitting shall have the ANSI/AWWA standard, pressure (or thickness) class, diameter, DI or ductile noted, manufacturer, and country and year where cast on the outside of the body.
13. No separate pay item has been established for fittings and no determination of the number of fittings required on the job has been made. The Contractor, during the bidding phase, shall determine the number of fittings required on the job and include the cost of fittings and installation in the unit price for pipe.

C. Polyvinyl Chloride (PVC) Pipe

1. Solid Wall PVC Pipe (SDR 35)
 - a. PVC pipe and fittings less than 15 inches in diameter shall conform to the requirements of ASTM Standard Specifications for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, Designation D 3034. Pipe and fittings shall have a minimum cell classification of 12454B or 12454C as defined in ASTM D-1784. All pipe shall have a pipe diameter to wall thickness ratio (SDR) of a maximum of 35.
 - b. PVC pipe and fitting with diameters 18-inch through 27-inch shall conform to the requirements of ASTM D-1784 and ASTM F-679. Pipe and fittings shall have a minimum cell classification of 14545C. The minimum wall thickness shall conform to T-1 as specified in ASTM F-679.
 - c. Joints shall be push-on bell and spigot type using elastomeric ring gaskets conforming to ASTM D 3212 and F 477. The gaskets shall be securely fixed into place in the bells so that they cannot be dislodged during joint assembly. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oils and groundwater, and which will endure permanently under the conditions of the proposed use.
 - d. Pipe shall be furnished in lengths of not more than 13 feet. The centerline of each pipe section shall not deviate from a straight line drawn between the centers of the openings at the ends by more than 1/16 inch per foot of length.
 - e. PVC pipe shall not have a filler content greater than ten percent (10%) by weight relative to PVC resin in the compound.
 - f. PVC pipe shall be clearly marked at intervals of 5 feet or less with the manufacturer's name or trademark, nominal pipe size, PVC cell classification, the legend "Type PSM SDR 35 PVC Sewer Pipe" and the designation "ASTM D 3034", or "ASTM F-679". Fittings shall be clearly marked with the manufacturer's name or trademark, nominal size, the material designation "PVC", "PSM" and the designation "ASTM D 3034", or "ASTM F-679".
 - g. PVC pipe shall have minimum pipe stiffness of 46 psi for each diameter when measured at 5 percent vertical ring deflection and tested in accordance with ASTM D 2412.
 - h. Five (5) copies of directions for handling and installing the pipe shall be furnished to the Contractor by the manufacturer at the first delivery of pipe to the job. PVC pipe installation shall conform to ASTM D-2321 latest revision.
 - i. Pipe shall be as manufactured by H & W Pipe Company, or equal.

D. Reinforced Concrete Pipe

1. All reinforced concrete pipe shall conform to the requirements of ASTM C76, latest edition. Class shall be as shown on the Drawings.
2. Joints shall be bell and spigot type using rubber Forsheda 138 or Forsheda 103 gaskets (or approved equal) and shall conform to ASTM C443.
3. The pipe shall be furnished in standard lengths of 8 feet to 16 feet.
4. The pipe shall be permanently marked showing the nominal inside diameter, manufacture date, ASTM C76 class, and manufacturer's name. These markings for 30-inch diameter and larger shall be inscribed on the pipe exterior and stenciled on the interior with paint or permanent ink.
5. There shall be no lift holes.
6. Pipe shall be as manufactured by Independent Concrete Pipe Company or approved equal.
7. Pipe Coatings

a. Interior Lining

(1) Description

All concrete pipe and fittings shall have a high build protective lining on the interior. All surface areas must be smooth without voids and projections, i.e. casting or manufacturing imperfections. Any patching of the interior of the concrete pipe shall be satisfactorily repaired by the pipe manufacturer by using a two component epoxy grout. No patching compounds containing a latex or acrylic base, or curing compounds shall be used on the interior surfaces of the concrete pipe to be lined. All rough and sharp edges on bells and spigots shall be rounded smooth with at least 1/8-inch radius.

(2) Lining Material

The material must be a high build multi-component amine cured novalac epoxy polymeric lining. The standard of quality is Inner-Liner by Vulcan Painters, Birmingham, Alabama. Equal products considered are Protecto Pipe Lining 1011 and PERMITE 9043 Type 2 polyamide epoxy. Any other alternates must be accompanied by the following:

- (a) The permeability rating equal to the specified material when tested according to Method A of ASTM E-96-66, Procedure A, with a test duration of 42 days as reported by an independent laboratory.

- (b) A statement from the Manufacturer of the submitted material attesting to the fact that at least 20% of the volume of the lining contains ceramic quartz pigment or similar inert material that will not be affected by the sewer liquids and gas.
- (c) A laboratory report containing test data for immersion in acids, bases, and deionized water equal to the performance of the specified material using ASTM D-714-56 (1974) for the rating method.
- (d) A statement concerning recoatability and repair to the lining.

(3) Concrete Pipe and Manholes

(a) Surface Preparation

All centrifugally cast concrete pipe shall have the interior fines, which include the gray layer of loosely-bound laitance, washed out at the time of manufacture. The intent is to expose tightly-bound concrete so that the lining will have a sound substrate for adhesion. After the pipe has cured the equivalent of seven (7) days at 77°F, the interior of the pipe exposed to liquids and gases shall be blasted and cleaned to remove all laitance, form oils, or other loose material. All none-water soluble grease or oils shall be removed by the pipe manufacturer before surface preparation by steam cleaning.

(b) Lining

After cleaning, the lining material shall be applied at 40 mils for the complete system using a centrifugal lance applicator. No lining shall take place over grease, oil, etc., that would be detrimental to the adhesion of the compound to the substrate. The compound shall not be applied when the substrate temperature is below 40°F or in adverse atmosphere conditions which will cause detrimental blistering, pinholing, or porosity of the film. In no case shall the lining be applied when the concrete surface is above 14% moisture content.

(c) Coating of Gasket and Spigot Ends

Due to tolerances, the joint areas must be coated with 6 mils, 10 mils maximum, Inner-Liner joint compound. It is the pipe manufacturer's responsibility to ensure that these tolerances are acceptable. This coating shall be hand-applied by brush to ensure a continuous protective

barrier. Care should be taken that the coating is smooth without excess buildup in the gasket area of the bell or on the gasket groove on the spigot end. All materials for the gasket groove and spigot end shall be applied after the application of the lining.

(4) Inspection and Certification

(a) Inspection

(a1) All concrete pipe and manholes shall be checked for thickness using a magnetic film thickness gauge on metal coupons attached to 5% of the pipe lined. **Note:** All dry film thickness shall be measured by application Specification No. 2 (SSPC-PA2 November 1, 1982).

(a2) The barrel of all pipe and fittings shall be pinhole-detected with a non-destructive 2,500-volt pinhole test. This test shall take place as soon as the lining is cured to prevent damage or contamination on the lining surfaces.

(a3) Each pipe joint and fitting shall be marked with the date of application of the lining system and with its numerical sequence of application on that date.

(a4) All pipe and fittings shall be inspected visually before and after installation, if possible, to ensure that any defect or damage to the pipe or lining is repaired prior to placing in service.

(b) Certification

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

(5) Field Touch-Up

(a) Surface Preparation

(a1) The damaged or abraded area should be brushed vigorously with a wire brush or sanded with coarse sandpaper to remove all loose material. After the surface has been cleaned, care should be

taken to remove all dust from the cleaning operation. This can be accomplished by blowing-off with compressed air or by brushing with a dry brush.

(a2) Inner-Liner Joint Compound shall be used for touchup or repair and shall be mixed thoroughly in strict accordance with manufacturer's recommendations. After the material has been thoroughly mixed, apply to the prepared surface by either brush, roller, or airless spray. The material will be applied in one or two coats, as directed by the Engineer, depending on the size of the damaged area and whether it goes to the substrate or not. All touch-up shall be applied using the guidelines established for temperature and moisture content in paragraph for "Lining".

b. Exterior Coating

All reinforced concrete pipe shall be water-proofed on the exterior with asphalt coating. (Steel cylinder concrete pipe does not have to be water-proofed.)

PART 3 - EXECUTION

3.01 PIPE LAYING

- A. All pipe shall be laid with ends abutting and true to the lines and grades indicated on the Drawings. The pipe shall be laid straight between changes in alignment and at uniform grade between changes in grade. Pipe shall be fitted and matched so that when laid in the trench, it will provide a smooth and uniform invert. Supporting of pipe shall be as set out in Section 02225 and in no case shall the supporting of pipe on blocks be permitted.
- B. Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure its being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe and beveled to match the factory bevel for insertion into gasketed joints. Bevel can be made with hand or power tools.
- C. The interior of the pipe, as work progresses, shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted into the pipe bell so as to exclude earth or other material and precautions taken to prevent flotation of pipe by runoff into trench.

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

3.02 JOINTING

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

3.03 UTILITY CROSSING CONCRETE ENCASEMENT

- A. At locations shown on the Drawings, required by the Specifications, or as directed by the Engineer, concrete encasement shall be used when the clearance between the proposed sanitary sewer pipe and any existing utility pipe is 18 inches or less. Utility pipe includes underground water, gas, telephone and electrical conduit, storm sewers, and any other pipe as determined by the Engineer.
- B. There are two cases of utility crossing encasement. Case I is applicable when the proposed sanitary sewer line is **below** the existing utility line. Case II is applicable when the proposed sanitary sewer line is laid **above** the utility line. In either case, the concrete shall extend to at least the spring line of each pipe involved.
- C. Concrete shall be Class B (3000 psi) and shall be mixed sufficiently wet to permit it to flow between the pipes to form a continuous bridge. In tamping the concrete, care shall be taken not to disturb the grade or line of either pipe or damage the joints.
- D. Concrete for the Work is not a separate pay item and will be considered incidental to utility pipe installation.

3.04 TESTING OF GRAVITY SEWER LINES

- A. After the gravity piping system has been brought to completion, and prior to final inspection, the Contractor shall rod out the entire system by pushing through each individual line in the system, from manhole to manhole, appropriate tools for the removal from the line of any and all dirt, debris, and trash. If necessary during the process of rodding the system, water shall be turned into the system in such quantities to carry off the dirt, debris, and trash.
- B. During the final inspection the Engineer will require all flexible sanitary sewer pipe to be mandrel deflection tested after installation.
1. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with nine (9) evenly spaced arms of prongs. The mandrel dimension shall be 95 percent of the flexible pipe's published ASTM average inside diameter. Allowances for pipe wall thickness tolerances of ovality (from shipment, heat, shipping loads, poor production, etc.) shall not be deducted from the ASTM average inside diameter, but shall be counted as part of the 5 percent allowance. The contact length of the

mandrel's arms shall equal or exceed the nominal diameter of the sewer to be inspected. Critical mandrel dimensions shall carry a tolerance ± 0.001 inch.

2. The mandrel inspection shall be conducted no earlier than 30 days after reaching final trench backfill grade provided, in the opinion of the Engineer, sufficient water densification or rainfall has occurred to thoroughly settle the soil throughout the entire trench depth. Short-term (tested 30 days after installation) deflection shall not exceed 5 percent of the pipe's average inside diameter. The mandrel shall be hand pulled by the contractor through all sewer lines. Any sections of the sewer not passing the mandrel test shall be uncovered and the Contractor shall replace and recompact the embedment backfill material to the satisfaction of the Engineer. These repaired sections shall be retested with the go/no-go mandrel until passing.
 3. The Engineer shall be responsible for approving the mandrel. Proving rings may be used to assist in this. Drawings of the mandrel with complete dimensioning shall be furnished by the Contractor to the Engineer for each diameter and type of flexible pipe.
- C. The pipe line shall be made as nearly watertight as practicable, and leakage tests and measurements shall be made. All apparatus and equipment required for testing shall be furnished by the Contractor and the cost shall be included in the unit price bid for pipe and manholes.
1. The Engineer may require the Contractor to smoke test the first section (manhole to manhole) of each size of pipe and type of joint prior to backfilling, to establish and check laying and jointing procedures. The test shall consist of smoke blown into closed-off sections of sewer under pressure and observing any smoke coming from the pipe line indicating the presence of leaks. Other supplementary smoke tests prior to backfilling may be performed by the Contractor at his option; however, any such tests shall not supplant the final tests of the completed work unless such final tests are waived by the Engineer.
 2. Where the groundwater level is more than 1 foot above the top of the pipe at its upper end, the Contractor shall conduct either infiltration tests or low pressure air tests on the completed pipeline.
 3. Where the groundwater level is less than 1 foot above the top of the pipe at its upper end, the Contractor shall conduct either exfiltration tests or low pressure air tests on the completed pipeline.
- D. Low-pressure air tests shall be performed on all gravity sanitary sewers to verify watertightness of pipe joints and connections. The Contractor shall perform testing on each manhole-to-manhole section of sewer line after placement of backfill.

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

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

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

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

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

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

- E. Infiltration tests (for concrete pipe only) shall be made after underdrains, if present, have been plugged and other groundwater drainage has been stopped such that the groundwater is permitted to return to its normal level insofar as practicable.
1. Upon completion of a section of the pipeline, the line shall be dewatered and a satisfactory test conducted to measure infiltration for at least 24 hours. The amount of infiltration, including manholes, tees and connections, shall not exceed 200 gallons per nominal inch diameter per mile of sewer per 24 hours.
- F. Exfiltration tests (for concrete pipe only) which subject the pipeline to an internal pressure, shall be made by plugging the pipe at the lower end and then filling the line and manholes with clean water to a height of 2 feet above the top of the sewer at its upper end. Where conditions between manholes may result in test pressures which would cause leakage at the plugs or stoppers in branches, provisions shall be made by suitable ties, braces and wedges to secure the plugs against leakage resulting from the test pressure.
1. The rate of leakage from the sewers shall be determined by measuring the amount of water required to maintain the level 2 feet above the top of the pipe.
 2. Leakage from the sewers under test shall not exceed the requirements for leakage into sewers as hereinbefore specified.
- G. The Contractor shall furnish suitable test plugs, water pumps, and appurtenances, and all labor required to properly conduct the tests. Suitable bulkheads shall be installed, as required, to permit the test of the sewer. The Contractor shall construct weirs or other means of measurements as may be necessary.

- H. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing the leaks and retesting as the Engineer may require with additional compensation.
- I. If in the judgment of the Engineer, it is impracticable to follow the foregoing procedure for any reason, modifications in the procedures shall be made as required and as acceptable to the Engineer, but in any event, the Contractor shall be responsible for the ultimate tightness of the line within the above test requirements.

- END OF SECTION -

DIVISION 8

WINDOWS & DOORS

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SECTION 08370 - ACCESS HATCHES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment, and service required for the complete installation of the access hatches as specified herein and shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Cast-in-Place Concrete: Section 03300
- B. Precast Concrete: Section 03400

1.03 SUBMITTALS

- A. Submit manufacturer's data and shop drawings for the materials specified herein. Comply with all requirements of Section 01340.
- B. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering.
- C. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.
- D. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Access Hatches	X	X		X						X		

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PART 1

1.01

1.02

1.03

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SECTION 09970 - WET WELL REHABILITATION SYSTEM WITH EPOXY COATING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Requirements for cleaning, surface preparation, applying structural cement and applying an epoxy coating system to the sewer manhole wall surfaces.

1.02 RELATED SECTIONS

- A. Concrete Repair.

1.03 REFERENCES

- A. ASTM C 150 Standard Specification for Portland Cement.
- B. ASTM C 595 Standard Specification for Blended Hydraulic Cements.
- C. ASTM C 39-86 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- ASTM C 496 Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
- D. ASTM C 78 Standard Test Method for Flexural Strength of Concrete; Using Simple Beam with Third Point Loading.
- E. ASTM C 267 Standard Test Method for Determining the Chemical Resistance of Grouts and Mortars.
- F. AASHTO T277 Rapid Determination of the Chloride Permeability of Concrete.
- G. ASTM D 4541-89 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- K. ASTM C 33-86 Standard Specification for Concrete Aggregates.
- M. ASTM C 494-86 Standard Specification for Chemical Admixtures for Concrete. ASTM C 260-86 Specification for Air-Entraining Admixtures for Concrete.
- N. ACI 201.2R-93 Guide for Durable Concrete.

1.04 SUBMITTALS

- A. Submit the following information to the engineer:

1. Technical product data, including brand name and manufacturer for each product. Provide laboratory test results verifying the cements 28-day compressive strength in accordance with ASTM C-39 or ACI 318.
2. The manufacturer shall provide satisfactory test results that demonstrate conformance to ASTM C 267, Chemical Resistance of Mortars, Grouts and Monolithic Surfacing.
3. Product Certification stating the chloride ion content of the cement material.
4. Provide a list of similar sewer manhole rehabilitation projects with five years of history. Include the Owner and Engineer's name and the project date.
5. The contractor shall furnish all of the labor, equipment and materials. The application equipment shall be capable of spraying the cement and epoxy materials as required by the manufacturers printed recommendations.

1.05 QUALITY CONTROL

- A. Provide a procedure that meets applicable ASTM, NACE and SSPC inspection standards and quality assurance control that meet the manufacturer's procedure. The engineer shall approve the procedure before start up.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store the materials in a dry area and protect from weather. Protect the cement and epoxy coating materials, store between 50° F and 90° F. Keep open flame away.

1.07 WARRANTY

- A. The applicator shall guarantee the work to be free of defects in materials and workmanship for one-year period, unless otherwise stated, after completion and acceptance of the work. The applicator shall repair defects in materials or workmanship, which may develop during the one-year period; and any damage to other work caused by such defects or discovered within the same period at no additional cost to the owner will.

PART 2 - PRODUCTS

2.01 CONCRETE SUBSTRATE

- A. Remove all existing coatings before applying the new epoxy coating. The applicator shall maintain a strict surface preparation procedure that is suitable for top coating and provides the greatest compatibility with the new epoxy coating. The applicator will adhere to all applicable ASTM, NACE and SSPC guidelines for proper surface preparation.
- B. Generally, the protective epoxy coating manufacturer shall make all recommendations for accelerated epoxy coating application, use LG 68 Heavy Duty Concrete Cleaner to etch the concrete or new cement liner in this case.

2.02 MANUFACTURER

- A. Standard Cement Materials, Inc., Houston Texas. 1. 888. 278.1337 or Fax 713. 680-1017.
- B. A manufacturer's representative shall be available for consultation by telephone or on site upon 48-hour notice.

2.03 MATERIALS

- A. Use the monolithic cement liner and high build epoxy coating system to repair, fill voids, and provide structural restoration and integrity, eliminating water infiltration and exfiltration and corrosion protection. The repair materials must be compatible with the specified epoxy coating.
- B. The following products are approved for use as specified:
 - 1. Use the Reliner MSP Cement. A high strength, factory blend of finely divided cementitious and pozzolanic materials, a microsilica-based admixture ingredient, polypropylene fibers and other admixtures that enhance workability during placement.

Physical Properties:

Portland cement, Type I or II		ASTM C-150, C-595
Compressive Strength:		
1 day	2000	ASTM C-39
28 day	6000	ASTM C-495
Split-Tensile	500	ASTM C-496
Flexural	650	ASTM C-78
Bond	150	ASTM D- 4551*
Adhesion	150	ACI 503R
Sulfate Resistance:		
90 day	+0.26	ASTM C-267
Water to cement ratio	0.36	

- 2. Use the Standard Epoxy Coating 4553, a 100% solids, solvent-less two-component, high strength epoxy coating system with increased bond strength and broad range chemical resistance. Protects concrete, steel, masonry and Fiberglass structures in moist and damp environments. Use a maximum of 40 mils in two applications over a smooth horizontal, vertical or overhead surface. The recommended coverage's will vary from 30 to 60 mils depending on the application. Contact Standard Cement Materials Inc., Houston, Texas for information.

Adhesion to:

Wet concrete	450	ACI 452
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* Modified test procedure.

2.04 PROTECTIVE COATING APPLICATION EQUIPMENT

- A. Use a plural component spray pump designed specifically for this purpose. Spray apply the mixed Standard Epoxy Coating 4553 to the specified thickness.

PART 3 - EXECUTION

3.01 REPAIR PROCEDURE

- A. The applicator shall bear complete responsibility for cleaning, stopping all minor water infiltration, mixing of the materials, applying and finishing of the rehabilitation system.

The applicator shall limit his work activity and material storage to the repair area. All additional work in the adjacent streets, material installation and removal of line plugs shall be performed as shown on the drawings.

1. The Contractor shall comply with all local; state and OSHA confined space entry requirements. Provide all the plugs, blocks, restraints and discharge lines required for controlling and diverting the water flow into the influent line.
- B. The Contractor will take the appropriate action to lower the water flow below the surface to be coated.

3.02 CLEAN THE LIFT STATION WET WELL

- A. Clean the existing wet well chamber. The Sewer Lift Station Wet Well Chamber Rehabilitation System requires a suitable, clean and sound surface. Use a high-pressure water washing or wet abrasive sand blasting, use 3500-psi water pressure, minimum. Remove dirt, oil, loose concrete, any previously applied coatings or other deleterious materials. Continue the cleaning procedures until a uniform and sound profile is obtained. The wet well may require part of the following; cleaning, inspection, proper replacement or preparation of the steel reinforcement, structural crack repair, stopping water leaks and joint treatment. Remove all of the corroded cement mortar that has a light white tint color or which has experienced excessive erosion and deterioration greater than 1 inch. The cleaned surface profile shall be restored using the Reliner MSP Cement, as specified in this specification. Contact Standard Cement Materials, Inc. for more help with repair materials, selecting cleaning equipment or inspection services.
- B. After all the preparations have been completed, repair or fill any damaged areas or large voids in the concrete.

3.03 REPAIR MATERIALS

- A. Fill or repair all voids and irregularities at least one hour prior to applying the Reliner MSP Cement. Use the Fast Set Bench Repair Cement, FSR, a non-metallic shrink compensating grout. A cement patcher sets in about fifteen minutes and reaches final set in thirty minutes.
1. Hand mix and apply the Fast Set Bench Repair Cement patcher for filling voids and making repairs in concrete and masonry walls. Mix a small amount of FSR Cement patcher with cold water to the consistency of pancake batter. Brush the neat mixture over the area as a "primer". Carefully work the primer into the surface pores and voids. Then mix additional FSR Cement patcher to the consistency of soft putty to fill the void. Mix thoroughly for one minute, work quickly, the FSR Cement patcher begins to stiffen in about six to eight minutes. Apply by hand or with a trowel, level and smooth the patch. Keep the patch damp

by spraying lightly with water or by covering with a damp cloth for at least one hour. Protect the mortar from wind changes, freezing and temperature extremes.

B. Hydraulic Cement

1. Use CUSTOM PLUG Hydraulic Cement (or STANDARD PLUG) to stop all active water leaks. Use a rapid setting hydraulic cement product specifically designed for that purpose. Contact your Standard Cement Materials representative for help in selecting the right product to stop the leak.

C. Chemical Grout

If the leak persist and is difficult to stop, use an acceptable chemical grout to stop the water infiltration. Contact your Standard Cement Materials representative for more help in selecting the correct grout to stop difficult leaks.

3.04 MIXING THE CEMENT MORTAR

- A. Mix the Reliner MSP Cement in accordance with the manufacturers printed data. The manufacturer shall provide a source for consultation throughout the application of the manhole liner system.
- B. Follow the manufacturer's mixing, sampling and testing procedures as described in ASTM C 94 specification for Ready Mixed Concrete.

3.05 MIXING THE EPOXY CORROSION BARRIER

- A. Charge the epoxy coating storage bins.
 1. The liquid Standard Epoxy Coating 4553 is a 2:1 component, Activator Compound at 1-gallon and Base Compound at 2-gallons. Use a plural component spray pump designed specifically for this purpose.

3.06 APPLICATION OF CEMENT LINER

- A. Dampen the repair areas, but allow no running water. Spray apply the Reliner MSP Cement liner to a minimum 1-inch thickness. Compact the cement into all of the remaining voids and crevices. Measure the cement liner depth to insure that the desired thickness has been applied. Finish with a stainless steel trowel to a smooth or brush finish surface. Apply the cement liner down from the top, along the walls to the floor. Spray apply in such a manner so as to produce an even surface. Produce a cove finish at the wall to the ceiling and floor interface. Contact the manufacturer for recommendations when more than 24 hours have passed between starting and finishing the application.
- B. No application shall be made when ambient temperatures are less than 40 degrees F and when freezing temperature is expected within 24 hours. If the ambient temperature is in excess of 90 degrees F; precautions shall be taken to keep mixing water below 85 degrees F. Use ice if necessary.

3.07 APPLICATION OF PROTECTIVE EPOXY COATING SYSTEM

- A. The protective epoxy coating shall be applied by a trained certified applicator. The applicator shall furnish all of the labor, equipment, materials and application as required by the manufacturer.
- B. Coat the specified surface with a moisture tolerant, solvent-less, 100% solids, self-priming epoxy protective coating as described herein. Spray apply the mixed Standard Epoxy Coating 4553TM material to a nominal wet film thickness range of 40 mils, DFT. Apply the epoxy coating over the Reliner MSP Cement as soon as possible. Contact your Standard Cement Materials representative for details about spray equipment. Use a systolic piston pump designed specifically for this purpose.
 - 1. To avoid damage to the uncured epoxy coating, keep all pipe penetrations plugged for a minimum of 4 to 8 hours after the coating installation.
 - 2. Allow the finished process to cure 8 to 24 hours before being subjected to active flow. Follow the manufacturer's recommendations.

3.08 CURING

The ambient temperature and condition in the wet well chamber is usually adequate for curing the wet cement. However, for the best curing, place wet damp curing blanket, lid, wind shade, an impervious cover or use a high molecular weight curing compound over the mortar to protect it from the heat, wind changes or extremes. Keep the epoxy corrosion barrier coating system dry and clean up to 8 hours.

A. Hot Weather Placement

- 1. Avoid any potential problems due to shrinkage cracking. Follow ACI 302 "Guide for Concrete Floors and Slab Construction" and ACI 308 "Standard Practice for Curing Concrete" to minimize decreased bleeding problems. Protect the cement liner material from dry, hot, severe weather extremes and freezing. If the ambient temperature is equal to 70 degrees F, or in excess of 90 degrees F, then take precautions to keep the mixing water cool. Cool the water to a temperature equal to or below 70 degrees F. Use an auxiliary ASTM C 494, Type A, D or F and G cement admixture, block ice or other means if necessary. Follow the manufacturer's recommendation for placement and the use of any auxiliary admixtures.

No application shall be made when the ambient temperature is less than 40 degrees F and when freezing temperature is expected within 24 hours. Protect the finished cement. Wet cure immediately, cover with plastic sheets or use an acceptable liquid membrane-forming curing compound, ASTM C 309. The curing compound shall contain minimum 25% solids and prevent a maximum loss of water up to 0.4-kg/ cubic meters in 72 hours. Spray apply, roll or brush the curing compound while the cement is still in a soft workable state. Apply in accordance with the manufacturer's recommendation.

This repair process can be stopped and restarted as job conditions allow. All washed out areas should be allowed to cure 24 hours, clean and coat again with the Reliner MSP Cement liner material. The Sewer Lift Station Wet Well