

CONTRACT DOCUMENTS AND SPECIFICATIONS

FOR

Lansdowne South Trunk Replacement

**Wastewater System Improvements
Division of Water Quality
Lexington Fayette Urban County Government**

Remedial Measures Plan ID No. WH-5

LFUCG Bid No. 174-2018

Date: January 29, 2019

PREPARED BY:

**ECSI, LLC
340 South Broadway, Suite 200
Lexington, KY 40508**

Edition: Bid Documents

Updated 7/27/2016

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SECTION 00100 - ADVERTISEMENT FOR BIDS

1.01 INVITATION

Sealed proposals for the following work will be received by the Lexington-Fayette Urban County Government (LFUCG) until 2:00 PM, local time, February 28, 2019 for furnishing all labor and/or materials and performing all work as set forth in the Contract Documents prepared by and for Lexington-Fayette Urban County Government, Division of Water Quality (OWNER). Immediately following the scheduled closing time for reception of Bids, all proposals which have been submitted in accordance with the above will be publicly opened and read aloud.

1.02 DESCRIPTION OF WORK

The project includes providing all construction supervision, labor, materials, tools, test equipment necessary for the Lansdowne South Trunk Sewer Replacement, which includes the replacement of approximately 5000 linear feet of 15-inch trunk sewer with larger capacity pipes. The new sewer will consist of approximately 2,900 feet of 21-inch sewer and 2,100 feet of 24-inch sewer. The Lansdowne project will connect on the downstream end with two other LFUCG sewer projects that are also on a concurrent construction schedule, therefore, coordination between the three projects is mandatory.

1.03 OBTAINING PLANS, SPECIFICATIONS, AND BID DOCUMENTS

Plans, Specifications, and Contract Documents may be obtained from Lynn Imaging, 328 Old Vine Street, Lexington, KY 40507, (859) 255-1021 or (www.lynnimaging.com) and click on planroom for a non-refundable price of reproduction for each full set of plans and documents. Contract Documents may be examined at the following places:

LFUCG
Division of Central Purchasing
200 East Main Street
Third Floor, Room 338
Lexington, KY 40507
(859) 258-3320

McGraw-Hill Co./F.W. Dodge
2321 Fortune Drive
Suite 112-A
Lexington, KY 40509

LFUCG
Division of Water Quality
125 Lisle Industrial Avenue
Lexington, KY 40511
(859) 425-2400

Builders Exchange
1035 Strader Drive
Suite 100
Lexington, KY 40505
(859) 288-0011

1.04 METHOD OF RECEIVING BIDS

Bids will be received from Prime contracting firms on a unit price basis. Bids shall be submitted in the manner and subject to the conditions as set forth and described in the Information Available to Bidders and Bid Form. Sealed Bids shall be clearly marked on the outside of the envelope as follows: Company Name and Address, Bid Invitation Number, and the Project Name. Bids are to remain sealed until official Bid closure time.

1.05 METHOD OF AWARD

Determination of the successful Bid will be based on the lowest responsive and responsible Bidder whose qualifications indicate the award will be in the best interest of the OWNER and

whose Bid/proposal complies with all the prescribed requirements. No Notice of Award will be given until the OWNER has concluded such investigation as deemed necessary to establish the responsibility, qualifications and financial ability of Bidders to do the work in accordance with the Contract Documents to the satisfaction of the OWNER within the time prescribed. The OWNER reserves the right to reject the Bid of any Bidder who does not pass such investigation to the OWNER's satisfaction. In analyzing Bids, the OWNER may take into consideration alternate and unit prices, if requested by the Bid forms.

1.06 BID WITHDRAWAL

No Bidder may withdraw his Bid for a period of ninety (90) calendar days after the closing date for receipt of Bids. Errors and omissions will not be cause for withdrawal of Bid without forfeit of Bid Bond. Bids may be withdrawn in person prior to the closing date of receipt of Bids.

1.07 BID SECURITY

All Bids shall be accompanied by a Bid Bond of not less than five percent (5%) of the amount of the Bid executed by a Surety Company authorized to do business in the Commonwealth of Kentucky and countersigned by a licensed Kentucky Resident Agent, representing the Surety Company. Certified Check or Bid Bond shall be payable to Lexington-Fayette Urban County Government.

1.08 SUBMISSION OF BIDS

Contractors shall submit their Bids to the Lexington-Fayette Urban County Government, Division of Purchasing, Third Floor, 200 East Main Street, Lexington, Kentucky 40507. Bids shall be submitted in a sealed envelope not later than 2:00 p.m. (local time) February 28, 2019. Sealed proposals shall be marked clearly on the outside of the container "**Sealed Proposal for: Lansdowne South Trunk Sewer Replacement to be opened at 2:00 p.m. Local Time, February 28, 2019.**" Bids received after the scheduled closing time for receipt of Bids will not be considered and will be returned unopened.

1.09 RIGHT TO REJECT

The Lexington-Fayette Urban County Government reserves the right to reject any and all Bids and to waive all informalities and/or technicalities where the best interest of the Lexington-Fayette Urban County Government may be served.

1.10 NOTICE CONCERNING MWDBE GOAL

Notice of requirement for Affirmative Action to ensure Equal Employment Opportunities and Disadvantaged Business Enterprises (DBE), Minority-Owned Business Enterprises (MBE), and Woman-Owned Business Enterprises (WBE) Contract participation.

LFUCG has set a goal that not less than ten percent (10%) of the total value of this Contract be subcontracted to MWDBEs. The Lexington Fayette Urban County Government also has set a goal that not less than three percent (3%) of the total value of this Contract be subcontracted to Veteran-owned Small Businesses. The goal for the utilization of MWDBEs as well as Veteran subcontractors is a recommended goal. Contractor(s) who fail to meet such goal will be expected to provide written explanations to the Director of the Division of Purchasing of efforts they have made to accomplish the recommended goal, and the extent to which they are successful in accomplishing the recommended goal will be a consideration in the procurement process.

Depending on the funding source, other MWDBE goals may apply.

For assistance in locating MWDBE Subcontractors contact:

Sherita Miller, Division of Central Purchasing
LFUCG
200 East Main Street, 3rd Floor, Room 338
Lexington, Kentucky 40507
smiller@lexingtonky.gov

1.11 PRE-BID MEETING

A non-mandatory pre-Bid meeting will be held at 9:00 AM local time, February 4, 2019 at the Division of Water Quality, 115 Lisle Industrial Avenue, Lexington, KY, North Elkhorn Conference Room.

1.12 CONSENT DECREE REQUIREMENTS

The work to be provided through this Bid will assist the Lexington-Fayette Urban County Government (the "Owner") in successfully implementing the Agreement (Contract) and complying with any requirements which are related to the CONSENT DECREE entered in a case styled *United States & Commonwealth of Kentucky v. Lexington-Fayette Urban County Government*, United States District Court for the Eastern District of Kentucky, Civil Action No. 5:06-cv-386-KSF (the "CONSENT DECREE"). The services provided through this Bid are hereinafter referred to as the Agreement (Contract). The primary goal of the Agreement (Contract) is to provide the owner with the technical support and/or construction services necessary to successfully meet the obligations and deadlines of the CONSENT DECREE.

The Bidder shall familiarize itself with and shall at all times comply with the CONSENT DECREE, and all federal, state and local laws, ordinances, and regulations that in any manner affect the Agreement (Contract). Time is of the essence in the performance of Agreement (Contract). Bidder is aware that the Owner is subject to penalties for non-compliance with the CONSENT DECREE deadlines.

If delays result solely by reason of acts of the Bidder, the Bidder shall be held liable for any financial penalties incurred by the Owner as a result of the delay, including but not limited to those assessed pursuant to the CONSENT DECREE. In the event the parties cannot mutually agree upon the cause(s) associated with the delays in completing project deliverables, the Bidder must immediately notify the Owner in the event of such delay, and provide the Owner a written action plan within five (5) business days on how it will attempt to resolve the delay.

In the event that Bidder's delay or other nonperformance of its obligations hereunder results in the imposition of penalties against the Owner pursuant to the CONSENT DECREE, or the Owner otherwise suffers damage as a result of such delay or nonperformance, Bidder shall be solely liable to Owner for any and all such damages, including any costs and attorney's fees.

An electronic version of the CONSENT DECREE is available on the LFUCG web page for review or to print a copy at no charge.

END OF SECTION

SECTION 00300 – INFORMATION AVAILABLE TO BIDDERS

1.01 RECEIPT AND OPENING OF BIDS

The Lexington-Fayette Urban County Government (herein called the Owner) invites Bids from firms on the project described in the Advertisement for Bids. The Owner will receive Bids at the Division of Purchasing, at the time and in the manner set forth in the Advertisement for Bids, and the Bids will then be publicly opened and read aloud. The Owner may consider informal any Bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all Bids. Any Bid may be withdrawn prior to the scheduled time for the opening of Bids or authorized postponement thereof. Any Bid received after the time and date specified shall not be considered. No Bidder may withdraw a Bid within ninety (90) days after the actual time and date of the Bid opening, but Owner may, in its sole discretion, release any Bid and return the Bid Security prior to that date.

The Lexington-Fayette Urban County Government assumes no responsibility for Bids that are not addressed and delivered as indicated above. Bids that are not delivered to the Division of Central Purchasing by the stated time and date will be rejected.

1.02 PREPARATION OF BID

Each Bid must be submitted on the prescribed Bid Form. All blank spaces for the Bid prices must be filled in, either in ink or typewritten, for both unit prices and extensions. Totals for each Bid item must be added to show the total amount of the Bid. Each Bid must be submitted in a sealed envelope bearing on the outside the name of the Bidder, the Bidder's address, the name of the project, the invitation number and time and date for which the Bid is submitted. Bids must be addressed to the Director of Purchasing, Lexington-Fayette Urban County Government, Third Floor, 200 East Main Street, Lexington, Kentucky 40507. If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed as specified above.

1.03 SUBCONTRACTS

The Bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the Owner. All proposed subcontractors must be identified on Bid Form. Prior to the award of Contract, the Owner or the Owner's representative will advise the Contractor of the acceptance and approval thereof or of any action necessary to be taken. Should any Subcontractor be rejected by the Owner, the Contractor shall present a new name and/or firm to the Owner at no change in the Contract Price.

1.04 QUALIFICATIONS OF BIDDER

The Owner may make such investigations as the Owner deems necessary to determine the ability of the Bidder to perform the Work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Agreement (Contract) and to complete the Work contemplated therein. Conditional Bids will not be accepted.

In evaluating Bids, Owner shall consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and alternatives and unit or lump sum prices, as requested. Owner may consider maintenance requirements, performance data, and disruption or damage to private property. The contract, if awarded, will be awarded to the lowest, qualified, responsible Bidder based upon Owner's evaluation which indicates that the award will be in the best interest of Owner and the general public.

In the event there is any question as to the Bidder's qualifications and ability to complete the work, a final determination will be made in accordance with a fair evaluation by the Lexington-Fayette Urban County Government of the above listed elements.

- A. If the Owner requires filling out a detailed financial statement, the Bidder may provide its current certified financial statement(s) for the required time interval.
- B. Corporate firms are required to be registered and in good standing with the requirements and provisions of the Office of the Secretary of State, Commonwealth of Kentucky.
- C. Good standing with Public Works Act - any Contractor and/or subcontractors in violation of any wage or work act provisions (KRS 337.510 to KRS 337.550) are prohibited by Statutory Act (KRS 337.990) from bidding on or working on any and all public works contracts, either in their name or in the name of any other company, firm or other entity in which he might be interested. No Bid from a prime contractor in violation of the Act can be considered, nor will any subcontractor in violation of the Act be approved and/or accepted. The responsibility for the qualifications of the subcontractor is solely that of the prime contractor.
- D. Documents Required of Contractor - (1) A sworn statement signed by the President or owner of the Company regarding all current work in progress anywhere; (2) A document showing the percent of completion of each project and the total worth of each project; and (3) Documentation showing the percentage of the DBE employment levels on each project of the Bidder's current work force, and DBE participation levels for Subcontractors.
- E. Optional Owner Requirements - The Owner, at its discretion, may require the Bidder/Contractor to provide: (1) A current detailed financial statement for a period including up to 3 prior years. (2) Financial security or insurance in amounts and kinds acceptable to the Owner to meet the financial responsibility requirements for the Contractor to indemnify the Owner. (3) Additional information and/or DBE work force data, as well as DBE participation data.
- F. Each Bidder agrees to waive any claim it has or may have against the Owner, the Architect/Engineer, and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any Bid.

1.05 BID SECURITY

- A. Each Bid must be accompanied by a Bid bond prepared on a Form of Bid Bond and attached thereto, duly executed by the Bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the Bid. Such Bid bond will be returned to the unsuccessful Bidder(s) only upon written request to the Director of Central Purchasing within seven (7) days of opening of Bids. Bid bond shall be made payable to the Lexington-Fayette Urban County Government. Bid security is not required for projects under \$50,000.
- B. Bonds shall be placed with an agent licensed in Kentucky with surety authorized to do business within the state. When the premium is paid for such coverage, the full commission payable shall be paid to such local agent who shall not divide such commission with any person other than a duly licensed resident local agent.

1.06 LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful Bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within ten (10) days after he has received notice of the acceptance of his Bid, shall forfeit

to the Owner, as liquidated damages for such failure or refusal, the security deposited with his Bid.

1.07 TIME OF COMPLETION AND LIQUIDATED DAMAGES

Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" from the Owner and to fully complete the Project within the time as specified in the Contract Documents. Bidder must agree also to pay liquidated damages for each consecutive calendar day thereafter as specified in the Contract Documents.

1.08 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

- A. It is the responsibility of each Bidder before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site(s) to become familiar with local conditions that may affect cost, progress, performance or furnishing of the work, (c) consider Federal, State and Local laws and regulations that may affect cost, progress, performance or furnishing of the work, (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify Engineer of all conflicts, errors or discrepancies in the Contract Documents.
- B. Bidders should examine the requirements of the General Conditions for information pertaining to subsurface conditions, underground structures, underground facilities, and availability of lands, easements, and rights-of-way. The completeness of data, presented in the Contract Documents, pertaining to subsurface conditions, underground structures, and underground facilities for the purposes of bidding or construction is not assured. The Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (surface and subsurface) which may affect cost, progress, performance or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents. On request in advance, Owner will provide access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes, clean up and restore the site to its former condition upon completion of such explorations.
- C. The submission of a Bid will constitute an incontrovertible representation by the Bidder that Bidder has complied with every requirement of this Article; that without exception the Bid is premised upon furnishing and performing the Work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents; and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

1.09 ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the Contract Documents will be made to any Bidder orally. Every request for such interpretation should be in writing addressed to the Director of Central Purchasing, who in turn will have an addendum issued for the Lexington-Fayette Urban County Government, and to be given consideration must be received prior to the date fixed for the opening of Bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications. Acknowledgement of the receipt of addenda must be included with all submitted Bids. Failure of any Bidder to receive any such addendum or interpretation shall not relieve such Bidder from any obligation under his Bid as submitted. All addenda so issued shall become part of the Contract Documents.

1.10 SECURITY FOR FAITHFUL PERFORMANCE

- A. Simultaneously with the delivery of the executed Contracts, the Contractor shall furnish Performance, Payment, and Erosion and Sediment Control Bonds as security for the faithful performance of this Contract and for payment of all persons performing labor on the Project under this Contract and furnishing materials in connection with this Contract. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner and authorized to do business in the Commonwealth of Kentucky.
- B. The Contractor shall furnish the Warranty Bond upon completion of the Work, prior to the Owner's release of the final payment.
- C. All bonds required by this Contract and laws of this State shall be placed with agents licensed in the State of Kentucky. When the premium is paid for such coverage's, the full commission shall be paid to such local agent who shall not divide such commission with any person other than a duly licensed resident local agent.
- D. Contractor shall use standard Performance, Payment, Warranty, and Erosion and Sediment Control Bond forms such as documents provided with the Contract Documents or AIA form A312 (latest edition), for the Performance and Payment Bonds only.
- E. The Performance Bond shall be in the amount of one hundred percent (100%) of the Agreement (Contract) amount. The Payment Bond shall be in the amount of one hundred percent (100%) of the Agreement (Contract) amount. The Warranty Bond shall be in the amount of five percent (5%) of the final construction cost amount (based on contractor's final pay request). The Erosion and Sediment Control Performance Bond shall be in the amount of the Erosion and Sediment Control lump sum price in the Bid Form.

1.11 POWER OF ATTORNEY

Attorney-in-fact who signs Bid bonds or Contract bonds must file with each bond a certified and effectively dated copy of their Power of Attorney.

1.12 TAXES AND WORKMEN'S COMPENSATION

The Contractor and subcontractor will be required to accept liability for payment of all payroll taxes, sales and use tax, and all other taxes or deductions required by local, state or federal law, such as social security measured by wages. Each shall carry Workmen's Compensation Insurance to the full amounts as required by Statutes and shall include the cost of all foregoing items in the Bid. The Contractor will not otherwise be reimbursed or compensated for such tax payments. The Contractor is urged to ascertain at his own risk his actual tax liability in connection with the execution or performance of this Contract.

1.13 LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract throughout, and they will be deemed to be included in the Contract, the same as though herein written out in full.

1.14 EROSION AND SEDIMENT CONTROL AND PERMITS

The Contractor and Subcontractors performing Work on projects on behalf of the Owner shall also comply with all applicable federal, state, and local environmental regulations and all requirements and conditions set forth in specifications herein.

1.15 PREVAILING WAGE LAW AND MINIMUM HOURLY RATES

Federal or State wage rates are not applicable to this project.

1.16 AFFIRMATIVE ACTION PLAN

The successful Bidder must submit with their bid the following items to the Urban County Government (see section 00410 – Bid Form):

- A. Affirmative Action Plan of the firm
- B. Current Work Force Analysis Form
- C. Good Faith Effort Documentation to meet the MWDBE goals.
- D. List of Disadvantaged Business Enterprise Subcontractors and the Dollar Value of each Subcontract

A Work Force Analysis on the prescribed form shall be submitted for each Contract. Failure to submit these items as required herein may result in disqualification of the Bidder from award of the Contract.

All submissions should be directed to:

Director, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, Third Floor
Lexington, KY 40507

1.17 CONTRACT TIME

The number of calendar days within which the Work is to be substantially completed and ready for final payment (the Contract Time) is set forth in the Bid Form and the Agreement (Contract).

1.18 SUBSTITUTE OR "OR-EQUAL" ITEMS

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by the Contractor if acceptable to the Engineer and Owner, application for such acceptance will not be considered by the Engineer and Owner until after the effective date of the Agreement (Contract). The procedure for submission of any such application by the Contractor and consideration by the Engineer and Owner is set forth in the General Conditions.

1.19 EQUIPMENT MANUFACTURERS LIST

The Equipment Manufacturers identified in the Equipment Manufacturers List are the only equipment manufacturers/suppliers to be considered in the Bid. There are and will be no other equals considered during the bidding phase for these equipment items. The Contractor may select any of the listed manufacturers for each item and must circle the selected manufacturer for each item at the time of Bid submission.

The design was completed based upon the first listed manufacturer. The Contractor, at no cost to the Owner, will be responsible for any changes to the structures, piping, electrical, instrumentation, or other to accommodate any required changes should a vendor other than the

first listed be selected in the bid. This will include payment to the Engineer of Record for any required redesign.

1.20 ALTERNATE BIDS

Bidders shall submit alternate Bids/proposals only if and when such alternate Bids/proposals have been specifically requested in an Advertisement for Bids. If alternate Bids/proposals are requested in an Advertisement for Bids, the form of submission of such alternate Bid and the conditions under which such alternate Bids will be considered for award of a contract will be established in the Advertisement.

Any Bidder who submits a Bid incorporating an alternate proposal when alternate Bids/proposals have not been requested in the Advertisement for Bids shall have his/her Bid rejected as non-responsive.

Any Bidder who submits a Bid incorporating two (2) or more prices for an item or groups of items (unless such method of pricing is requested in the Advertisement for Bids), or which imposes conditions for acceptance other than those established in the Advertisement for Bids, shall have their Bid rejected as non-responsive.

1.21 SIGNING OF AGREEMENT (CONTRACT)

When Owner gives a Notice of Award to the successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement (Contract) with all other written Contract Documents attached. Within ten days thereafter, Contractor shall sign and deliver the required number of counterparts of the Agreement (Contract) and attached documents to Owner with the required Bonds, Certificate of Insurance, and Power of Attorney. The Owner will deliver one fully signed counterpart to Contractor at such time as it has been signed by the Mayor.

1.22 ASSISTANCE TO BE OFFERED TO DISADVANTAGED BUSINESS ENTERPRISE (MWDDBE) CONTRACTORS

A. Outreach for MWDDBE(s)

The Lexington-Fayette Urban County Government (LFUCG) maintains a database of MWDDBE contractors and organizations. When a LFUCG construction project is advertised for bidding, notices are sent to companies registered at <https://lexingtonky.ionwave.net>. The notices describe the project and indicate the deadline for submitting bids.

If you wish to be added to the LFUCG MWDDBE contractor database, please contact:

Sherita Miller, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, Room 338
Lexington, Kentucky 40507
smiller@lexingtonky.gov

B. Bid Bond Assistance for MWDDBE(s)

For those MWDBE contractors who wish to bid on LFUCG project, bid bond assistance is available. This bid bond assistance is in the form of a "Letter of Certification" which is accepted by the LFUCG's Division of Purchasing, in lieu of a bid bond. The "Letter of Certification" must be included in the bid package when it is submitted to the Division of Purchasing. The "Letter of Certification" will reference the specific project for which the bid is being submitted, and the time and date on which the bid is due. Bid bond assistance must be requested from the Lexington-Fayette Urban County Government's Division of Central Purchasing.

C. Eligibility for Bid Bond Assistance for MWDBE(s)

In order to be eligible for any Bid bonding assistance, a MWDBE construction company must be owned or controlled at the level of 51% or more by a member or members of a minority group or females. Prior to receiving assistance, a statement providing evidence of ownership and control of the company by a member or members of a minority group or females must be signed by the Owner or corporate officer and by an attorney or accountant submitted to:

Sherita Miller, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, Room 338
Lexington, Kentucky 40507
smiller@lexingtonky.gov

D. MWDBE and Veteran Subcontractors

The LFUCG will, upon request, assist prime contractors in the procurement of eligible DBE and Veteran subcontractors in an effort to achieve 10% minimum MWDBE goal and to achieve 3% minimum Veteran goal.

For a list of eligible subcontractors, please contact:

Sherita Miller, Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street, Room 338
Lexington, Kentucky 40507
smiller@lexingtonky.gov

1.23 MWDBE PARTICIPATION GOALS

A. GENERAL

1. The LFUCG request all potential contractors to make a concerted effort to include Minority-Owned (MBE), Woman-Owned (WBE) and Disadvantaged (DBE) Business Enterprises as subcontractors or suppliers in their bids.
2. Toward that end, the LFUCG has established 10% of total procurement costs as a Goal for participation of Minority-Owned, Woman-Owned and Disadvantaged Businesses on this contract.
3. The LFUCG has also established a 3% of total procurement costs as a Goal for participation of Veteran-Owned Small Businesses (VOSB).
4. **It is therefore a request of each Bidder to include in its bid, the same goal (10%) for MWDBE participation, the same goal (3%) for Veteran participation and other requirements as outlined in this section.**

B. PROCEDURES

1. The successful bidder will be required to report to the LFUCG, the dollar amounts of all payments submitted to Minority-Owned, Woman-Owned or Veteran-Owned subcontractors and suppliers for work done or materials purchased for this contract. (See Subcontractor Monthly Payment Report, section 00410 – Bid Form)
2. Replacement of a Minority-Owned, Woman-Owned or Veteran-Owned subcontractor or supplier listed in the original submittal must be requested in writing and must be accompanied by documentation of Good Faith Efforts to replace the subcontractor / supplier with another MWDBE Firm; this is subject to approval by the LFUCG. (See MWDBE Substitution Form, section 00410 – Bid Form)
3. For assistance in identifying qualified, certified businesses to solicit for potential contracting opportunities, bidders may contact:
 - a. The Lexington-Fayette Urban County Government, Division of Central Purchasing (859-258-3320)
4. The LFUCG will make every effort to notify interested MWDBE and Veteran subcontractors and suppliers of each Bid Package, including information on the scope of work, the pre-bid meeting time and location, the bid date, and all other pertinent information regarding the project.

C. DEFINITIONS

1. A Minority-Owned Business Enterprise (MBE) is defined as a business which is certified as being at least 51% owned and operated by persons of African American, Hispanic, Asian, Pacific Islander, American Indian or Alaskan Native Heritage.
2. A Woman-Owned Business Enterprise (WBE) is defined as a business which is certified as being at least 51% owned and operated by one or more Non-Minority Females.
3. A Disadvantaged Business (DBE) is defined as a business which is certified as being at least 51% owned and operated by a person(s) that are economically and socially disadvantaged.
4. A Veteran-Owned Small Business (VOSB) is defined as a business which is certified as being at least 51% owned and operated by a veteran and/or a service disabled veteran.
5. Good Faith Efforts are efforts that, given all relevant circumstances, a bidder or proposer actively and aggressively seeking to meet the goals, can reasonably be expected to make. In evaluating good faith efforts made toward achieving the goals, whether the bidder or proposer has performed the efforts outlined in the Obligations of Bidder for Good Faith Efforts outlined in this document will be considered, along with any other relevant factors.

D. OBLIGATION OF BIDDER FOR GOOD FAITH EFFORTS

1. **The bidder shall make a Good Faith Effort to achieve the Participation Goal for MWDBE and Veteran subcontractors/suppliers. The failure to meet the goal shall not necessarily be cause for disqualification of the bidder; however, bidders not meeting the goal are required to furnish with their bids written documentation of their Good Faith Efforts to do so.**
2. Award of Contract shall be conditioned upon satisfaction of the requirements set forth herein.

3. Section 00410 – Bid Form includes a section entitled "MWDBE Participation Form". The applicable information must be completed and submitted as outlined below.
4. **Failure to submit this information as requested may be cause for rejection of bid.**

E. DOCUMENTATION REQUIRED FOR GOOD FAITH EFFORTS

1. Bidders reaching the Goal are required to submit only the MWDBE Participation Form. The form must be fully completed including names and telephone number of participating MWDBE firm(s); type of work to be performed; estimated value of the contract and value expressed as a percentage of the total Lump Sum Bid Price. The form must be signed and dated, and is to be submitted with the bid.
2. Bidders not reaching the Goal must submit the "MWDBE Participation Form", the "Quote Summary Form" and a written statement documenting their Good Faith Effort to do so. If bid includes no MWDBE participation, bidder shall enter "None" on the subcontractor / supplier form). In addition, the bidder must submit written proof of their Good Faith Efforts to meet the Participation Goal (see section 00410 – Bid Form).

1.24 MINORITY BUSINESS ENTERPRISE PROGRAM



Sherita Miller, MPA
Minority Business Enterprise Liaison
Division of Central Purchasing
Lexington-Fayette Urban County Government
200 East Main Street
Lexington, KY 40507
smiller@lexingtonky.gov
859-258-3323

OUR MISSION: The mission of the Minority Business Enterprise Program is to facilitate the full participation of minority and women owned businesses in the procurement process and to promote economic inclusion as a business imperative essential to the long term economic viability of Lexington-Fayette Urban County Government.

To that end the city council adopted and implemented resolution 167-91—Disadvantaged Business Enterprise (DBE) 10% Goal Plan in July of 1991. The resolution states in part (a full copy is available in Central Purchasing):

"A Resolution supporting adoption of the administrative plan for a ten percent (10%) Minimum goal for disadvantaged business enterprise participation in Lexington-Fayette Urban County Government construction and professional services contracts; Providing that as part of their bids on LFUCG construction contracts, general Contractors shall make a good faith effort to award at least ten percent (10%) of All subcontracts to disadvantaged business enterprises; providing that divisions of LFUCG shall make a good faith effort to award at least ten percent of their Professional services and other contracts to disadvantaged business enterprises..."

A Disadvantaged Business Enterprise is defined as a business that has been certified as being at least 51% owned, operated and managed by a U.S. Citizen of the following groups:

- African-American
- Hispanic-American
- Asian/Pacific Islander
- Native American/Native Alaskan
- Non-Minority Female
- Economically and Socially Disadvantaged

In addition, to that end the city council also adopted and implemented resolution 167-91—Veteran-owned Businesses, 3% Goal Plan in July of 2015. The resolution states in part (a full copy is available in Central Purchasing):

"A resolution adopting a three percent (3%) minimum goal for certified veteran-owned small businesses and service disabled veteran-owned businesses for certain of those Lexington-Fayette Urban County contracts related to construction for professional services, and authorizing the Division of Purchasing to adopt and implement guidelines and/or policies consistent with the provisions and intent of this resolution by no later than July 1, 2015."

We have compiled the list below to help you locate certified MBE, WBE and DBE certified businesses. Below is a listing of contacts for LFUCG Certified MWDBEs and Veteran-Owned Small Businesses in (<https://lexingtonky.ionwave.net>)

Business	Contact	Email Address	Phone
LFUCG	Sherita Miller	smiller@lexingtonky.gov	859-258-3323
Commerce Lexington – Minority Business Development	Tyrone Tyra	ttyra@commercelexington.com	859-226-1625
Tri-State Minority Supplier Diversity Council	Susan Marston	smarston@tsmsdc.com	502-365-9762
Small Business Development Council	Shirie Hawkins, UK SBDC	smack@uky.edu	859-257-7666
Community Ventures Corporation	Phyllis Alcorn	palcorn@cvky.org	859-231-0054
KY Transportation Cabinet (KYTC)	Melvin Bynes	Melvin.bynes2@ky.gov	502-564-3601
KYTC Pre-Qualification	Shella Eagle	Shella.Eagle@ky.gov	502-782-4815
Ohio River Valley Women's Business Council (WBENC)	Sheila Mixon	smixon@orwbc.org	513-487-6537
Kentucky MWBE Certification Program	Yvette Smith, Kentucky Finance Cabinet	Yvette.Smith@ky.gov	502-564-8099
National Women Business Owner's Council (NWBOC)	Janet Harris-Lange	janet@nwbo.org	800-675-5066
Small Business Administration	Robert Coffey	robertcoffey@sba.gov	502-582-5971
LaVoz de Kentucky	Andres Cruz	lavozdeky@yahoo.com	859-621-2106
The Key News Journal	Patrice Muhammad	paaatricem@keynewsjournal.com	859-373-9428

1.25 OWNER PERMITS

Bidder shall refer to Section 00890 regarding permits that have been obtained by the Owner.

1.26 GEOTECHNICAL DATA

Bidder shall refer to Section 00320 regarding available geotechnical data for this Contract.

END OF SECTION



Geotechnical Engineers and Geologists.

**Geotechnical Engineering
Exploration**

**Project:
Lexington Fayette Urban County Government
Lansdowne South Trunk Sewer**

**Prepared for:
LFUCG
And
ECSI, LLC**

July 17, 2018

Providing Geotechnical Engineering • Forensic • Geologic • Special Inspection • Materials Testing Services



Geotechnical, Environmental
& Materials Engineering
Since 1957

July 17, 2018

Fred Eastridge, P.E.
ECSI, LLC
340 South Broadway, Suite 200
Lexington, KY 40508

**RE: Report of Geotechnical Exploration
LFUCG Lansdowne South Trunk Sewer
Lexington, Kentucky
L.E. Gregg Project Number: 2018019**

Mr. Eastridge,

L.E. Gregg Associates is pleased to present our report for the geotechnical exploration performed at the above referenced site. The attached report presents a review of the project information provided to us, a description of the site and subsurface conditions encountered, as well as any foundation and earthwork recommendations for the proposed project. This field exploration for this study was performed between April 24th and 26th, 2018.

Unless prior arrangements are made, any remaining soil samples will be discarded shortly after the issue date of this report. Rock cores will be retained for a period of 12 months and then discarded.

We appreciate the opportunity to assist you on this project. If we can be of further service on this or other projects, please contact us.

Respectfully,

L.E. GREGG ASSOCIATES

A handwritten signature in black ink, appearing to read "Steven Mortimer".

Steven Mortimer, P.E.
Project Engineer

A handwritten signature in black ink, appearing to read "Jason Ainslie".

Jason Ainslie, P.E.
President

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- Appendix A – Summary of Laboratory and Drilling Data
- Appendix B – Logs of Borings
- Appendix C – Site Location Map and Drawings
- Appendix D – Seismic Design Information

1.0 INTRODUCTION

1.1 PURPOSE OF EXPLORATION

The purpose of this exploration was to determine the general subsurface conditions existing at the project sites through a program of controlled drilling, sampling, and testing; and to evaluate these findings with respect to the project design, construction requirements, and currently accepted engineering practices. The purpose and scope of services were based off of drawing sheets C-07 and C-08 as well as, Appendix A - Geotechnical Investigation Scope of Work and Performance Criteria taken from the Request for Proposal for the Design and Preparation of Contract Documents and Services During Construction of the Lansdowne South Trunk, provided by Fred Eastridge, P.E. The purpose and scope is also outlined in L.E. Gregg proposal P18-024, dated April 6, 2018. More specifically, the objectives are;

1. Determine the textures, thicknesses, consistencies and general physical properties of the soil strata encountered at the boring locations, along with the depths to and elevations of the underlying bedrock surface beneath the proposed structure.
2. Determine the general geologic conditions existing at the site.
3. Determine the existing surface and subsurface water conditions at the site and their relation to design, construction, and service of the proposed project.
4. Perform the required soil and rock testing as required in Appendix A: Geotechnical Investigation Scope of Work and Performance Criteria.
5. Produce a report detailing the conditions encountered, testing results, and construction recommendations based on the encountered conditions.

2.0 PROJECT INFORMATION

2.1 BACKGROUND INFORMATION

Project information was provided in a request for proposal to L.E. Gregg Associates from ECSI, LLC. The project is for the construction of two crossings for the Lexington Fayette Urban County Government (LFUCG) Lansdowne South Trunk (LST) Sewer system. The construction of the LST gravity sewer system is in close proximity to the Wilson Downing tributary of West Hickman Creek and crosses Wilson Downing Road and Belleau Wood Drive. Due to this, a trenchless method will be required. The type of trenchless method used will be determined upon review of the subsurface conditions. These crossings will go under Wilson Downing Road between Ridgepoint Run and Allante Brook Court and Belleau Wood Drive between Pebble Creek Drive and Forest Green Drive. Boring layouts showing the location of crossings as well as the borings along each crossing are included in Appendix C.

2.2 SITE SURFACE CONDITIONS

The Wilson Downing crossing runs across Wilson Downing Road from the northwest to the southeast between Allante Brook Court and Ridgepoint Run. At the time of drilling the area had been cleared of nearly all trees and underbrush. The north side of the crossing was located in a very marshy area that was considerably wet at the surface. The south side of the crossing was relatively dry at the surface and covered with the remains of cut underbrush and limbs. It appears that the crossing lies within land that is currently owned by LFUCG.

The Belleau Wood crossing also runs from the west/northwest to the east/southeast. The area surrounding the crossing had not been cleared since the majority of the crossing lies within the limits of residential properties. The west end of the crossing lies in the yard of the residence at 3709 Belleau Wood Drive. The ground surface was uneven and slopes down to the northeast towards the creek. The east end of the crossing lies in the backyard of the residence at 616 Pebble Creek. The ground surface was relatively level with a slight slope to the south towards the creek.



Figure 1: Boring 4, Belleau Wood Crossing



Figure 2: Boring 4, Belleau Wood Crossing



Figure 3: Boring 5, Belleau Wood Crossing



Figure 4: Boring 6, Belleau Wood Crossing



Figure 5: Area of Boring B-1, Wilson Downing Crossing



Figure 6: Area of Boring B-2, Wilson Downing Crossing



Figure 7: Area of Boring B-3, Wilson Downing Crossing

2.3 SITE GEOLOGY

Geologic information was referenced from the Geologic Map of the Nicholasville Quadrangle, Jessamine and Fayette Counties, Kentucky, 1968. Materials underlying the northeast corner of the site are classified as Quaternary Alluvium. These materials are characterized by fine sand, silt, and clay in thin discontinuous beds and coarse sand and gravel lenses. Directly underlying the alluvium is the Clays Ferry Formation. This formation is characterized by interbedded shale (50%), silty shale (5%), and limestone (45%). Shale is greenish-gray to dark-gray and weathers brownish-gray to yellowish-gray, is calcareous and contains thin silty shale laminae. The limestone is light-gray, medium to coarse-grained, clastic with whole and fragmental fossils and silty sub-angular shale inclusions, and pyrite. The unit grades into overlying beds mapped with Garrard Siltstone. These rocks are faulted by the Bryan Station Fault zone and unconformably overly the Grier Limestone Member of the Lexington Limestone of Middle and Upper Ordovician Age. These rocks are characterized by limestone (80%) and shale (20%) that are irregularly bedded. Limestone is bluish-gray (fresh outcrop) to brownish-gray (weathered), fine to coarse grained, thin to thick bedded, nodular, slightly phosphatic with an argillaceous matrix. Shale is medium-gray, limy, in thin irregular beds between thicker limestone beds.

Materials underlying the southeast corner of the site are identical to those of the northeast corner except where the rocks are faulted by the Bryan Station Fault Zone. In this area of the site, the rocks unconformably overly the Middle to Upper Ordovician Tanglewood Limestone Member of the Lexington Limestone Formation. The Tanglewood Limestone Member is characterized by limestone with minor amounts of shale. The limestone is light-gray, medium to coarse grained, thin to thick bedded, with tabular beds and some crossbedding. These rocks are also phosphatic, siliceous and bioclastic. The shale is medium-gray, limy, thin-bedded, mostly interlaminated with shaly limestone in thin partings between limestone beds. Some beds contain chert nodules and silicified limestone.

No sinkholes are shown on the site or on land immediately adjacent; however, sinkholes are shown in the Tanglewood Limestone approximately 1,000 ft. north of the southeast corner of the site. The site itself is also in a medium to very high risk karst potential area.

As previously mentioned, the Bryan Station Fault Zone runs directly through the project area from the northeast to the southwest. This is shown in Appendix C. This is a surface fault that represents seismic activity that has occurred at least several million years ago and there has been no activity along these faults in recorded history. Seismic risk associated with these faults is very low. These faults may be associated with increased fracturing of the bedrock in the immediately adjacent area. The fracturing may effect slope stability and groundwater flow in these areas.

2.4 LABORATORY TESTING

The recovered soil and rock samples were transported to L.E. Gregg's laboratory. Selected soil samples were subjected to testing including; natural moisture content determinations (ASTM D2216), Atterberg limits (ASTM D4318), sieve analysis (ASTM D6913), visual/manual classifications and United Soil Classification System (ASTM D2488 and D2487) determinations were conducted in general accordance with the American Society of Testing and Materials (ASTM) practices and standards. The results are detailed in Appendix A.

Selected rock samples were either tested in house or sent to the Colorado School of Mines for testing including; Unconfined Compressive Strength (ASTM D2938), Cerchar Abrasivity Index (ASTM D7625), Splitting (Brazilian) Tensile Strength (ASTM D3967), Point Load Index Strength (ASTM D5731), Punch Penetration Testing, Moh's Hardness Scale, and Slake Durability (ASTM D4644). The results are included in a detailed report listed in Appendix A as well as listed in the tables below in Section 3.1 under Rock Conditions, Laboratory Testing Results for Rock Specimens.

3.0 EXPLORATION FINDINGS

3.1 SUBSURFACE CONDITIONS

General

Field testing procedures were performed in general accordance with ASTM practices, procedures, and standards. The borings were advanced using 4 in. solid flight augers (SFA). Samples were recovered in the undisturbed material below the tip of the auger using the standard drive sample technique in accordance with ASTM D 1586 or the thin walled tube sampling technique in accordance with ASTM D 1587. A 2 in. O.D. (outside diameter) by 1 3/8 in. I.D. (inside diameter) split-spoon sampler was driven a total of 18 in. with the number of blows of a 140 lb. hammer falling 30 in. recorded for each 6 in. of penetration. The sum of the blows for the final 12 in. of penetration is referred to as the Standard Penetration Test (SPT) result, commonly referred to as the N-value, or blow count, reported in blows per ft. (bpf). Split spoon samples were generally recovered at 1.0, 4.0, 6.5, and 9.0 ft. and at 5 ft. intervals thereafter. The boreholes were backfilled immediately with auger cuttings and/or granular material for safety considerations.

Soil Conditions

The geotechnical exploration consisted of six (6) soil test borings. Three (3) borings were located at each crossing. Borings B-1 thru B-3 were located at the Wilson Downing crossing and B-4 thru B-6 were located at the Belleau Wood crossing. The borings were placed near the proposed beginning, middle, and end of each tunnel crossing based on the alignment provided by ESCI, LLC. The borings were located, elevated, and staked in the field by AGE Engineering

Services, Inc. A few borings required small offsets in the field in order to avoid existing underground utilities. Approximate boring locations are shown on the boring layout in Appendix C.

The following subsurface descriptions are of a generalized nature in order to highlight the subsurface stratification features and material characteristics at the boring locations. The boring logs included in Appendix B of this report should be reviewed for specific information at each boring location. Information on actual subsurface conditions exists only at the specific boring locations and is relevant only to the time period that this exploration was performed. Variations may occur and should be expected at the site.

The subsurface conditions are described as follows. All measurements are approximate.

Wilson Downing Crossing

Boring B-1 encountered topsoil and organics from the surface to a depth of 12 in. Below the topsoil and extending to 5 ft., a lean clay with sand and rock fragments was encountered. Trace topsoil was encountered in the sample taken from 1.0-2.5 ft. The material was silty, brown and gray to dark brown, firm, and very moist to wet. Below the lean clay and extending to 6.8 ft., a fat clay material was encountered. The fat clay was tan and gray, silty, firm, and wet. A thin rock floater was encountered in the fat clay material from 5.3-5.6 ft. Below the fat clay and extending to 9.0 ft., thin layers of interbedded clay and weathered rock were encountered. Below this, weathered limestone and shale layers extended to a refusal depth of 15.0 ft.

Boring B-2 encountered topsoil from the surface to a depth of 6 in. Below the topsoil layer and extending to 6.5 ft., previously placed fill material consisting of lean clay and clayey gravel was encountered. The lean clay contained trace topsoil was silty, light brown to brown, firm, and wet. The clayey gravel was sandy, contained sandstone fragments and was brown to gray, loose, and moist. From below the fill and extending to 25.0 ft. weathered shale and weathered shale and interbedded limestone layers were encountered. The weathered material was light gray and hard.

Boring B-3 encountered topsoil from the surface to a depth of 12 in. Below the topsoil layer and extending to 4.5 ft., a lean clay with rock fragments was encountered. Trace organics were encountered in the sample taken from 1.0-2.5 ft. The lean clay material was silty, sandy, dark brown, soft to firm, and moist to wet. Below the lean clay and extending refusal at 7.3 ft., weathered shale was encountered. The weathered shale was gray and hard.

Belleau Wood Crossing

Boring B-4 encountered topsoil from the surface to a depth of 6 in. Below the topsoil layer and extending to 6.5 ft., lean clay with rock fragments was encountered. Trace organics were encountered in the sample taken from 1.0-2.5 ft. The lean clay material was silty, sandy, brown,

very moist to wet, and soft. A very thin, ~6 in., layer of gray, wet, and soft fat clay was encountered below the lean clay. Below the fat clay and extending to a refusal depth of 15.0 ft., weathered rock consisting of interbedded shale and limestone layers was encountered.

Boring B-5 encountered topsoil from the surface to a depth of 12 in. Below the topsoil layer and extending to 7.0 ft., previously placed fill consisting of lean clay with rock fragments and rock fill was encountered. Trace organics were encountered in the sample taken from 1.0-2.5 ft. From below the rock fill and extending to 8.0 ft., a layer of fat clay was encountered. The fat clay material was tan and gray, wet, and firm. From below the fat clay and extending to a refusal depth of 10.0 ft., weathered shale and limestone layers were encountered.

Boring B-6 encountered topsoil from the surface to a depth of 12 in. Below the topsoil layer and extending to 4.0 ft., previously placed fill consisting of lean clay with rock fragments was encountered. The lean clay materials were brown, silty, firm, and moist. From below the lean clay fill and extending to a refusal depth of 8.1 ft., weathered shale and limestone layers were encountered.

Table 1 – Standard Penetration N Values

Sample Number*	Standard Penetration N Value (bpf)					
	B-1	B-2	B-3	B-4	B-5	B-6
1	8	5	7	5	10	5
2	50+	5	52	5	50+	50+
3	50+	50+	50+	50+	24	NA
4	50+	50+	NA	50+	NA	NA
5	NA	50+	NA	NA	NA	NA

*Sample numbers correspond to sample numbers listed on boring logs in Appendix B. Samples were obtained at depths of 1.0, 4.0, 6.5, 9.0 ft. and 5 ft. intervals thereafter, with the exception of borings B-2 and B-5. The sample depths for B-2 and B-5 were slightly adjusted in the field due to encountered conditions.

Table 2 – Summary of Drilling Depths

Boring	Elevation (ft.)	Refusal Depth (ft.)	Refusal Elevation (ft.)
B-1	915.55	15.0	900.55
B-2	915.75	25.0 (terminated)	890.75
B-3	913.24	7.3	905.94
B-4	908.60	15.0	893.60
B-5	908.65	10.0	898.65
B-6	904.54	8.1	896.44

Rock Conditions

All of the borings in this exploration were advanced to refusal and weathered rock was generally encountered before refusal. Refusal was encountered at depths ranging from 7.3 to 15.0 ft. with

the exception of B-2, which was terminated at 25.0 ft. in weathered shale. Refusal generally indicates materials that cannot be penetrated with typical soil drilling methods. Therefore, refusal can indicate one or more of the following; coarse gravel, boulders, buried concrete, weathered rock, thin rock seams, or the upper surface of sound continuous bedrock. Core drilling is then required to determine the characteristics and soundness of the refusal materials. The refusal materials were cored according to ASTM D 2113, which utilizes a diamond studded bit fastened to the end of a hollow double tube core barrel. The assembly is lowered to refusal depth and the boring is flooded with water to control overheating and to bring the cuttings to the surface. As the drill is rotated at high speeds, the core bit advances into the refusal material and core samples are retained within the inner core barrel. These samples are removed after core runs of up to ten feet and placed in boxes for storage. The core samples were taken back to the laboratory where they were classified as to type of rock, percent recovery, and rock quality designation by an L.E. Gregg geologist or engineer. The percent core recovery (REC) is a ratio of the recovered sample length versus the total length attempted and is expressed as a percentage. The REC is used to assess the continuity of the refusal material. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the portions that are greater than or equal to 4 in., and dividing by the total length attempted. This is also expressed as a percentage and is used to assess the quality of the refusal material.

Boring B-1 encountered refusal at a depth of 15.0 ft. and rock coring was completed to a depth of 25.0 ft. The core consisted of limestone, fined grained, and thinly interbedded with shale. The core had recoveries (REC) of 70-88% and rock quality designations (RQD) of 0-18%, which indicates fairly continuous bedrock of very poor quality.

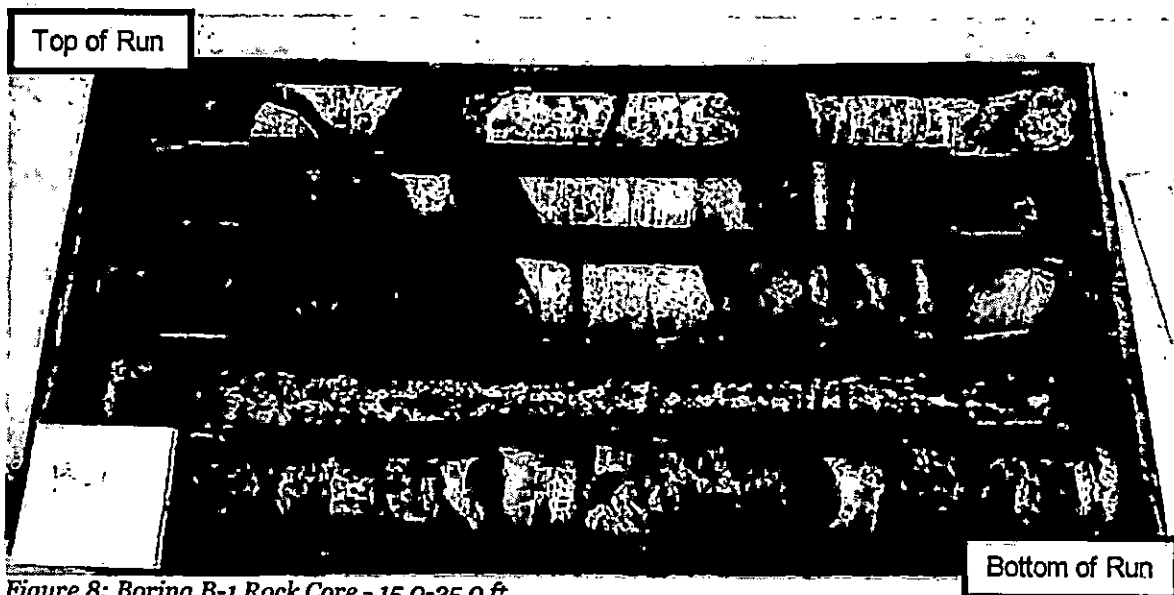


Figure 8: Boring B-1 Rock Core - 15.0-25.0 ft.

Boring B-3 encountered refusal at a depth of 7.3 ft. and rock coring was completed to a depth of 22.3 ft. The core consisted of limestone, fined to medium grained, and thinly interbedded with shale. The core had REC's of 60-100% and RQD's of 8-12%, which indicates competent to continuous bedrock of very poor quality.

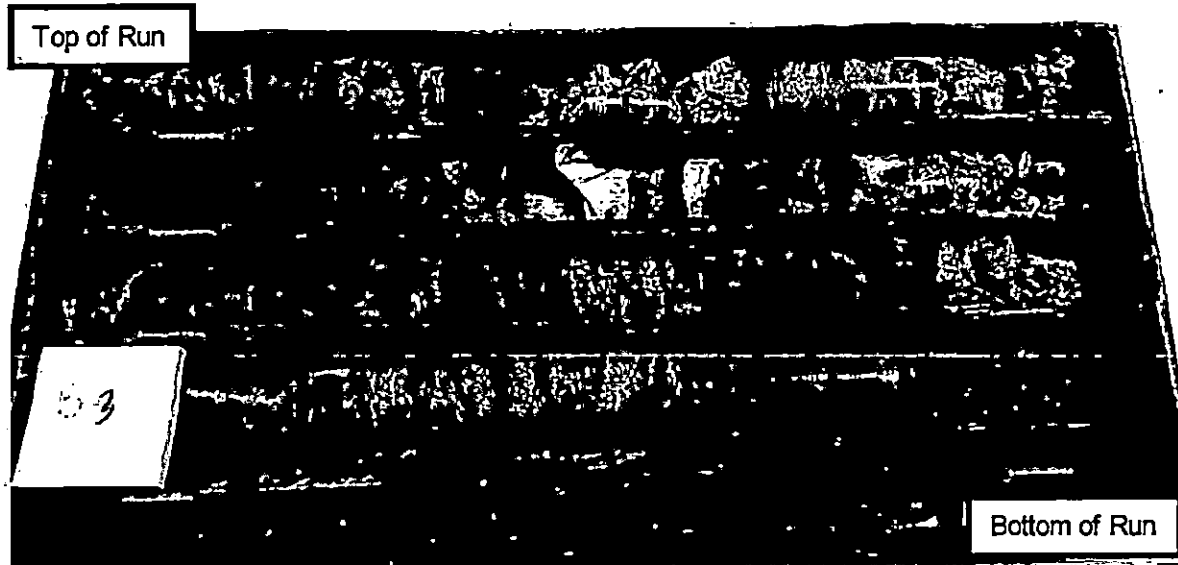


Figure 9: Boring B-3 Rock Core - 7.3-17.3 ft.

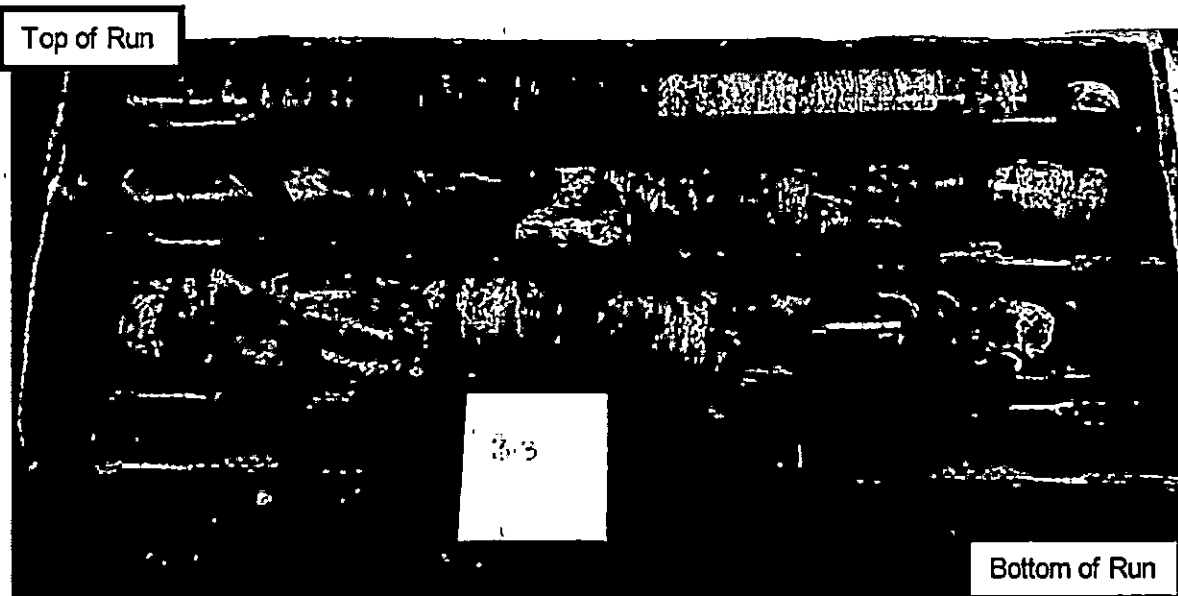


Figure 10: Boring B-3 Rock Core - 17.3-22.3 ft.

Boring B-4 encountered refusal at a depth of 15.0 ft. and rock coring was completed to a depth of 25.0 ft. The core consisted of limestone, fined to medium grained, and thinly interbedded with shale. The core had REC's of 80-92% and RQD's of 0-24%, which indicates fairly continuous to continuous bedrock of very poor quality.

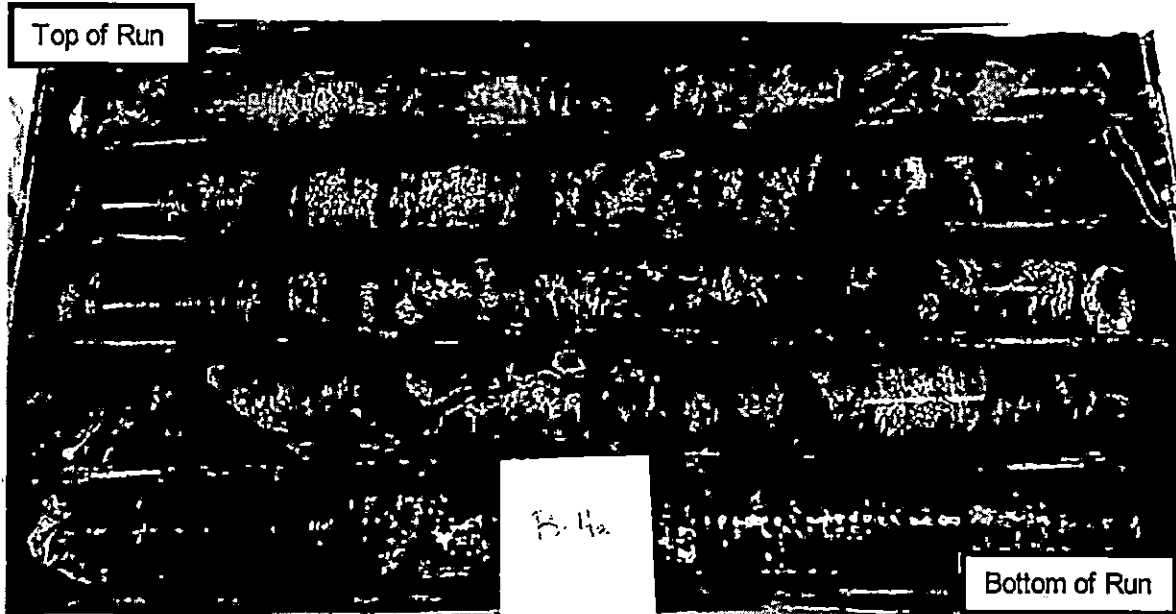


Figure 11: Boring B-4 Rock Core – 15.0-25.0 ft.

Boring B-5 encountered refusal at a depth of 10.0 ft. and rock coring was completed to a depth of 25.0 ft. The core consisted of limestone, fined to medium grained, and thinly interbedded with shale. The core had REC's of 72-100% and RQD's of 0-38%, which indicates fairly continuous to continuous bedrock of very poor to poor quality.

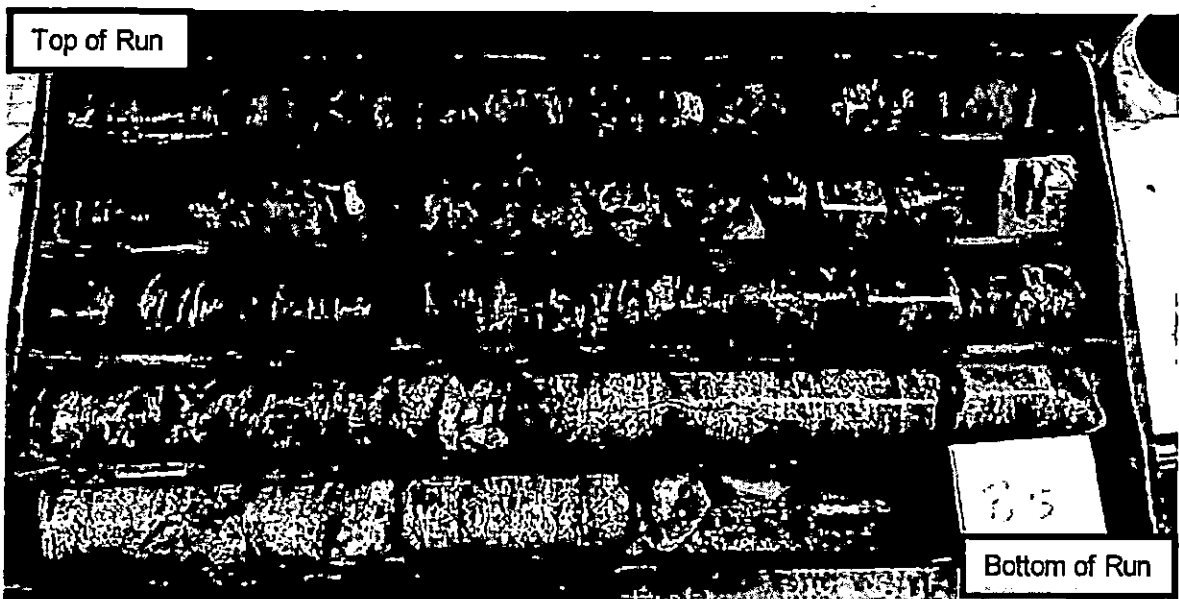


Figure 12: Boring B-5 Rock Core – 10.0-20.0 ft.

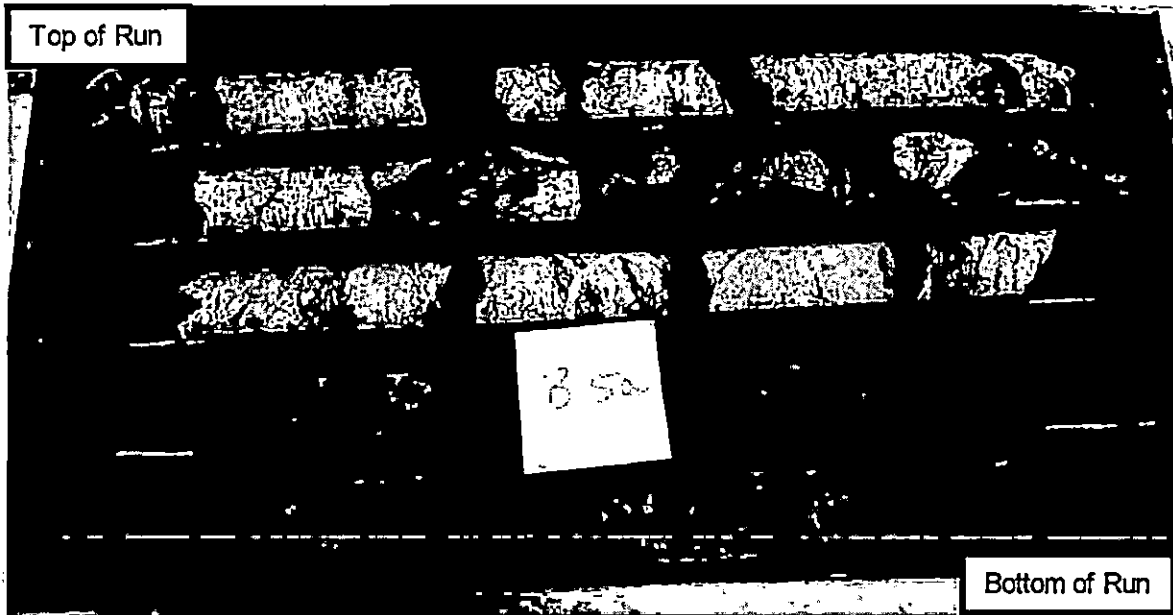


Figure 13: Boring B-5 Rock Core – 20.0-25.0 ft.

Boring B-6 encountered refusal at a depth of 8.1 ft. and rock coring was completed to a depth of 23.1 ft. The core consisted of limestone, fined to medium grained, and thinly interbedded with shale. The core had REC's of 94-100% and RQD's of 42-58%, which indicates continuous bedrock of poor to fair quality.

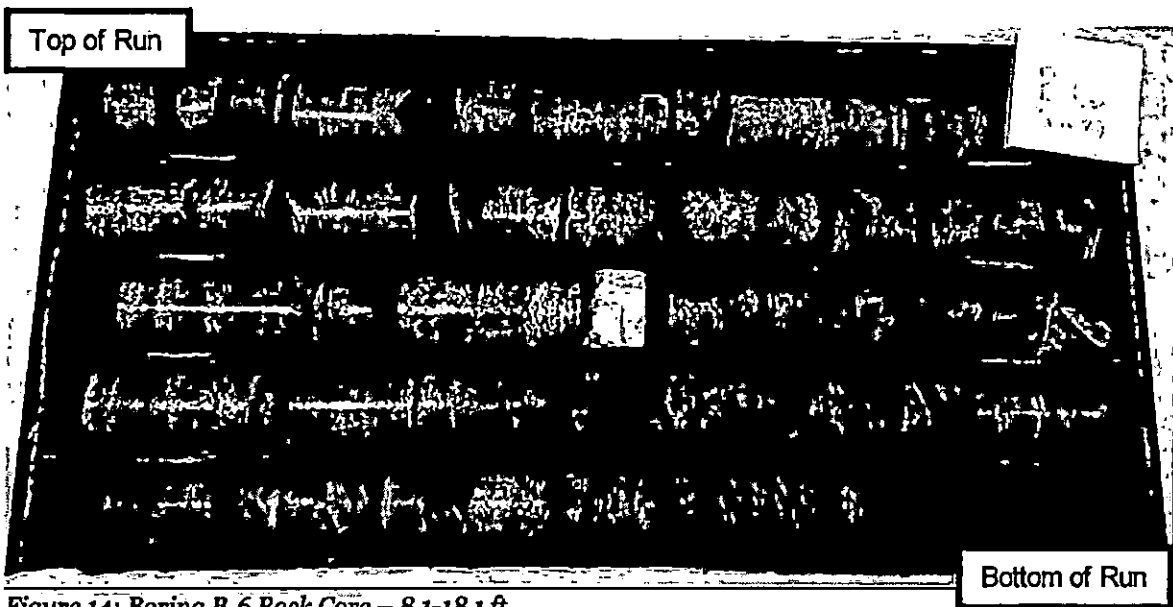


Figure 14: Boring B-6 Rock Core – 8.1-18.1 ft.

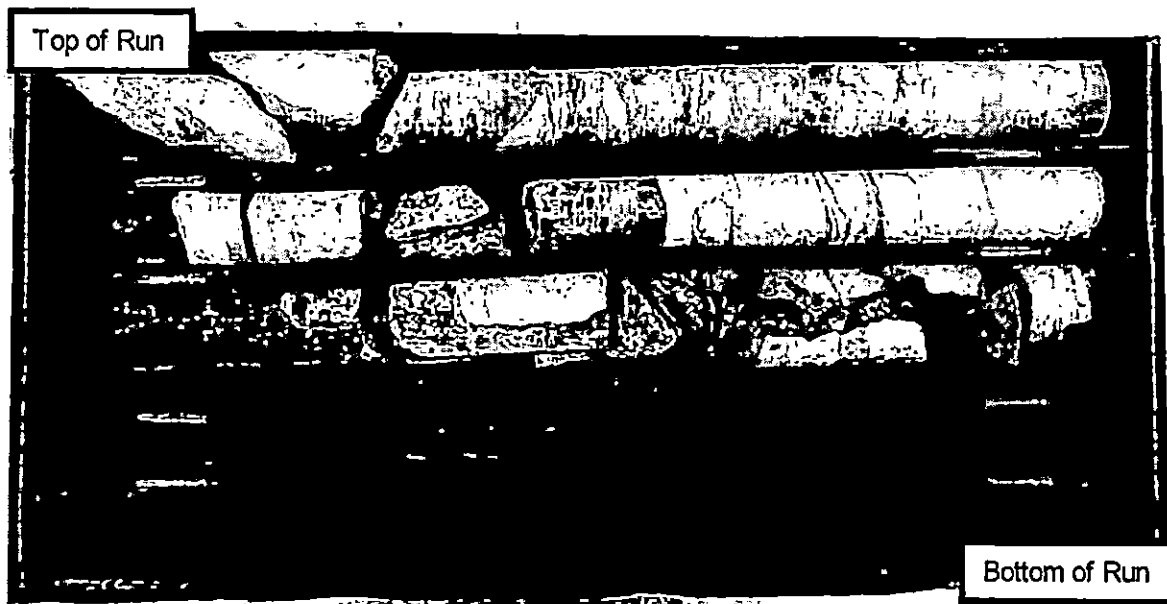


Figure 15: Boring B-6 Rock Core – 18.1-23.1 ft.

The bedding planes for all of the core specimens are generally perpendicular to the vertical coring axis. Some vertical and near vertical jointing was observed.

Table 3 – Summary of Rock Coring Sampling

Boring	Core Run	Beginning Elevation (ft.)	Ending Elevation (ft.)	Core Length (ft.)	Recovery (%)	Rock Quality Designation (%)
B-1	1	900.55	895.55	5.0	70	18
	2	895.55	890.55	5.0	88	0
B-3	1	905.94	900.94	5.0	60	10
	2	900.94	895.94	5.0	80	8
	3	895.94	890.94	5.0	100	12
B-4	1	893.60	888.60	5.0	80	24
	2	888.60	883.60	5.0	92	0
B-5	1	898.65	893.65	5.0	72	0
	2	893.65	888.65	5.0	100	24
	3	888.65	883.65	5.0	100	38
B-6	1	896.44	891.44	5.0	100	42
	2	891.44	886.44	5.0	94	44
	3	886.44	881.44	5.0	100	58

Laboratory Testing Results for Rock Specimens

Table 4 – ASTM D3967 Splitting (Brazilian) Tensile Strength*

Location	Average Length (in.)	Average Diameter (in.)	Failure Load (lbs)	Indirect (Brazilian) Tensile Strength		Failure Type
				(psi)	(MPa)	
B-1 – 15.0-20.0	1.32	1.858	3,025	787	5.4	Non-Structural
B-3 – 17.3-22.3	1.27	1.855	3,054	825	5.7	Structural
B-4 – 15.0-20.0	1.09	1.848	2,436	767	5.3	Non-Structural
B-5 – 20.0-25.0	1.16	1.863	2,377	699	4.8	Non-Structural
B-6 – 8.1-13.1	1.08	1.866	3,265	1,029	7.1	Non-Structural

*Completed by the Colorado School of Mines Earth Mechanics Institute

Table 5 – Punch Penetration Test*

Location	Punch Penetration Test Peak Slope (kips/in)
B-1 – 15.0-20.0	114
B-3 – 17.3-22.3	71
B-4 – 15.0-20.0	166
B-5 – 20.0-25.0	75
B-6 – 8.1-13.1	108

*Completed by the Colorado School of Mines Earth Mechanics Institute

Table 6 – ASTM D5731 Point Load Index Strength*

Location	Loading Direction	Length (in.)	Average Diameter (in.)	Failure Load (N)	Point Load Index Strength			
					Is		Is(50)	
					(psi)	(MPa)	(psi)	(MPa)
B-1 – 15.0-20.0	Diametric	2.57	1.853	9,855	645	4.45	628	4.33
B-3 – 17.3-22.3	**Axial	1.23	1.854	3,015	234	1.61	219	1.51
B-4 – 15.0-20.0	Diametric	2.86	1.858	6,750	440	3.03	428	2.95
B-5 – 20.0-25.0	Diametric	2.78	1.863	8,170	529	3.65	516	3.56
B-6 – 8.1-13.1	Diametric	2.81	1.857	4,760	310	2.14	302	2.08

*Completed by the Colorado School of Mines Earth Mechanics Institute

**Length of sample didn't meet standard for "Diametric" test

Table 7 – ASTM D7625 Cerchar Abrasivity Index *

Location	Cerchar Abrasivity Index**
B-1 – 15.0-20.0	1.3
B-3 – 17.3-22.3	0.3
B-4 – 15.0-20.0	0.6
B-5 – 20.0-25.0	1.2
B-6 – 8.1-13.1	1.3

*Completed by the Colorado School of Mines Earth Mechanics Institute

**CERCHAR tests have been run on saw cut surface. No correction factor has been added to the results.

Table 8 – ASTM D2938 Unconfined Compressive Strength *

Location	Load (lbs)	Strength (psi)
B-3 – 7.3-12.3	30,515	11,220
B-3 – 17.3-22.3	41,025	15,080
B-4 – 15.0-20.0	31,485	11,580
B-5 – 15.0-20.0	28,725	10,560
B-6 – 8.1-13.1	34,320	12,620

*Completed by L.E. Gregg's in house testing laboratory. Core material obtained from B-1 was not of sufficient length for unconfined compression testing.

Table 9 – Moh's Hardness *

Location	Moh's Relative Hardness
Shale Material	2
Limestone Material	5

*Completed by L.E. Gregg's in house testing laboratory. Shale and limestone material taken from various core locations produced similar relative hardness values.

Table 10 – ASTM D4644 Slake Durability Index *

Location	Slake Durability Index (%)	Natural Water Content (%)	SDI Type
B-5 – 15.0-20.0	90.7	1.2	1

*Completed by S&ME's Lexington, KY laboratory.

Water Conditions

Water was encountered at the Wilson Downing crossing between 5.0 and 7.3 ft. and at the Belleau Wood crossing between 4.0 and 7.0 ft. Water was generally encountered at or near the interface between the soil and weathered rock layers. Water may be present in the bedrock materials especially in the fractured zones near the surface. Perched water with the bedrock surface also may vary seasonally. Groundwater refers to any water that percolates through the soil and can refer to isolated or perched water pockets or water that occurs below the "water table", which is a zone that remains saturated and water-bearing. The groundwater levels encountered during drilling may fluctuate significantly over time due to weather influences and should not be considered a true static groundwater level.

3.2 SEISMIC SITE CLASSIFICATION

The Kentucky Building Code (current edition), Chapter 20 of the ASCE 7-10, and the USGS seismic design website were reviewed to determine the Seismic Site Classification for the site based on the following coordinates, 37.97742°N, 84.50586°W and 37.97473°N, 84.50256°W. Based on review of geologic data, previous experience with similar projects, and the subsurface conditions encountered, a **SEISMIC SITE CLASS "B"** would be recommended. A detailed report of the seismic data is included in Appendix D

Furthermore, using a Site Classification of **B**, we recommend the use of spectral response acceleration coefficients as follows:

0.2 second period: $S_s = 0.187g$ and Soil Factor = 1.0

1.0 second period: $S_r = 0.092g$ and Soil Factor = 1.0

The design spectral response acceleration factors are as follows:

$S_{DS} = 0.124$

$S_{DI} = 0.061$

4.0 GEOTECHNICAL RECOMMENDATIONS

4.1 GEOTECHNICAL CONSIDERATIONS

General

Based on the provided information, the subsurface conditions encountered and past experience with similar projects, the following considerations should be addressed. These considerations are briefly summarized below.

High Plasticity Clays

Fat clay (CH) materials were encountered near the bedrock soil interface. Fat clays are known for their high plasticity characteristics and can be subject to high volume changes with fluctuations in moisture content and are also known to have strength loss with increases in moisture content. The active zone for expansive clays in the region begins at the bearing elevation and can extend to refusal depths. With some exceptions, due to the weather patterns in the central Kentucky region, shrinking and swelling of bearing soils are not generally as severe as other regions since long periods of excessive wet or dry weather patterns typically do not occur. However, if construction takes place in the dryer summer and fall months, significant drying of the subgrade could occur after construction is complete in wetter months and become re-saturated causing heave. Conversely, moisture loss can contribute to settlement of structures. If moisture fluctuations are not controlled, shrink and swell could continue throughout the life of a structure causing structural issues, increased stress, and/or advanced deterioration.

Silty and/or Sandy Clays

Natural soils consisting of silty and/or sandy clays were encountered during this exploration. These materials can be sensitive to changing moisture conditions and can degrade under repetitive loading and unloading. Heavy equipment traffic during construction can cause these materials to break down. Care will need to be taken to organize construction traffic and the contractor will need to consider changing moisture conditions during construction. The owner and contractor should consider seasonal weather patterns for construction scheduling.

Bedrock Conditions

Auger refusal was encountered at elevations ranging from 893 to 906 ft. and weathered rock layers were encountered at elevations ranging from 900 to 909 ft. The bedrock consists of layers of interbedded limestone and shale. The cores obtained during the field exploration had REC's ranging from 60-100 and RQD's ranging from 0-58. The low REC and RQD values are due to the interbedded nature of the limestone and shale within the bedrock. The shale is much softer than the limestone and washout of the core material during the rock coring process was an issue.

Karst Potential

The project sites are located in a medium to very high risk karst environment. There is a potential for other karst features such as solution channels, rock pinnacles, or sinkholes to be encountered during construction. Close attention should be given during the construction process to identify possible karst features or surface movement. Adequate drainage to minimize water infiltration into the subsurface during and after construction should be provided to lessen the risk of damage due to karst activity during construction. Any significant solution features or dropouts encountered during construction will require remediation and will need to be evaluated on a case-by-case basis. A sinkhole could be repaired by compaction grouting methods and/or the use of an inverted cone filter. The cone filter method would require the excavating the material in a possible sink to find the throat, then lining the excavation with a filter fabric, and backfilling with crushed aggregate. L.E. Gregg should be contacted to provide specific recommendations for remediation of any encountered karst features on a case-by-case basis.

Ground Water or Free Water

As previously mentioned, water was generally encountered at or near the interface between the soil and weathered rock layers. Water may be present in the bedrock materials especially in the fractured zones near the surface. Perched water with the bedrock surface also may vary seasonally. The available geological information and past experience with similar projects indicates that it is possible that during construction ground water could be encountered. Ground water and/or free water encroaching upon construction excavations should be removed by placing a sump near the source of seepage and then pumping from the sump. Should heavy seepage or ponding of water occur, then L.E. Gregg should be contacted.

4.2 CROSSING CONDITIONS

The top of the 36 in. casing for the Wilson Downing crossing will run from an elevation of ~905.90 to 904.78 ft. The top of the 36 in. casing for the Belleau Wood crossing will run from an elevation of ~899.01 to 897.90 ft. Both lines will have a 0.50% fall in grade. Based on the profiles of the proposed alignments, the Wilson Downing crossing will encounter weathered layers of shale and limestone along with bedrock consisting of interbedded limestone and shale.

The Belleau Wood crossing will also encounter weathered layers of shale and limestone and bedrock consisting of interbedded limestone and shale as well as some fat clay interbedded with weathered rock layers. Water was typically encountered near the soil and weathered rock interface and water may be present in the bedrock in the fractured zones near the surface. Perched water with the bedrock surface also may vary seasonally. Both the Wilson Downing and the Belleau Wood crossing will encounter mixed face conditions, possible water inflows, and variable support conditions for the roof of the tunnel where soil and fractured/weathered rock is encountered. The bedrock surface should be expected to be irregular with pinnacles and/or solution widened joints. These conditions should be considered when selecting the trenchless method chosen for construction.

4.3 TRENCHLESS CONSTRUCTION METHODS

Trenchless methods include, but are not limited to; horizontal directional drilling (HDD), horizontal auger boring (bore and jack), pipe jacking/ramming, and the use of tunnel boring machines (TBM) or micro-tunnel boring machines (MTBM).

HDD creates a pilot hole along the alignment which then requires additional passes to enlarge the bore hole to a larger diameter suitable for the installation of the required pipe, which is pulled into the bore hole in the final step of the process. HDD uses surface mounted equipment to complete the process and may require a launch pit or shaft. Due to the requirement of surface mounted equipment, the tunnel must bend before reaching the intended grade and may flex or vary over the intended alignment. HDD can achieve accuracies of +/- 100 mm, which would mean that alignments are not installed precisely on grade. The IIDDD method is possible in rock conditions; however, it can be more costly than other trenchless methods due to the equipment and number of passes to remove the required amount of rock. HDD is not recommended for mixed soil conditions with rocks and boulders.

Horizontal auger boring involves the use of an auger machine to bore along a linear alignment. Launch and exit pits are excavated to the depth required for the pipe alignment. The pit must be properly shored since workers will be entering the pit to mount and operate the boring equipment. A casing pipe is advanced using powerful jacking devices while the auger removes the cuttings from the face of the excavation back to the launching pit. The cuttings must be then be removed and disposed. Once the casing is installed the carrier pipe can be installed through the casing. Mixed soil conditions containing rock, soil, and boulders are not recommended.

Pipe jacking or ramming requires the use of powerful jacking devices or percussion hammering devices to advance a casing pipe along the intended alignment. With pipe jacking, workers must remove the soils from the face of the jacketed pipe. With pipe ramming, the soils are removed by an auger, air or water jetting. These methods are intended for use in soil

conditions and not rock. They also cannot achieve the accuracy required for the installation of gravity sewer lines.

TBM and MTBM requires the use of a full face circular shield machine with a rotary cutting head. TBM is used for larger diameter projects in which the equipment is operated and steered by workers on the TBM. Cuttings are removed from the face using augers/conveyors and transported to the rear of the TBM. The casing is installed behind the rotary cutting head as the TBM advances. MTBM methods are used on a much smaller scale than TBM. MTBM requires the excavation of a launch and exit shaft in which the MTBM is lowered and hydraulic jacking equipment is installed to advance the MTBM and casing. The casing and/or carrier pipe are installed directly behind the MTBM resulting in a one pass install. MTBM can achieve accuracy of +/- 10 mm using laser guidance. The excavation cuttings are typically captured in a slurry which is pumped to the surface for disposal.

4.4 SHAFT CONSTRUCTION

The proposed trenchless technologies will require an entry and exit shaft or pit for the equipment and or personnel to access the sewer alignment. In reviewing the profiles of the alignments, the bottom of the shafts/pits will be required to be 15-20 ft. below the existing ground surface. The length, width, and shape of the shaft/pit required will depend on the type of machine required, length of pipe sections, diameter of pipe sections, worker clearance, cutting removal system, and drainage requirements. The manner of excavation will be chosen by the contractor; however, we would expect the use of tracked excavation equipment. Hoe ramming and/or blasting will likely be required for the bedrock layers. Depending on the size of the shaft required and space limitations at the project sites, a large caisson rig could be used to drill the shaft.

Excavations must be completed per the required Occupational Safety and Health Administration (OSHA) regulations. More specifically, *Construction Standards for Excavations, 29 CFR part 1926, subpart P*. Excavation dewatering and shoring are temporary works that are typically the responsibility of the contractor to design, install, maintain and monitor. These designs are dependent on performance criteria, the type of system selected, and construction sequencing. Therefore, detailed recommendations should be made in collaboration with the shoring and dewatering designers.

It is anticipated that dewatering will be accomplished using interior sumps that collect groundwater and discharge the water to an appropriate discharge facility. The dewatering system implemented should be selected so as to have minimal impact on the groundwater level surrounding the proposed excavation.

Temporary shoring will be required during site construction. Shoring design pressures and construction sequence should be selected to limit horizontal and vertical ground deformations

due to shoring deflection. Shoring options that can be considered by the design team consist of, but are not limited to; trench shields/boxes, sheet piles, or soldier pile and lagging with tie-backs. Prior to tie-back design and construction, permission from the neighboring properties should be obtained if tie-backs are to encroach into those adjacent properties. Any shoring design must use the appropriate safety factors. Surcharging above will add additional load which must be considered. Appropriate drainage must be provided to avoid hydrostatic pressures behind walls.

Table 11 – OSHA Materials Classification for Shored Excavations

Material Type	OSHA Classification ⁽¹⁾	Temporary Slope Inclination (H:V)	Lateral Earth Pressures ⁽²⁾					
			Active Case		At-rest Case		Passive Case	
			EFP ⁽³⁾	K _a	EFP ⁽³⁾	K _o	EFP ⁽³⁾	K _p
Existing Fill/Natural Soils ⁽⁴⁾	C	1.5:1	38	0.36	56	0.53	291	2.77
Granular Backfill ⁽⁵⁾	C	1.5:1	30	0.25	50	0.38	-	-

1 - Classifications require field verification by contractor's "Competent Person".

2 - Assumes a level backfill, no hydrostatic pressure, and vertical orientation with respect to retained material

3 - Equivalent fluid weight in pcf

4 - Assumes maximum dry density of 105 pcf or greater and friction angle of 28° or greater

5 - If granular backfill is required. Assumes backfill is classified as GW or GP by the USCS

4.5 FILL PLACEMENT

Material considered suitable for use as structural fill should be clean soil free of organics, trash, or other deleterious materials, and contain no rock fragments greater than 6 in. in any one dimension. Preferably, structural soil fill material should have a standard Proctor maximum dry density of 90 pounds per cubic foot (pcf) or greater and a plasticity index (PI) of 25 percent or less. All material to be used as structural fill should be tested by the geotechnical engineer to confirm that it meets the project requirements before being placed.

Structural fill should be placed in loose, horizontal lifts not exceeding 8 in. thick. Each lift should be compacted per Table 12 below and within the range of minus (-) 2 percent to plus (+) 2 percent of the optimum moisture content. Each lift should be tested by geotechnical personnel to confirm that the contractors' method is capable of achieving the project requirements before placing any subsequent lifts. Any areas which have become soft or frozen should be removed before additional structural fill is placed. One in place density test should be performed a minimum of every 5,000 ft² for each 8 in. lift. Adequate surface drainage should be provided during all site grading and fill placement operations.

Please note that compaction efforts can be difficult to achieve using conventional construction methods during wet weather.

Table 12 – Fill Placement (ASTM D 698)

Location	Maximum Dry Density (%)
Footings and Floor Slabs	98.0
Pavement Areas	95.0
Landscape Areas	85.0

4.6 KARST REGION CONSTRUCTION RECOMMENDATIONS

Karst potential in the location of the site is classified as medium to very high risk. Close attention should be given during the construction process to identify possible karst features or surface movement. Adequate drainage to minimize water infiltration into the subsurface during and after construction should be provided to lessen the risk of damage due to karst activity during construction. Any significant solution features or dropouts encountered during construction will require remediation and will need to be evaluated on a case-by-case basis. A sinkhole could be repaired by excavating the material to find the throat, then lining the excavation with a filter fabric, and backfilling with crushed aggregate, however; L.E. Gregg should be contacted to provide specific recommendations for remediation of any encountered karst features.

5.0 BASIS FOR RECOMMENDATIONS

VARIATIONS

Since any general foundation or subsurface exploration can examine and report only that information which is obtained from the borings and samples taken there from, and since uniformity of subsurface conditions does not always exist, the following is recommended. If, during construction, any latent soil, bedrock, or water conditions are encountered that were not observed in the borings, contact L.E. Gregg so that the site may be inspected to identify any necessary modifications in the design or construction of the foundation.

OTHER INTERPRETATIONS

The conclusions and recommendations submitted in this report apply to the proposed project only. They are not applicable to on-site, subsequent construction, adjacent or nearby projects. In the event that conclusions or recommendations based on this report and relating to any other projects are made by others, such conclusions and recommendations are not the responsibility of L. E. Gregg Associates. The recommendations provided are based in part on project information provided to L.E. Gregg and only apply to the specific project and site discussed in this report. If the project information section in this report contains incorrect information or if additional information is available, the correct or additional information should be conveyed to L.E. Gregg for review.

It is recommended that this complete report be provided to the various design team members, the contractors and the project owner. Potential contractors should be informed of this report in the "instructions to bidders" section of the bid documents. The report should not be included or referenced in the actual contract documents.

STANDARD OF CARE

The services provided by L. E. Gregg Associates for this exploration have been performed in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances.

Important Information about Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/THE BEST PEOPLE ON EARTH exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.



8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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KEY TO SYMBOLS AND DESCRIPTIONS

	GW	Well graded gravels, little or no fines
	GP	Poorly graded gravels, little or no fines
	GM	Silty gravels, sand and silt mixtures
	GC	Clayey gravels, sand and clay mixtures
	SW	Well graded sand, little or no fines
	SP	Poorly graded sand, little or no fines
	SM	Silty sands, sand and silt mixtures
	SC	Clayey sands, sand and clay mixtures
	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands silts and with slight plasticity
	CL	Inorganic clays with low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clay of low plasticity
	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silt soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
	Topsoil	Usually top few inches of soil deposits and contains considerable amounts of organic matter
	Asphalt	Usually a black solid or semisolid mixture of bitumens mostly used in paving
	Fill	Soils that have been transported by man to their present location
	Limestone	Sedimentary rock consisting of predominantly of calcium carbonate
	Sandstone	Sedimentary rock consisting of sand with some cementitious material
	Siltstone	Fine grained rock of consolidated silt
	Shale	Fine grained sedimentary rock consisting of compacted clay, silt, or mud
	Coal	Natural black graphite like material formed from fossilized plants
	Limestone interbedded with Shale	Predominantly limestone interbedded with shale layers
	Weathered	Weathered rock

CONSISTENCY AND RELATIVE DENSITY CORRELATED WITH STANDARD PENETRATION TEST (SPT)

SILT AND CLAY		SAND AND GRAVEL	
Relative Density	Blows Per Foot (BPF)	Relative Density	Blows Per Foot (BPF)
Very Soft	0 to 1	Very Loose	0 to 4
Soft	2 to 4	Loose	5 to 10
Firm	5 to 8	Firm	11 to 20
Stiff	9 to 15	Very Firm	21 to 30
Very Stiff	16 to 30	Dense	31 to 50

ROCK PROPERTIES

RELATIVE HARDNESS OF ROCK	
Very Soft	Can be scratched by fingernail
Soft	May be broken by fingers
Medium	Corner and edges may be broken by fingers
Moderately Hard	Moderate blow of hammer required to break sample
Hard	Hard blow of hammer required to break sample
Very Hard	Several hard blows of hammer required to break sample

Rock Core Recovery (RC) and Rock Quality Designation (RQD)

Core Recovery (%)	Description	RQD (%)	Classification
0 - 40	Incompetent	<25	Very Poor
40 - 70	Competent	25 - 50	Poor
70 - 90	Fairly Continuous	50 - 75	Fair
90 - 100	Continuous	75 - 90	Good
		90 - 100	Very Good

Estimated Moisture Condition Relative to Optimum

Dry	Under 5% of Optimum
Slightly Moist	Minus 2% of Optimum
Moist	± 2% of Optimum
Very Moist	Plus 2% of Optimum
Wet	Over 5% of Optimum

NI 43-101 and Soil Sampler Symbols

N	Blows Per Foot (BPF)		Undisturbed Sample
% W	Percent Water		Standard Penetration Test (SPT)
RQD	Rock Quality Designation		Boring Location
REC	Rock Core Recovery		Water Table while Drilling
CLA	Classification of Combined Samples		Water Table after Drilling
	Rock Core (RC)		Bulk Sample (BK)

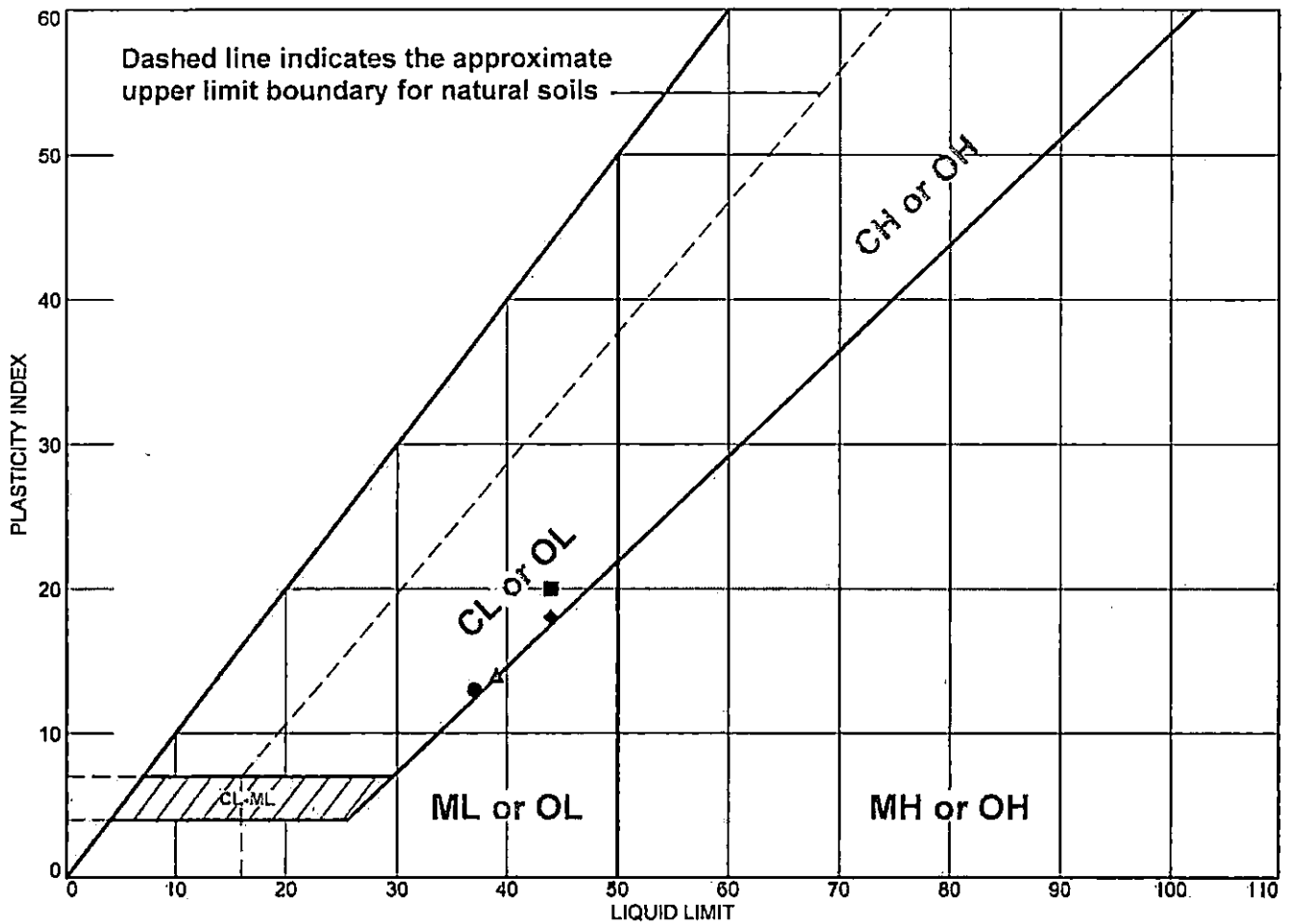


Geotechnical, Environmental & Materials Engineering
Since 1957

APPENDIX A

Summary of Laboratory and Drilling Data

LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
● Lean Clay with Sand (CL)	37	24	13	89.6	86.2	CL
■ Clayey Gravel with Sand (GC)	44	24	20	45.9	42.8	GC
▲ Lean Clay (CL)	39	25	14	96.1	91.3	CL
◆ Lean Clay (CL)	44	26	18	97.9	95.8	CL

Project No. 2018019 Client: LFUCG and ESCI, LLC

Project: LFUCG Lansdowne South Trunk Sewer

● Location: B-1 Depth: 1.0-2.5 Sample Number: 21031
 ■ Location: B-2 Depth: 4.0-5.5 Sample Number: 21032
 ▲ Location: B-3 Depth: 1.0-2.5 Sample Number: 21033
 ◆ Location: B-4 Depth: 1.0-2.5 Sample Number: 21034

Remarks:

L.E. Gregg Associates, Inc.
 2456 Fortune Dr, Ste 155, Lexington, KY 40509
 Phone: 859-252-7558

Figure

Checked By: SEM

Earth Mechanics Institute

Client: LE Gregg

Project: LFUCG Lansdowne South Trunk Sewer

Date: 5/24/2018

**Colorado School of Mines**

Mining Engineering Department

ASTM D3967

Sample ID	Rock Type	Average Length	Average Diameter	Failure Load	Indirect (Brazilian) Tensile Strength		Notes (Failure type)
		(in)	(in)		(psi)	(MPa)	
B-1-R1 @ 15.0-20.0	Sedimentary	1.32	1.858	3,025	787	5.4	Non - Structural
B-3-R2 @ 17.3-22.3	Sedimentary	1.27	1.855	3,054	825	5.7	Structural
B-4-R1 @ 15.0-20.0	Sedimentary	1.09	1.848	2,436	767	5.3	Non - Structural
B-5-R3 @ 20.0-25.0	Sedimentary	1.16	1.863	2,377	699	4.8	Non - Structural
B-6-R1 @ 8.1-13.1	Sedimentary	1.08	1.866	3,265	1,029	7.1	Non - Structural

Earth Mechanics Institute**Client: LE Gregg****Project: LFUCG Lansdowne South Trunk Sewer****Date: 5/24/2018****Colorado School of Mines****Mining Engineering Department**

Sample ID	Rock Type	Punch Penetration Test
		Peak Slope (kips/in)
B-1-R1 @ 15.0-20.0	Sedimentary	114
B-3-R2 @ 17.3-22.3	Sedimentary	71
B-4-R1 @ 15.0-20.0	Sedimentary	166
B-5-R3 @ 20.0-25.0	Sedimentary	75
B-6-R1 @ 8.1-13.1	Sedimentary	108

Earth Mechanics Institute

Client: LE Gregg

Project: LFUCG

Date: 5/22/2018

**Colorado School of Mines**

Mining Engineering Department

ASTM D5731

Sample ID	Rock Type	Loading Direction	Length (in)	Avg. Diameter (in)	Failure Load (N)	Point Load Index Strength				Notes (Failure type)
						Is		Is(50)		
						(psi)	(MPa)	(psi)	(MPa)	
B-1-R1 @ 15.0-20.0	Sedimentary	Diametric	2.57	1.853	9,855	645	4.45	628	4.33	Valid
B-3-R2 @ 17.3-22.3	Sedimentary	Axial*	1.23	1.854	3,015	234	1.61	219	1.51	Valid
B-4-R1 @ 15.0-20.0	Sedimentary	Diametric	2.86	1.858	6,750	440	3.03	428	2.95	Valid
B-5-R3 @ 20.0-25.0	Sedimentary	Diametric	2.78	1.863	8,170	529	3.65	516	3.56	Valid
B-6-R1 @ 8.1-13.1	Sedimentary	Diametric	2.81	1.857	4,760	310	2.14	302	2.08	Valid

* Length of the sample didn't meet standard for "Diametric" test.

Earth Mechanics Institute**Client: LE Gregg****Project: LFUCG Lansdowne South Trunk Sewer****Date: 5/21/2018****Colorado School of Mines****Mining Engineering Department****ASTM D7625**

Sample ID	Rock Type	Cerchar Abrasivity Index
B-1-R1 @ 15.0-20.2	Sedimentary	1.3
B-3-R2 @ 17.3-22.3	Sedimentary	0.3
B-4-R1 @ 15.0-20.0	Sedimentary	0.6
B-5-R3 @ 20.0-25.0	Sedimentary	1.2
B-6-R1 @ 8.1-13.1	Sedimentary	1.3

* CERCHAR tests have been run on saw cut surface. No correction factor has been added to the results.



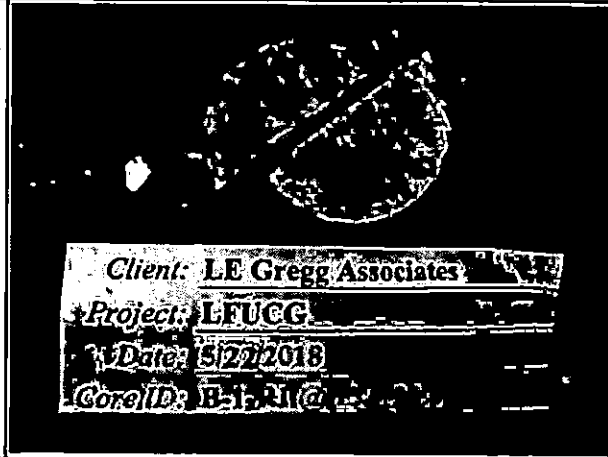
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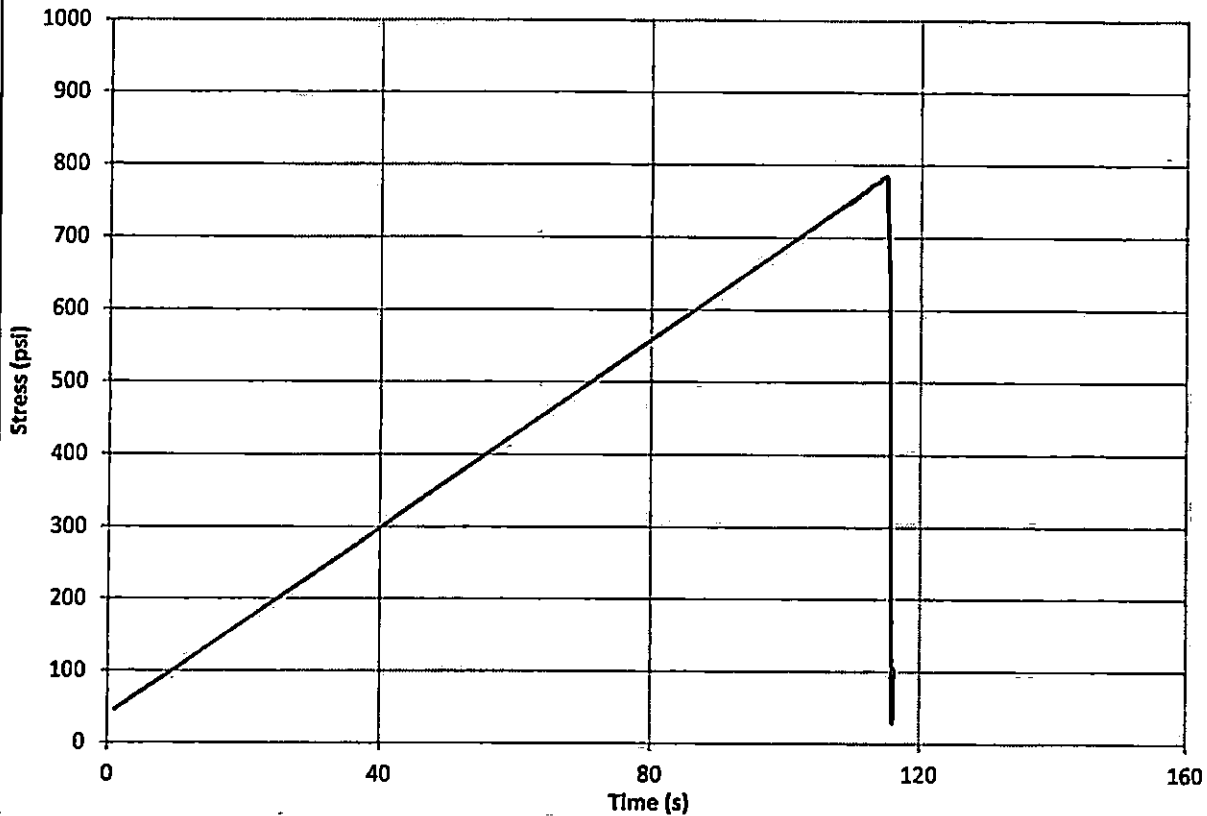


"Brazilian" Indirect Tensile Strength - ASTM D3967

Client: LE Gregg
Project: LFUCG Lansdowne South Trunk Sewer
Location: N/A
Rock Type: Sedimentary
Rock Name: N/A
Characteristics: N/A
Test Performed By: OF
Date Tested: 5/22/2018
Data Reduced By: OF
Date Reduced: 5/24/2018
Core ID: B-1-R1 @ 15.0-20.0
File Name: B-1-R1 @ 15.0-20.0_BTS
EMI Project No.: 346



Disc Length		Disc Diameter		L/D Ratio
in	cm	in	cm	
1.32	3.3	1.858	4.72	0.71
Failure Load		BTS		Failure Mode
lbf	N	psi	MPa	
3,025	13,456	787	5.4	Non - Structural





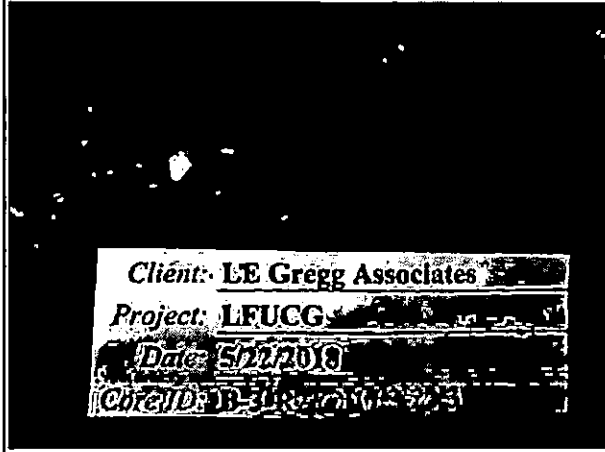
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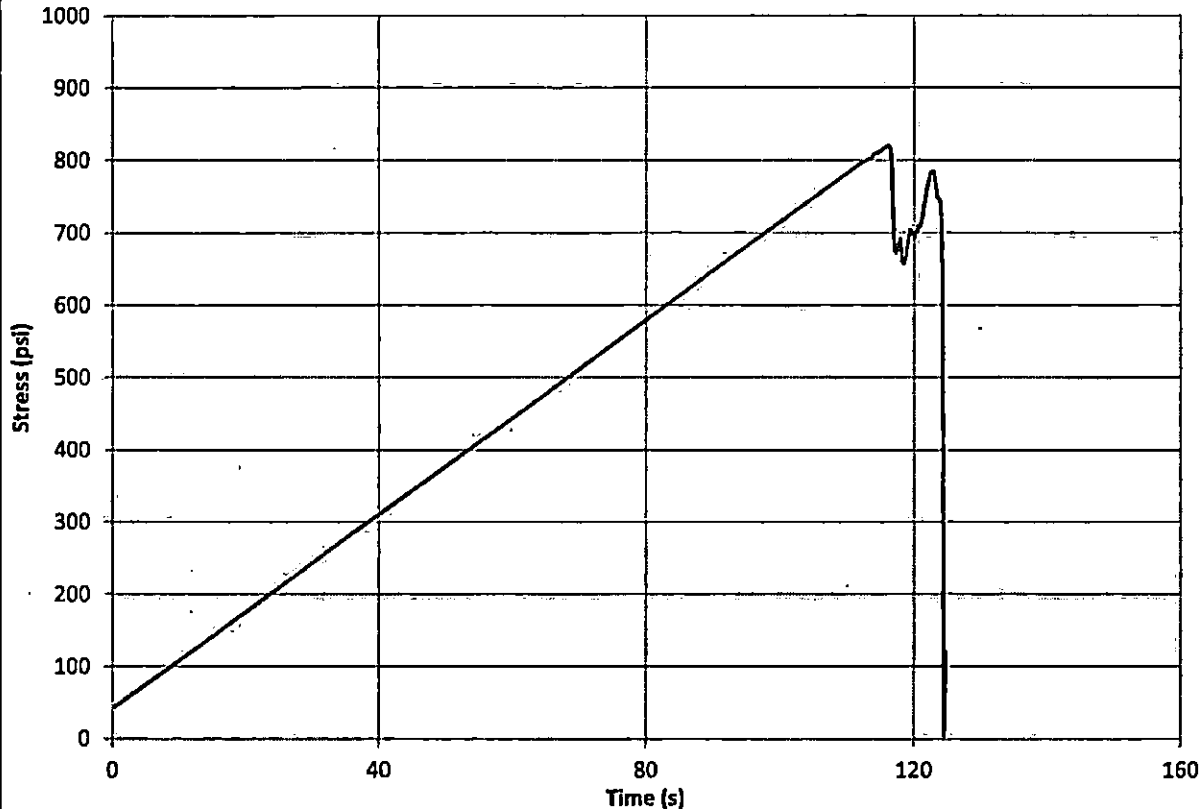


"Brazilian" Indirect Tensile Strength - ASTM D3967

Client: LE Gregg
Project: LFUCG Lansdowne South Trunk Sewer
Location: N/A
Rock Type: Sedimentary
Rock Name: N/A
Characteristics: N/A
Test Performed By: OF
Date Tested: 5/22/2018
Data Reduced By: OF
Date Reduced: 5/24/2018
Core ID: B-3-R2 @ 17.3-22.3
File Name: B-3-R2 @ 17.3-22.3_BTS
EMI Project No.: 346



Disc Length		Disc Diameter		L/D Ratio
in	cm	in	cm	
1.27	3.2	1.855	4.71	0.68
Failure Load		BTS		Failure Mode
lbf	N	psi	MPa	
3,054	13,585	825	5.7	Structural





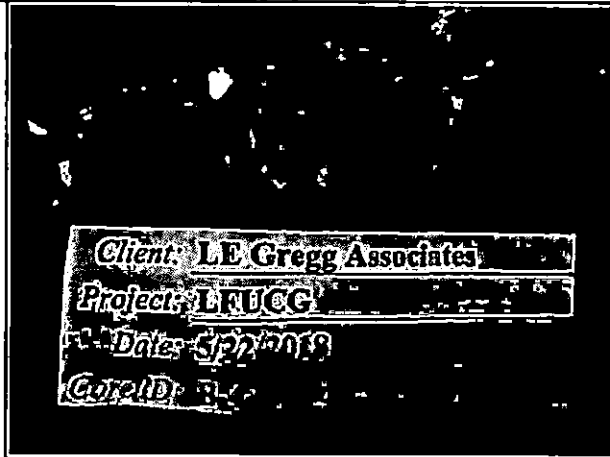
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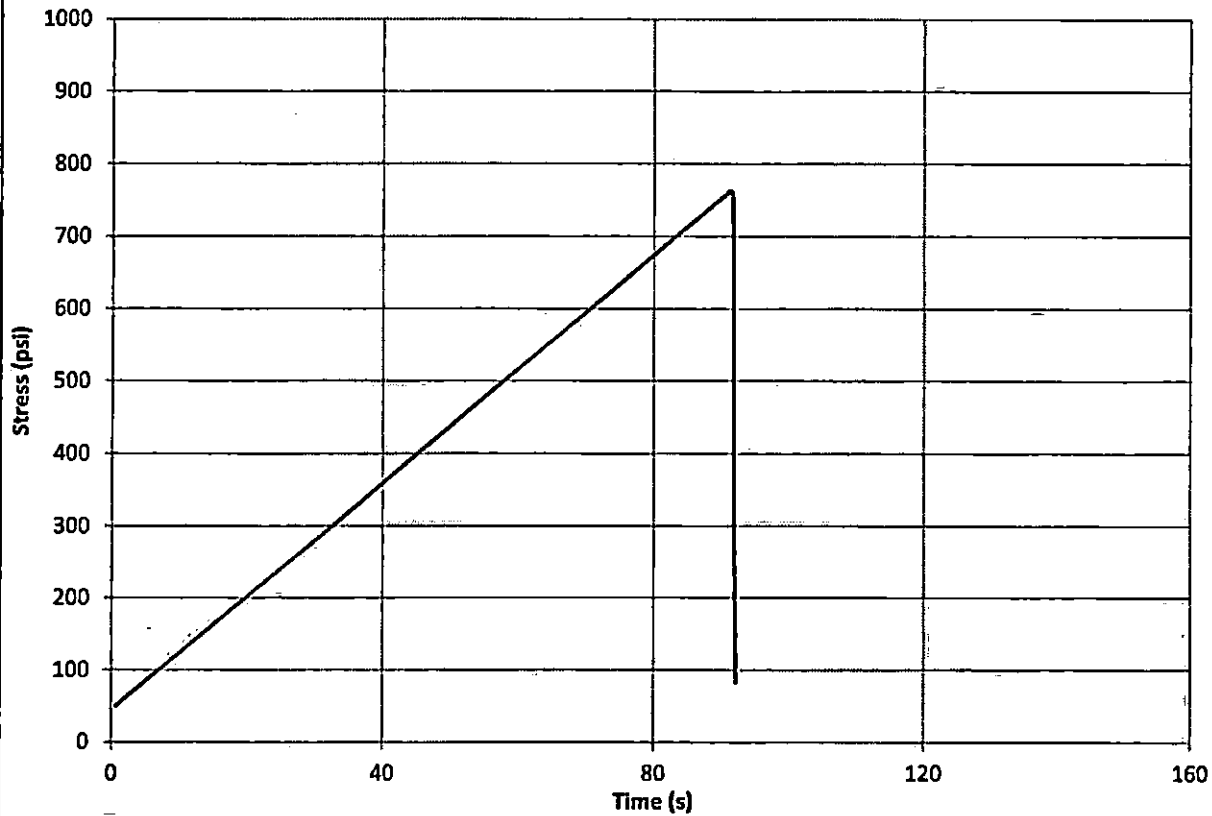


"Brazilian" Indirect Tensile Strength - ASTM D3967

Client: LE Gregg
Project: LFUCG Lansdowne South Trunk Sewer
Location: N/A
Rock Type: Sedimentary
Rock Name: N/A
Characteristics: N/A
Test Performed By: OF
Date Tested: 5/22/2018
Data Reduced By: OF
Date Reduced: 5/24/2018
Core ID: B-4-R1 @ 15.0-20.0
File Name: B-4-R1 @ 15.0-20.0_BTS
EMI Project No.: 346



Disc Length		Disc Diameter		L/D Ratio
in	cm	in	cm	
1.09	2.8	1.848	4.69	0.59
Failure Load		BTS		Failure Mode
lbf	N	psi	MPa	
2,436	10,838	767	5.3	Non - Structural





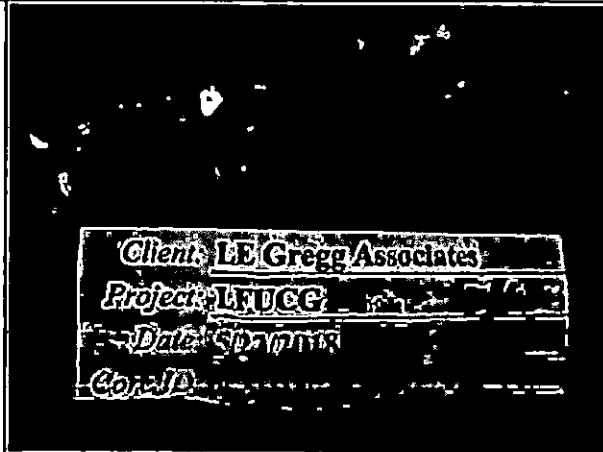
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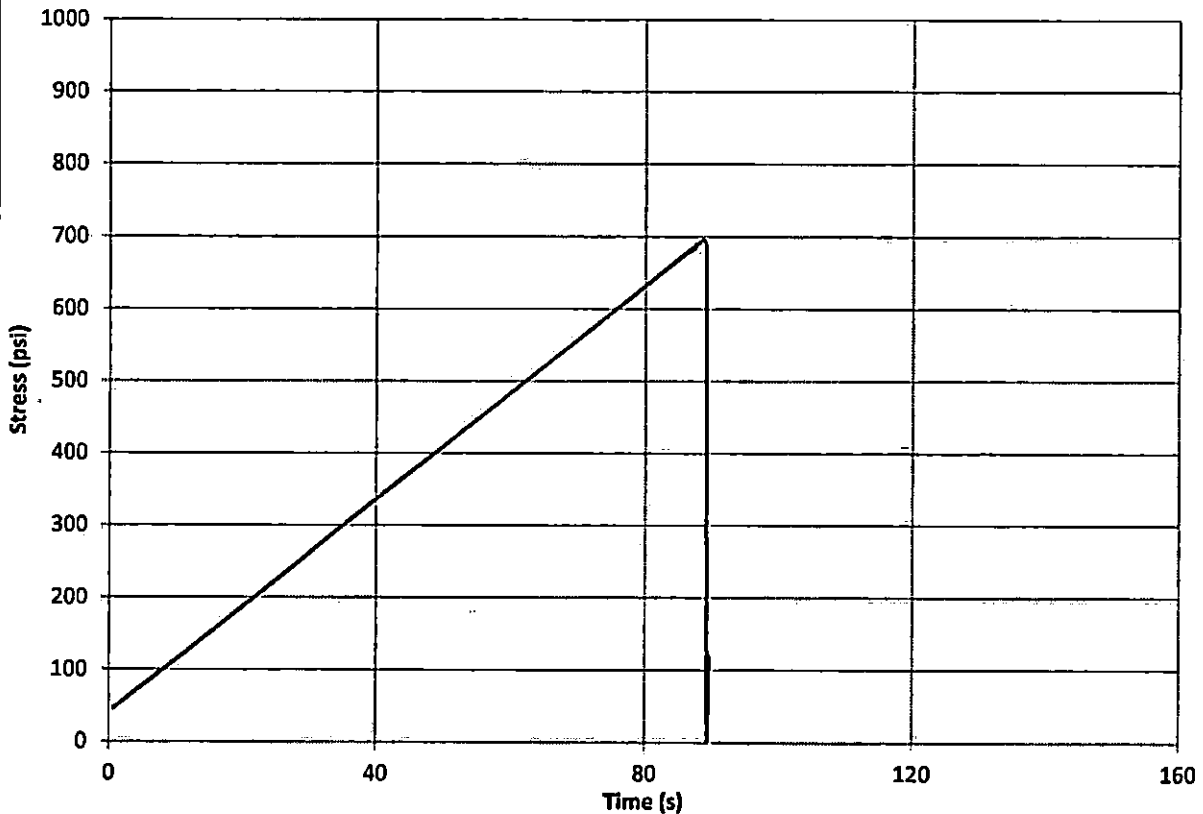


"Brazilian" Indirect Tensile Strength - ASTM D3967

Client: LE Gregg
Project: LFUCG Lansdowne South Trunk Sewer
Location: N/A
Rock Type: Sedimentary
Rock Name: N/A
Characteristics: N/A
Test Performed By: OF
Date Tested: 5/22/2018
Data Reduced By: OF
Date Reduced: 5/24/2018
Core ID: B-5-R3 @ 20.0-25.0
File Name: B-5-R3 @ 20.0-25.0_BTS
EMI Project No.: 346



Disc Length		Disc Diameter		L/D Ratio
in	cm	in	cm	
1.16	2.9	1.863	4.73	0.62
Failure Load		BTS		Failure Mode
lbf	N	psi	MPa	
2,377	10,573	699	4.8	Non - Structural





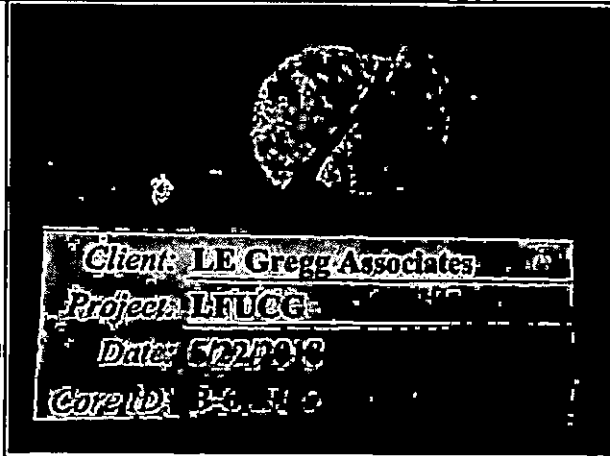
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Mining Engineering Department, CSM

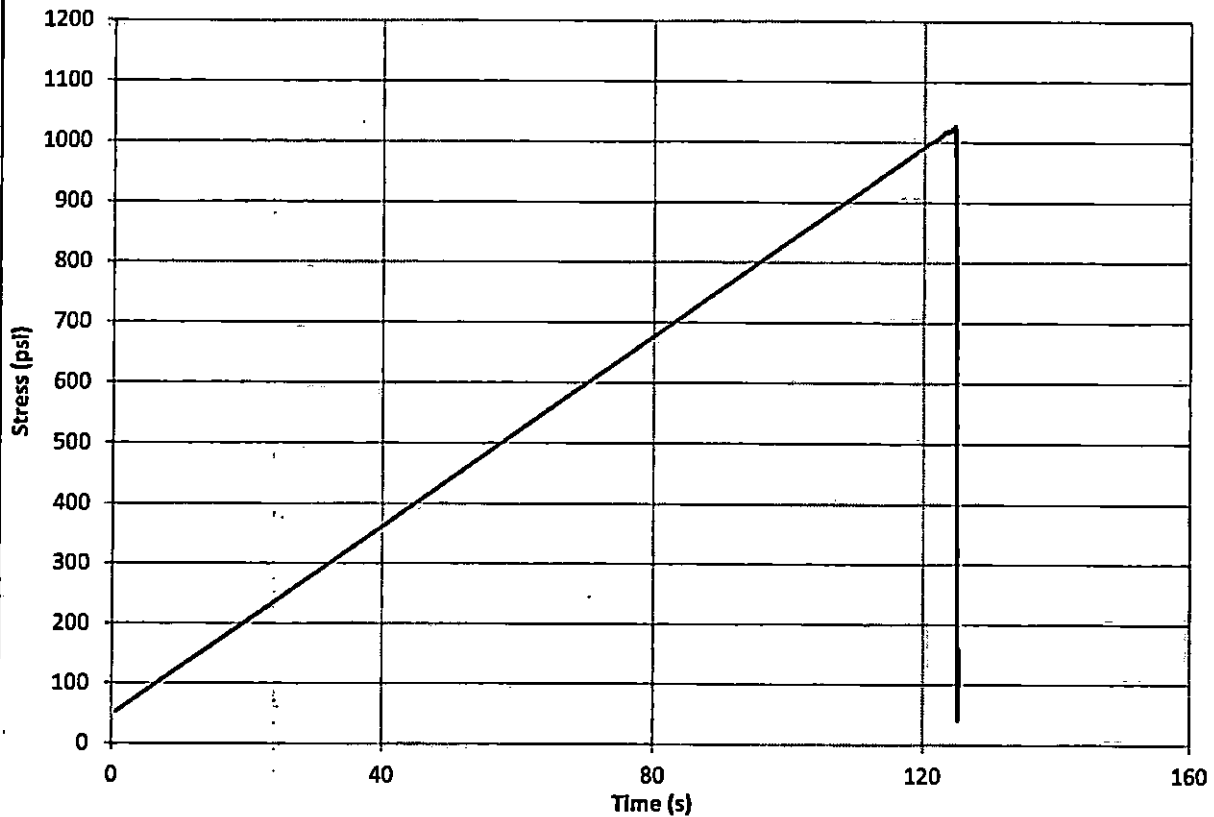


"Brazilian" Indirect Tensile Strength - ASTM D3967

Client: LE Gregg
Project: LFUCG Lansdowne South Trunk Sewer
Location: N/A
Rock Type: Sedimentary
Rock Name: N/A
Characteristics: N/A
Test Performed By: OF
Date Tested: 5/22/2018
Data Reduced By: OF
Date Reduced: 5/24/2018
Core ID: B-6-R1 @ 8.1-13.1
File Name: B-6-R1 @ 8.1-13.1_BTS
EMI Project No.: 346



Disc Length		Disc Diameter		L/D Ratio
in	cm	in	cm	
1.08	2.7	1.866	4.74	0.58
Failure Load		BTS		Failure Mode
lbf	N	psi	MPa	
3,265	14,523	1,029	7.1	Non - Structural





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Punch Penetration Test



Client: LE Gregg Associates

Project: LFUCG

Location: N/A

EMI Project No.: 346

Core ID: B-1-R1 @ 15.0-20.0

File Name: B-1-R1 @ 15.0-20.0_PP

Rock Type: Sedimentary

Rock Name: N/A

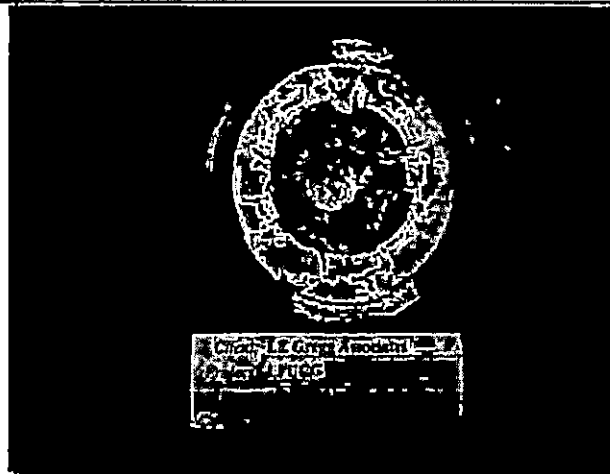
Characteristics: N/A

Test Performed By: OF

Date Tested: 5/22/2018

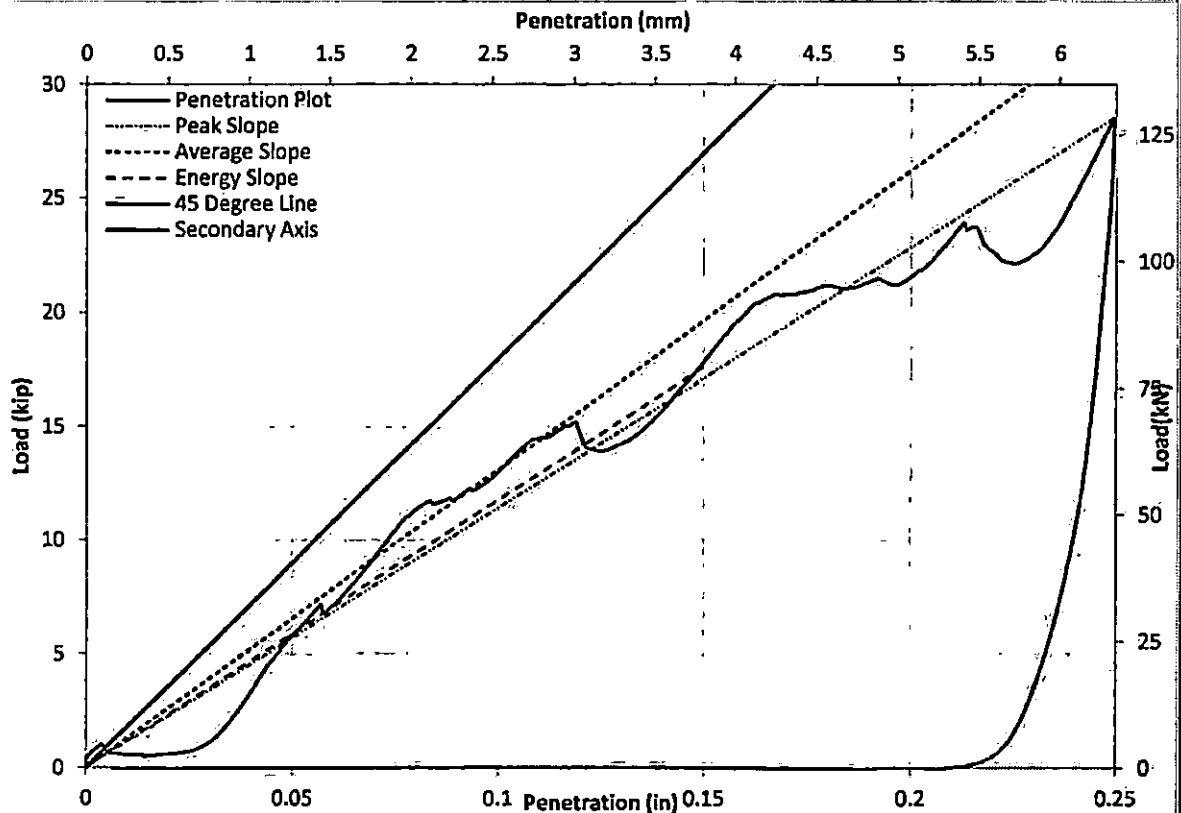
Data Reduced By: OF

Date Reduced: 5/24/2018



Penetration Rate		Maximum Load		45° (Standard) Index:	
in/s	mm/s	kip	kN	kip/in	kN/mm
0.001	0.025	28.542	126.960	180	31.5
Peak Slope Index		Average Slope Index		Energy Slope Index	
kip/in	kN/mm	kip/in	kN/mm	kip/in	kN/mm
114	20.0	131	23.0	118	20.6

Note: Indenter is made of Tungsten Carbide with base diameter of 7.5in, cone angle of 120° and tip radius of 2mm





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Punch Penetration Test

Client: LE Gregg Associates

Project: LFUCG

Location: N/A

EMI Project No.: 346

Core ID: B-3-R2 @ 17.3-22.3

File Name: B-3-R2 @ 17.3-22.3_PP

Rock Type: Sedimentary

Rock Name: N/A

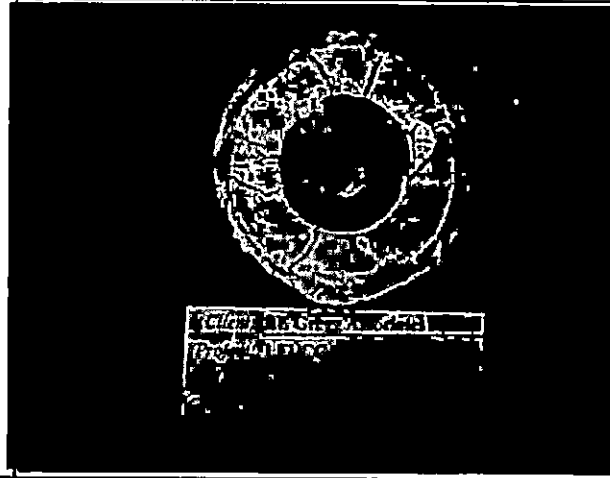
Characteristics: N/A

Test Performed By: OF

Date Tested: 5/22/2018

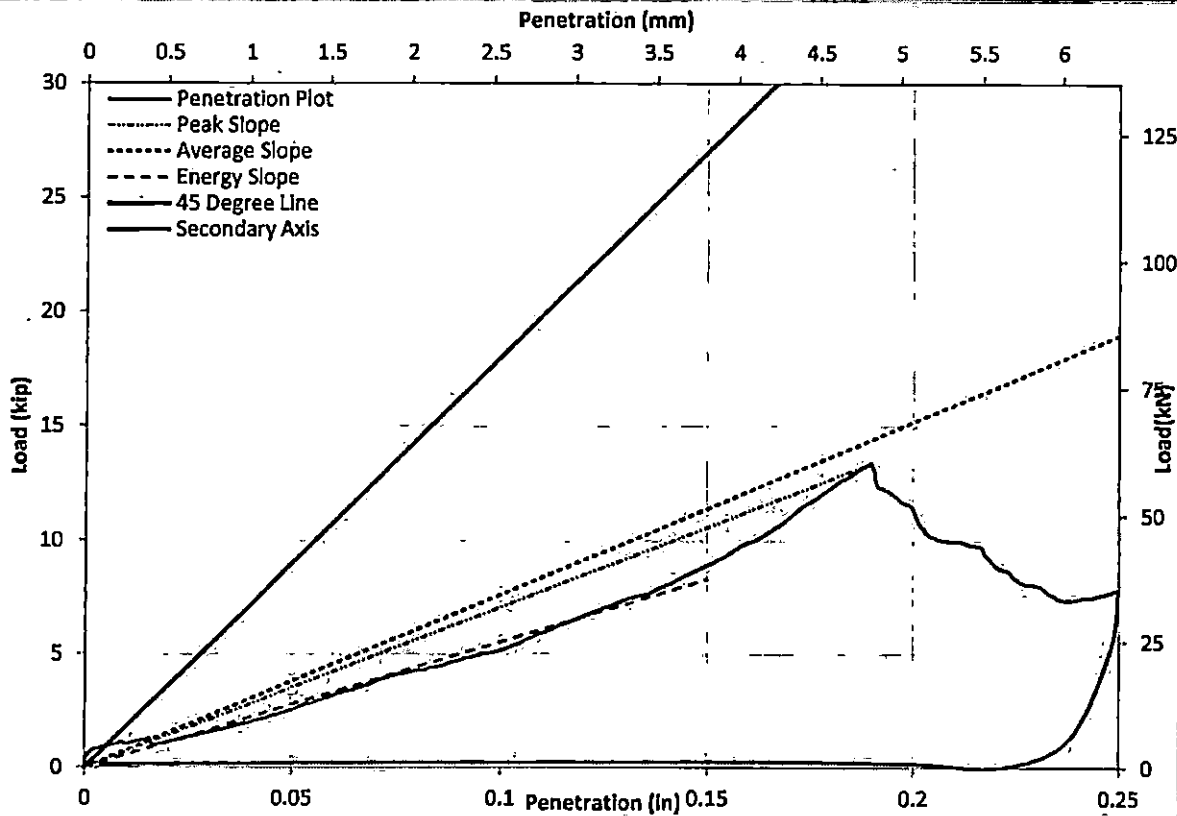
Data Reduced By: OF

Date Reduced: 5/24/2018



Penetration Rate		Maximum Load		45° (Standard) Index:	
in/s	mm/s	kip	kN	kip/in	kN/mm
0.001	0.025	13.392	59.571	180	31.5
Peak Slope Index		Average Slope Index		Energy Slope Index	
kip/in	kN/mm	kip/in	kN/mm	kip/in	kN/mm
71	12.4	76	13.3	55	9.7

Note: Indentor is made of Tungsten Carbide with base diameter of 7.5in, cone angle of 120° and tip radius of 2mm





EARTH MECHANICS INSTITUTE

Mining Engineering Department, CSM

Punch Penetration Test



Client: LE Gregg Associates

Project: LFUCG

Location: N/A

EMI Project No.: 346

Core ID: B-4-R1 @ 15.0-20.0

File Name: B-4-R1 @ 15.0-20.0_PP

Rock Type: Sedimentary

Rock Name: N/A

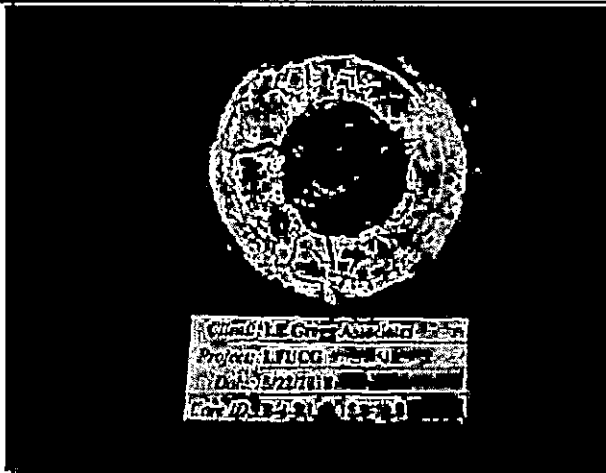
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Date Tested: 5/22/2018

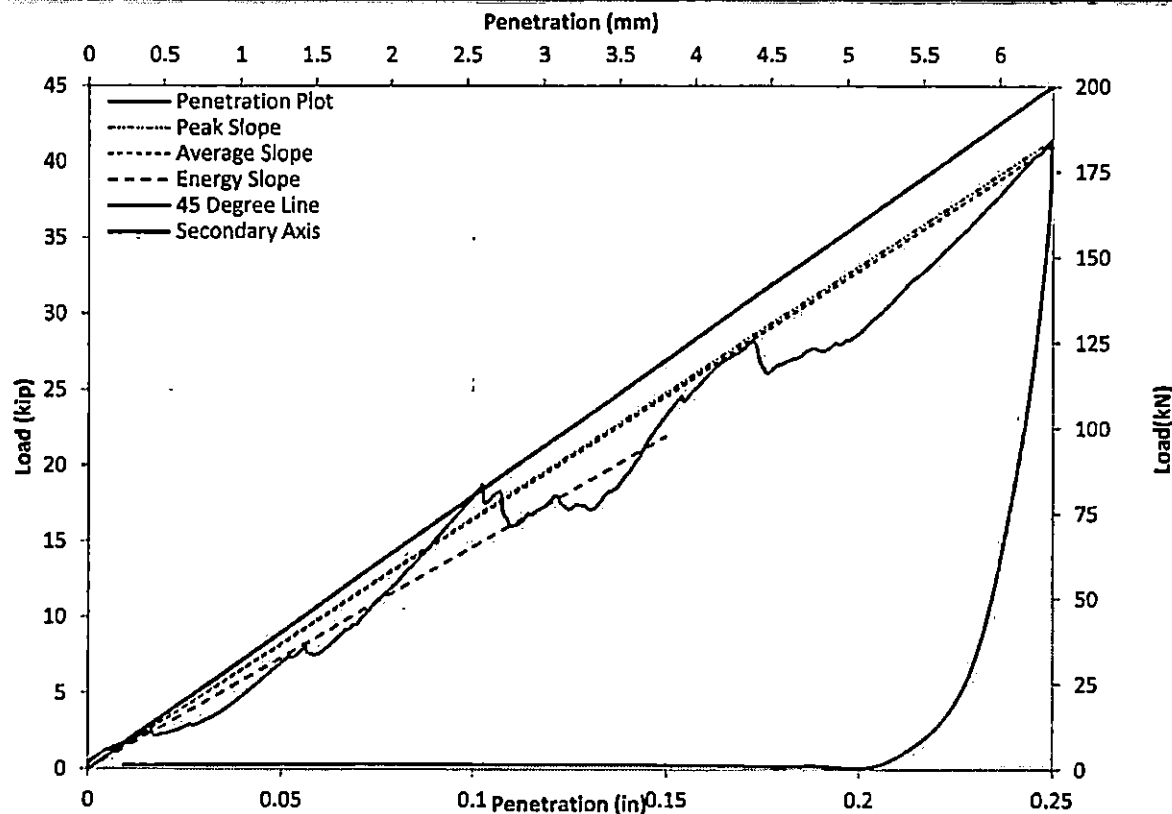
Data Reduced By: OF

Date Reduced: 5/24/2018



Penetration Rate		Maximum Load		45° (Standard) Index:	
in/s	mm/s	kip	kN	kip/in	kN/mm
0.001	0.025	41.412	184.211	180	31.5
Peak Slope Index		Average Slope Index		Energy Slope Index	
kip/in	kN/mm	kip/in	kN/mm	kip/in	kN/mm
166	29.0	164	28.8	146	25.7

Note: Indentor is made of Tungsten Carbide with base diameter of 7.5in, cone angle of 120° and tip radius of 2mm





EARTH MECHANICS INSTITUTE

Mining Engineering Department, CSM

Punch Penetration Test



Client: LE Gregg Associates

Project: LFUCG

Location: N/A

EMI Project No.: 346

Core ID: B-5-R3 @ 20.0-25.0

File Name: B-5-R3 @ 20.0-25.0_PP

Rock Type: Sedimentary

Rock Name: N/A

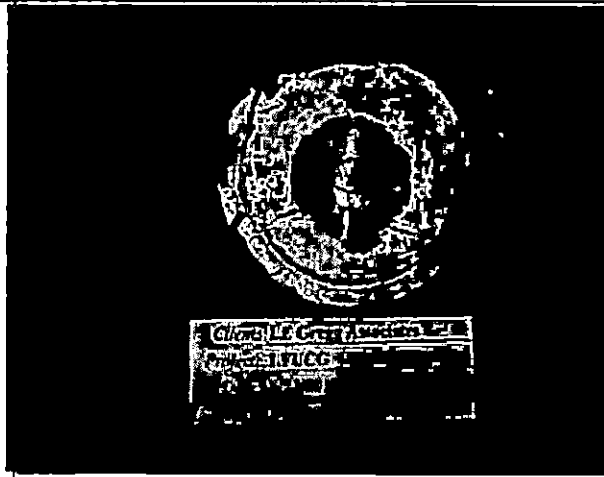
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Date Tested: 5/22/2018

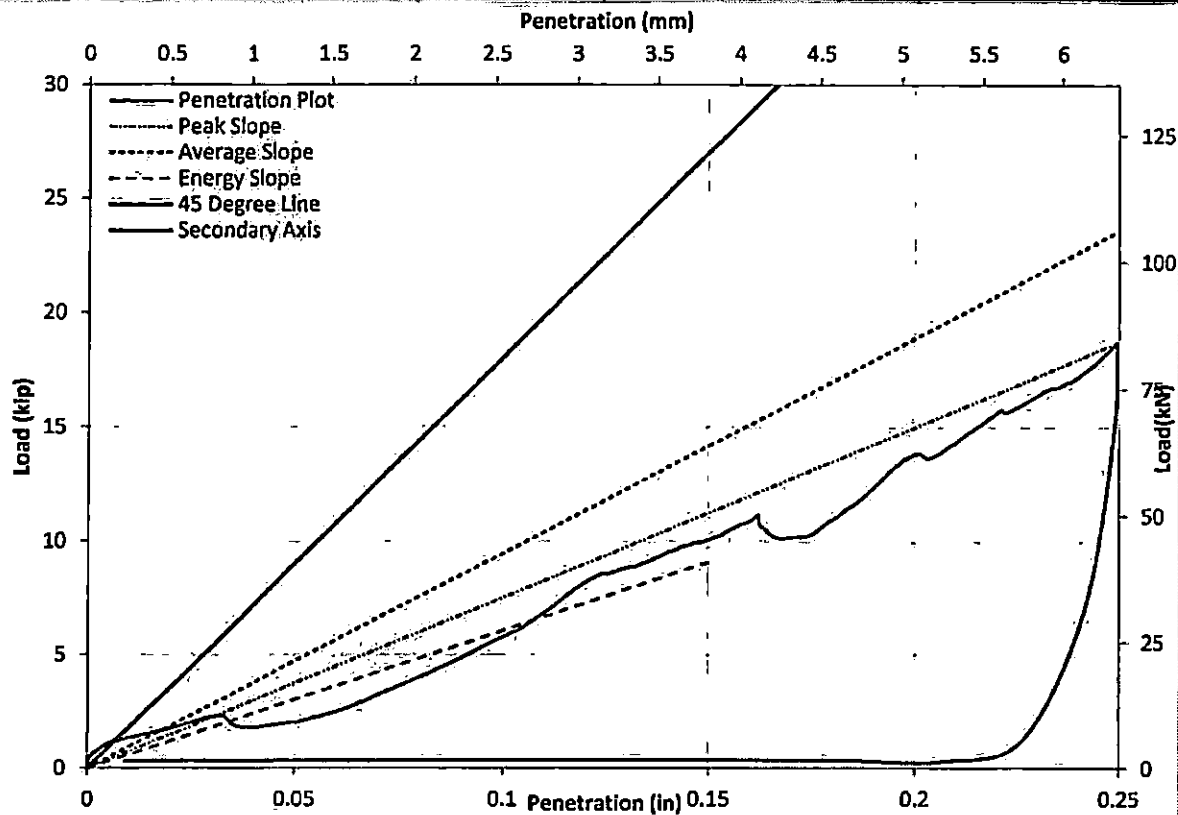
Data Reduced By: OF

Date Reduced: 5/24/2018



Penetration Rate		Maximum Load		45° (Standard) Index:	
in/s	mm/s	kip	kN	kip/in	kN/mm
0.001	0.025	18.726	83.299	180	31.5
Peak Slope Index		Average Slope Index		Energy Slope Index	
kip/in	kN/mm	kip/in	kN/mm	kip/in	kN/mm
75	13.1	94	16.5	61	10.6

Note: Indenter is made of Tungsten Carbide with base diameter of 7.5in, cone angle of 120° and tip radius of 2mm





EARTH MECHANICS INSTITUTE

Mining Engineering Department, CSM



Punch Penetration Test

Client: LE Gregg Associates

Project: LFUCG

Location: N/A

EMI Project No.: 346

Core ID: B-6-R1 @ 8.1-13.1

File Name: B-6-R1 @ 8.1-13.1_PP

Rock Type: Sedimentary

Rock Name: N/A

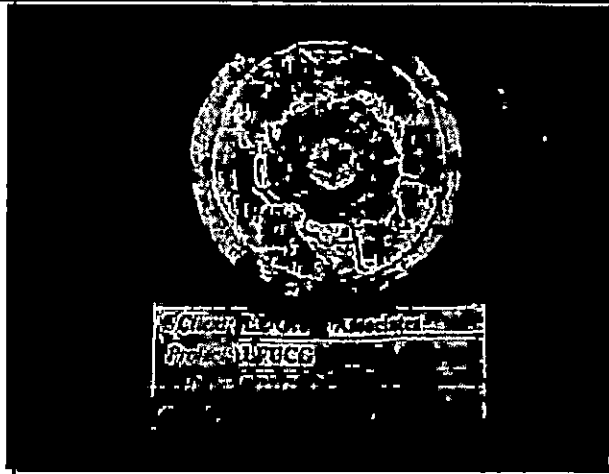
Characteristics: N/A

Test Performed By: OF

Date Tested: 5/22/2018

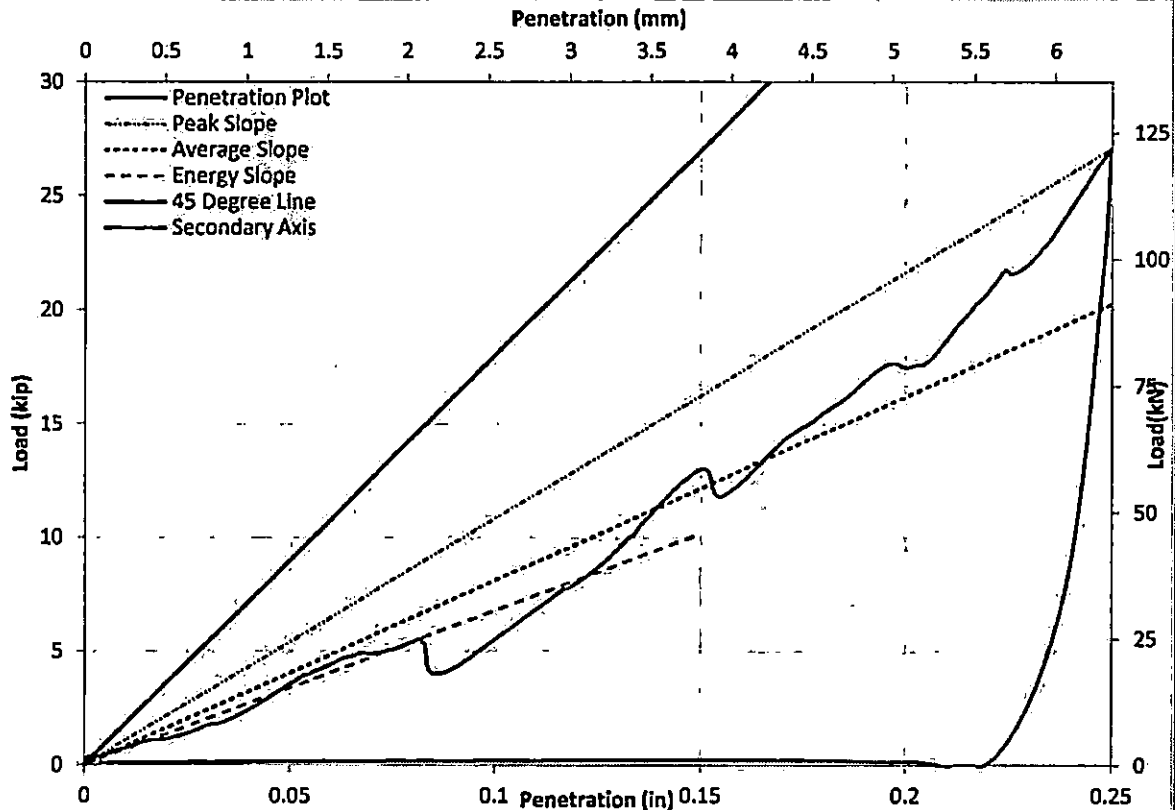
Data Reduced By: OF

Date Reduced: 5/24/2018



Penetration Rate		Maximum Load		45° (Standard) Index:	
in/s	mm/s	kip	kN	kip/in	kN/mm
0.001	0.025	27.060	120.370	180	31.5
Peak Slope Index		Average Slope Index		Energy Slope Index	
kip/in	kN/mm	kip/in	kN/mm	kip/in	kN/mm
108	19.0	81	14.2	68	11.9

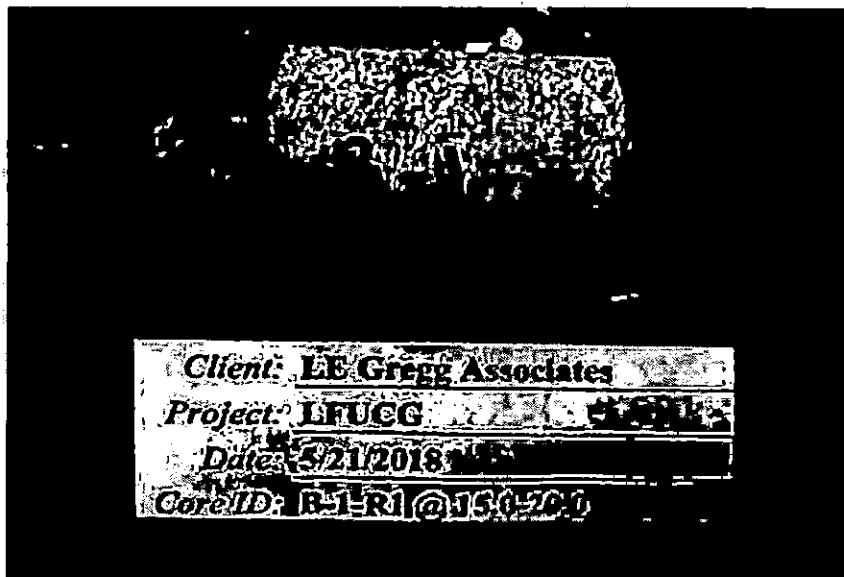
Note: Indenter is made of Tungsten Carbide with base diameter of 7.5in, cone angle of 120° and tip radius of 2mm



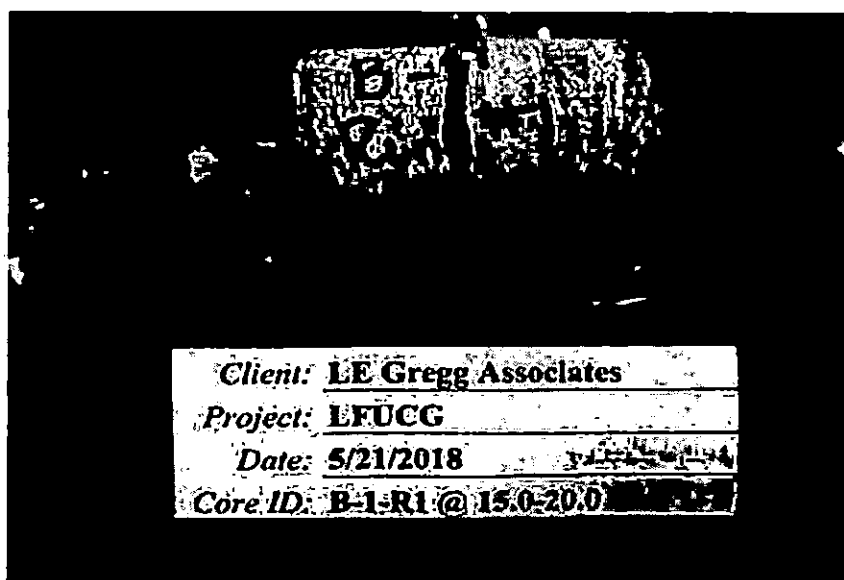
Pictures of Sample Before and After
Point Load Index Strength

Client Name: LE Gregg Associates
Project Name: LFUCG
Date: 5/21/2018

Sample ID: B-1-R1 @ 15.0-20.0



Before



After

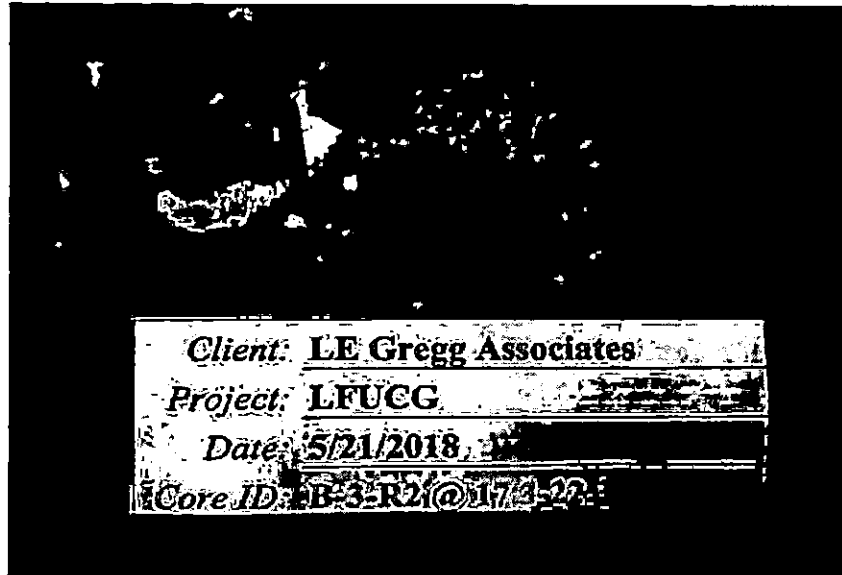
Pictures of Sample Before and After
Point Load Index Strength

Client Name: LE Gregg Associates

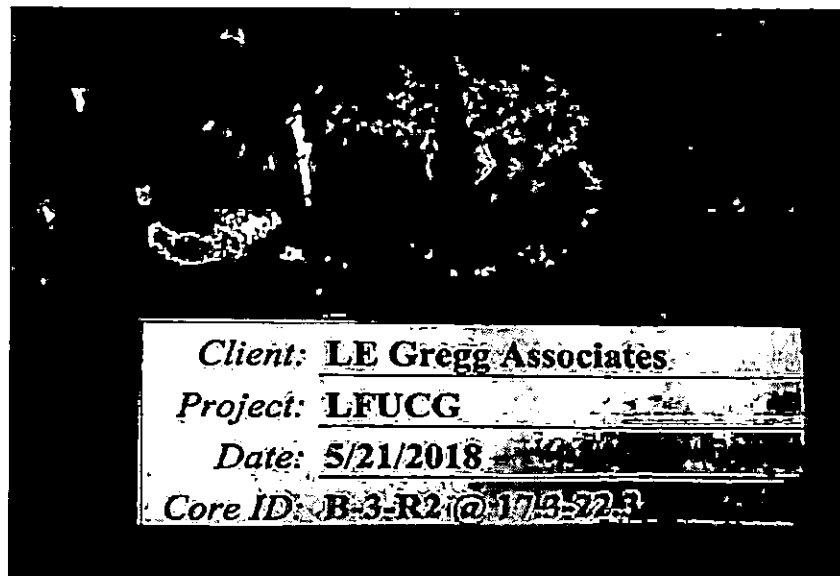
Project Name: LFUCG

Date: 5/21/2018

Sample ID: B-3-R2 @ 17.3-22.3



Before



After

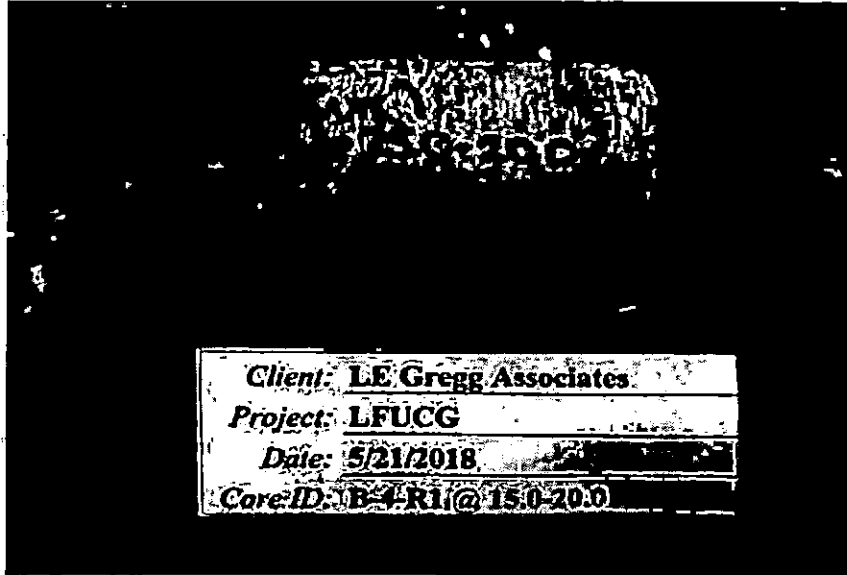
Pictures of Sample Before and After
Point Load Index Strength

Client Name: LE Gregg Associates

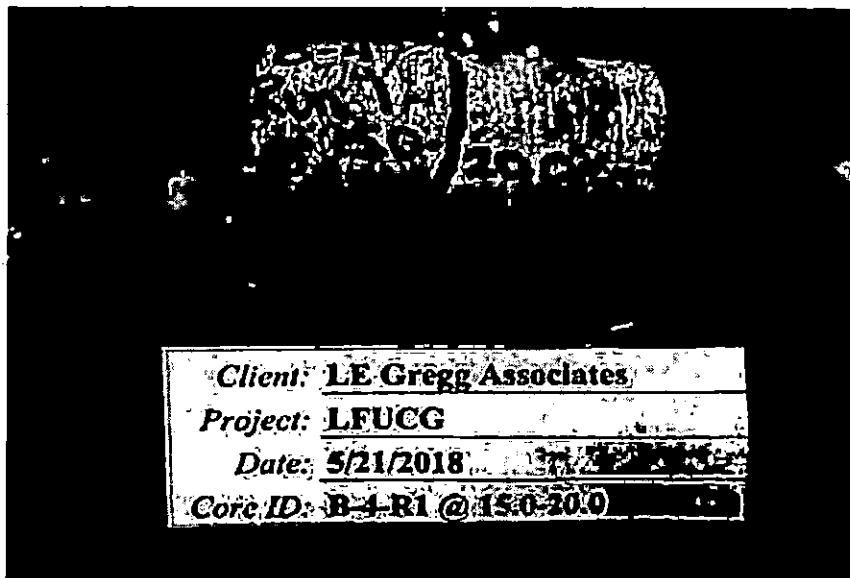
Project Name: LFUCG

Date: 5/21/2018

Sample ID: B-4-R1 @ 15.0-20.0



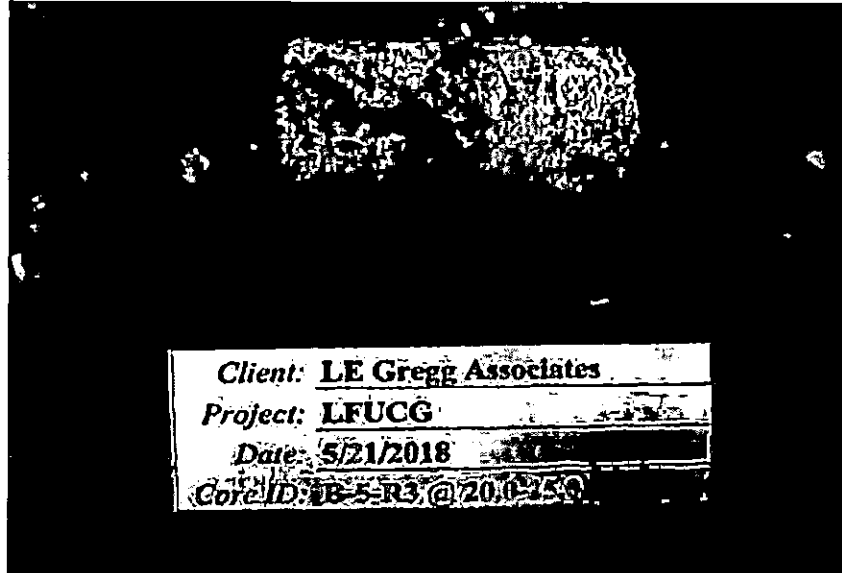
Before



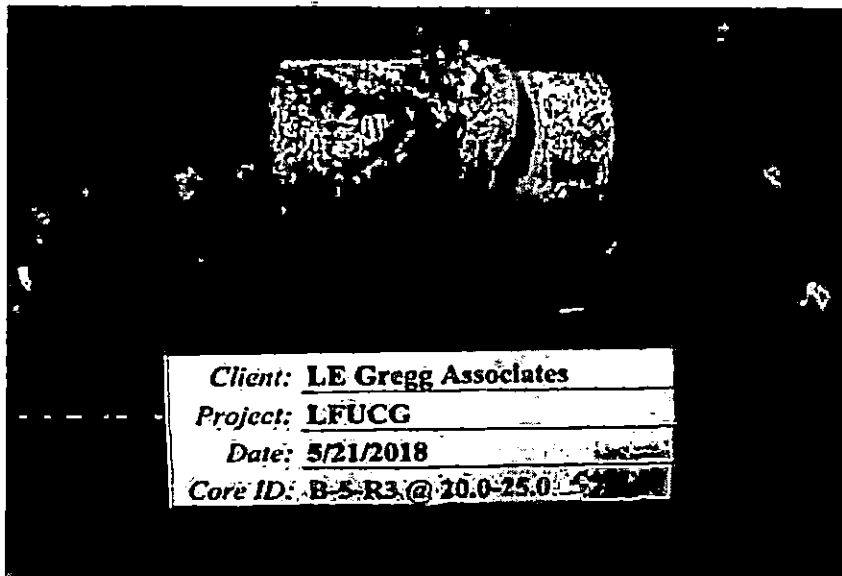
After

Pictures of Sample Before and After
Point Load Index Strength

Client Name: LE Gregg Associates
Project Name: LFUCG
Date: 5/21/2018
Sample ID: B-5-R3 @ 20.0-25.0



Before



After

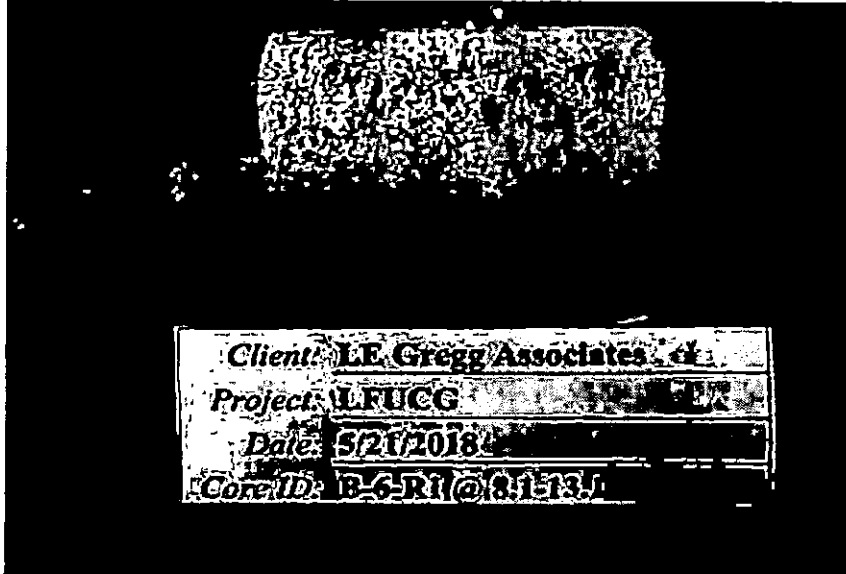
Pictures of Sample Before and After
Point Load Index Strength

Client Name: LE Gregg Associates

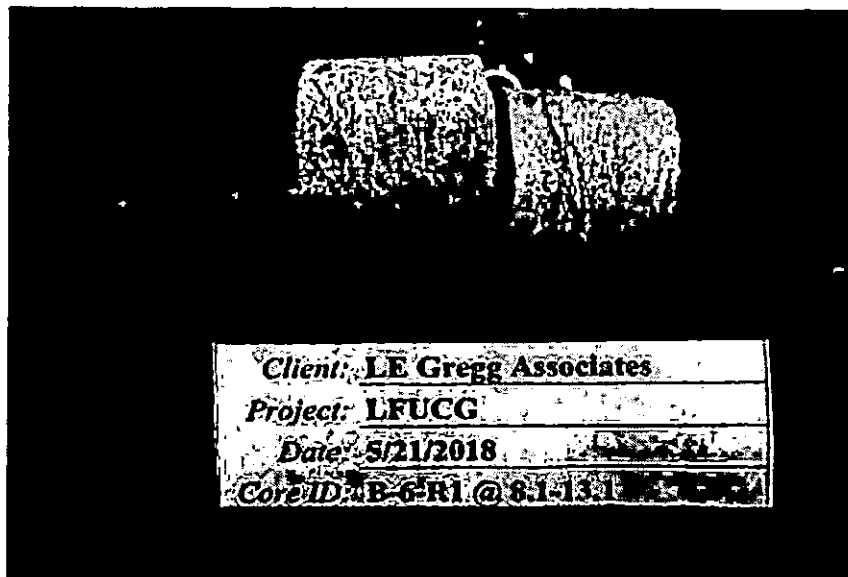
Project Name: LFUCG

Date: 5/21/2018

Sample ID: B-6-RI @ 8.1-13.1



Before



After

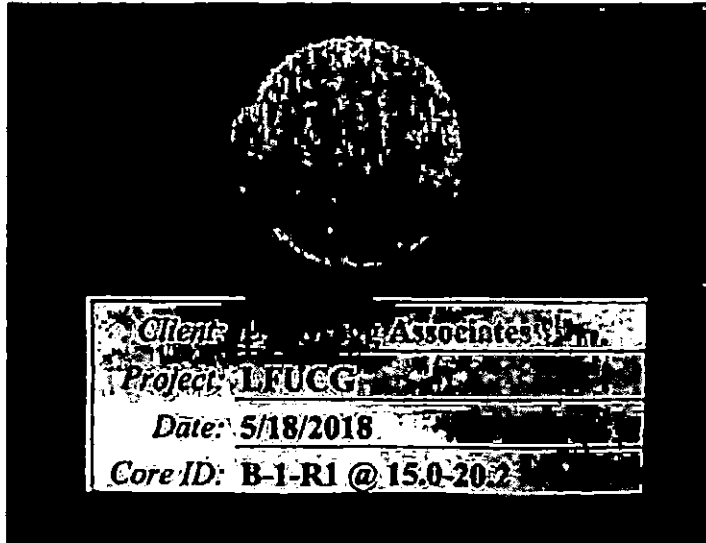
Pictures of Sample Before and After
Cerchar Abrasivity Index

Client Name: LE Gregg Associates

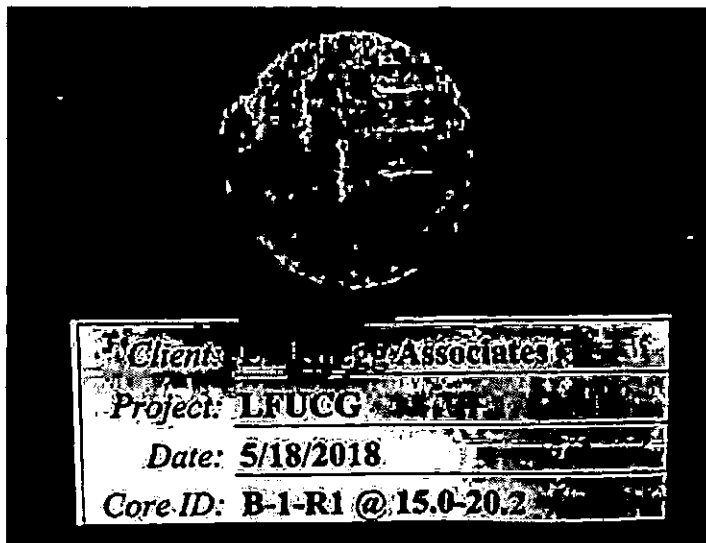
Project Name: LFUCG

Date: 5/21/2018

Sample ID: B-1-R1 @ 15.0-20.2



Before



After

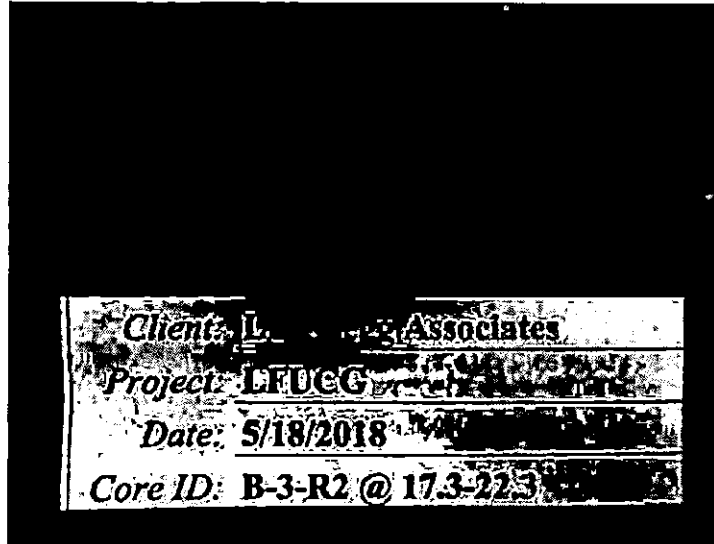
Pictures of Sample Before and After
Cerchar Abrasivity Index

Client Name: LE Gregg Associates

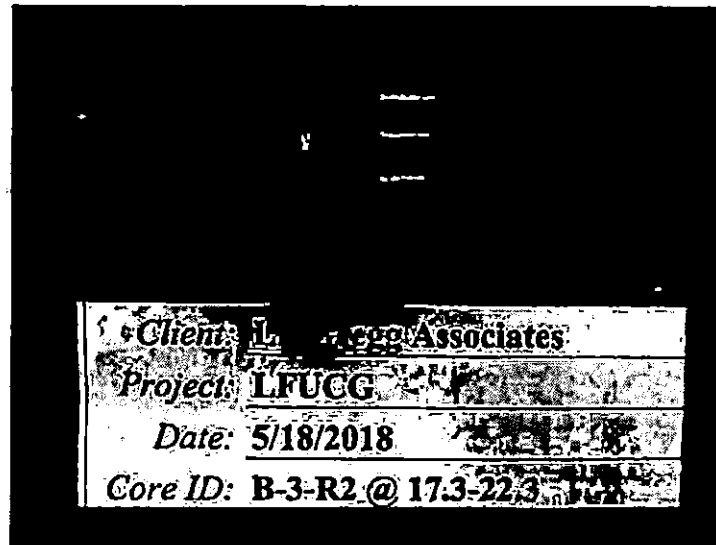
Project Name: LFUCG

Date: 5/21/2018

Sample ID: B-3-R2 @ 17.3-22.3



Before



After

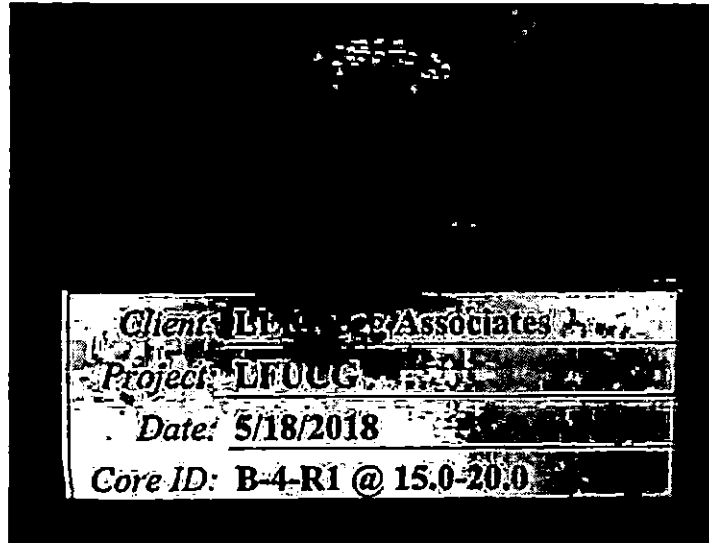
Pictures of Sample Before and After
Cerchar Abrasivity Index

Client Name: LE Gregg Associates

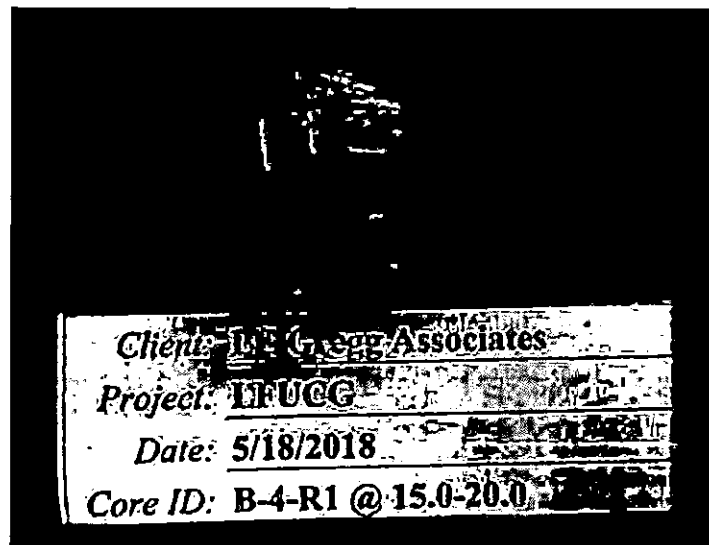
Project Name: LFUCG

Date: 5/21/2018

Sample ID: B-4-R1 @ 15.0-20.0



Before



After

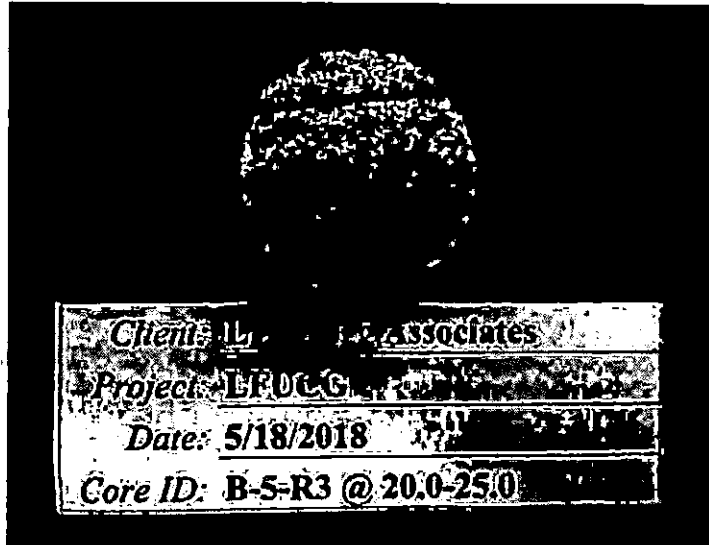
Pictures of Sample Before and After
Cerchar Abrasivity Index

Client Name: LE Gregg Associates

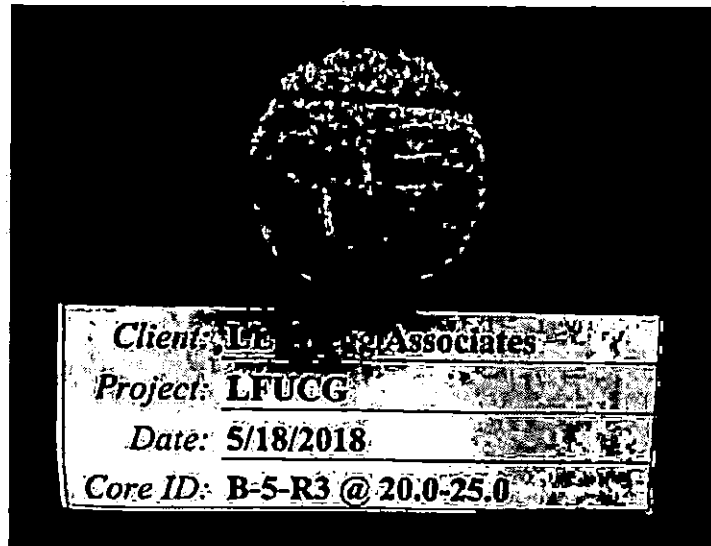
Project Name: LFUCG

Date: 5/21/2018

Sample ID: B-5-R3 @ 20.0-25.0



Before



After

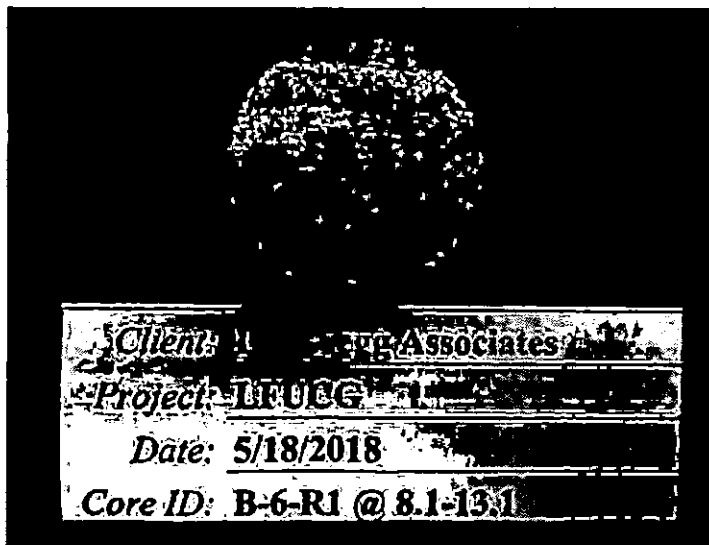
Pictures of Sample Before and After
Cerchar Abrasivity Index

Client Name: LE Gregg Associates

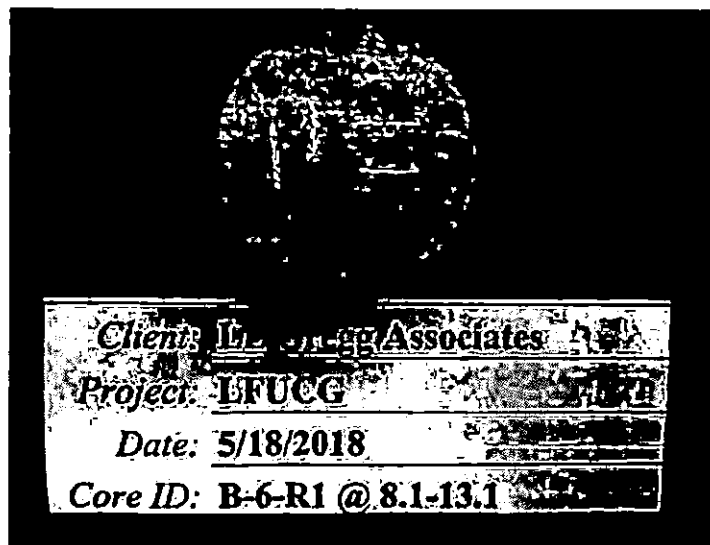
Project Name: LFUCG

Date: 5/21/2018

Sample ID: B-6-R1 @ 8.1-13.1



Before



After

APPENDIX B

Logs of Borings



PROJECT: LFUCG Lansdowne South Trunk Sewer PROJECT NO.: 2018019
 CLIENT: LFUCG and ESCI, LLC DATE: April 24-26, 2018
 LOCATION: LFUCG Lansdowne South Trunk Sewer - Wilson Downing Crossing
 DRILLER: Danny and Bobby LOGGED BY: SEM
 ELEVATION: 915.548 DRILLING METHOD: 4" SFA
 DEPTH TO WATER> INITIAL: 5.0 AFTER 24 HOURS: CAVING> C

BORING No. B-1

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	TEST RESULTS				Undrained Shear Strength (psf)	
					Plastic Limit Water Content -	Liquid Limit	NM	LL		PI
915.55	0	Topsoil (0.0-1.0)								
		Lean clay with sand and trace topsoil, silty, brown and gray, firm, very moist	4 4 4	1	37.7	37	13	8		
		Lean clay with rock fragments, silty, sandy, dark brown, firm, wet	8 50/3	2	25.1			50+		
910.55	5	Fat clay, silty, tan and gray, wet Boulder (5.3-5.6)	50/2	3	22.3			50+		
		Fat clay, silty, tan and gray, firm, wet Thin interbedded clay and weathered rock layers								
		Weathered limestone and shale layers	50/0	4				50+		
905.55	10									
		Auger refusal at 15.0 ft. Begin core recovery. Run 1 - 15.0-20.0 ft. Limestone, fine grained, thinly interbedded with with shale. Core barrel blocked off 2x due to thin beds of alternating limestone and shale.	REC- 70% ROD 18%							
900.55	15									
		Run 2 - 20.0-25.0 ft. Limestone, fine grained, thinly interbedded with with shale.	REC- 88% ROD 0%							
995.55	20									
		Core recovery terminated at 25.0 ft.								
890.55	25									
885.55	30									
880.55	35									

Figure



PROJECT: LFUCG Lansdowne South Trunk Sewer PROJECT NO.: 2018019
 CLIENT: LFUCG and ESCI, LLC DATE: April 24-26, 2018
 LOCATION: LFUCG Lansdowne South Trunk Sewer - Wilson Downing Crossing
 DRILLER: Danny and Bobby LOGGED BY: SEM
 ELEVATION: 915.754 DRILLING METHOD: 4" SFA
 DEPTH TO WATER > INITIAL: 6.0 AFTER 24 HOURS: CAVING > C

BORING No. B-2

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	TEST RESULTS				Undrained Shear Strength (psf)	
					Plastic Limit Water Content - Penetration -	Liquid Limit	NM	LL		PI
915.75	0	Topsoil (0.0-0.5)								
		Fill - Lean clay with trace topsoil, silty, light brown to brown, firm, wet	2 2 3	1	30.5				5	
910.75	5	Fill - Clayey gravel with sand, sandstone fragments, brown and gray, loose, moist	3 2 3	2	22.7	44	20		5	
		Weathered shale, light gray, hard								
905.75	10		18 20 50/4	3	9.2				50+	
900.75	15		20 50/3	4	10.5				50+	
895.75	20	Weathered shale with thin limestone layers, gray, hard	50/3	5	13.8				50+	
890.75	25	Boring terminated at 25.0 ft.								
885.75	30									
880.75	35									

Offset 16 ft. N/NE due to underground utility lines

Figure



PROJECT: LFUCG Lansdowne South Trunk Sewer PROJECT NO.: 2018019
 CLIENT: LFUCG and ESCI, LLC DATE: April 24-26, 2018
 LOCATION: LFUCG Lansdowne South Trunk Sewer - Wilson Downing Crossing
 DRILLER: Danny and Bobby LOGGED BY: SEM
 ELEVATION: 913.243 DRILLING METHOD: 4" SFA
 DEPTH TO WATER > INITIAL: 7.3 AFTER 24 HOURS: 7.3 CAVING > C

BORING No. B-3

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	TEST RESULTS				Undrained Shear Strength (psf)									
					Plastic Limit Water Content -	Liquid Limit	NM	LL		PI	N							
913.24	0	Topsoil (0.0-1.0)																
		Lean clay with trace organics, silty, dark brown, firm, moist	4 4 3	1	28.7	39	14	7										
908.24	5	Lean clay with rock fragments, silty, sandy, dark brown, wet, sampled as soft Weathered shale, gray, hard	2 14 38	2	16.1			52										
		Weathered shale, gray, hard, wet	50/2	3	11.3			50+										
903.24	10	Auger refusal at 7.3 ft. Begin core recovery. Run 1 - 7.3-12.3 ft. Limestone, fine grained, thinly interbedded with with shale.	REC: 60% RQD 10%															
		Run 2 - 12.3-17.3 ft. Limestone, fine grained, thinly interbedded with with shale.	REC: 80% RQD 8%															
898.24	15	Run 3 - 17.3-22.3 ft. Limestone, fine to medium grained, thinly interbedded with with shale. Recrystallization and pyritization in some areas.	REC: 100% RQD 12%															
893.24	20	Core recovery terminated at 22.3 ft.																
888.24	25																	
883.24	30																	
878.24	35																	

Figure



PROJECT: LFUCG Lansdowne South Trunk Sewer PROJECT NO.: 2018019
 CLIENT: LFUCG and ESCI, LLC DATE: April 24-26, 2018
 LOCATION: LFUCG Lansdowne South Trunk Sewer - Belleau Wood Crossing
 DRILLER: Danny and Bobby LOGGED BY: SEM
 ELEVATION: 908.60 DRILLING METHOD: 4" SFA
 DEPTH TO WATER > INITIAL: 4.5 AFTER 24 HOURS: CAVING > C

BORING No. B-4

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	TEST RESULTS				Undrained Shear Strength (psf)
					Plastic Limit Water Content - ●	Liquid Limit	NM	LL	
908.6	0	Topsoil (0.0-0.5) Lean clay with trace organics, silty, brown, sampled as soft, very moist		1	30.5	44	18	5	
903.6	5	Lean clay with rock fragments, silty, sandy, brown, wet, sampled as soft		2	27.8			5	
		Fat clay, silty, gray, soft, wet Weathered shale and limestone layers, gray, hard		3	22.0			50+	
898.6	10			4	16.7			50+	
893.6	15	Auger refusal at 15.0 ft; Begin core recovery. Run 1 - 15.0-20.0 ft. Limestone, fine grained, thinly interbedded with with shale.	REC-80% RQD-24%						
888.6	20	Run 2 - 20.0-25.0 ft. Limestone, fine to medium grained, thinly interbedded with with shale.	REC-92% RQD-0%						
883.6	25	Core recovery terminated at 25.0 ft.							
878.6	30								
873.6	35								

Figure



PROJECT: LFUCG Lansdowne South Trunk Sewer **PROJECT NO.:** 2018019
CLIENT: LFUCG and ESCI, LLC **DATE:** April 24-26, 2018
LOCATION: LFUCG Lansdowne South Trunk Sewer - Belleau Wood Crossing
DRILLER: Danny and Bobby **LOGGED BY:** SEM
ELEVATION: 908.648 **DRILLING METHOD:** 4" SFA
DEPTH TO WATER > INITIAL: 7.0 **AFTER 24 HOURS:** **CAVING >**

BORING No. B-5

This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	TEST RESULTS				Undrained Shear Strength (psf)	
					Plastic Limit Water Content - Penetration -	Liquid Limit	NM	LL		PI
908.65	0	Topsoil (0.0-1.0)								
		Fill - Lean clay with trace organics, silty, brown, moist, firm	5 4 6	1	24.4				10	
903.65	5	Fill - Lean clay with rock fragments, silty, brown, moist, spoon refusal on rock at 4.5 ft. Fill - Rock and cobbles	50/5	2	23.7				50+	
		Fat clay, silty, tan and gray, wet, firm	3 6 18	3	19.3				24	
		Weathered shale and limestone layers								
898.65	10	Auger refusal at 10.0 ft. Begin core recovery. Run 1 - 10.0-15.0 ft. Limestone, fine to medium grained, thinly interbedded with shale.								
893.65	15	Run 2 - 15.0-20.0 ft. Limestone, fine to medium grained, thinly interbedded with shale.								
888.65	20	Run 3 - 20.0-25.0 ft. Limestone, fine to medium grained, thinly interbedded with shale.								
883.65	25	Core recovery terminated at 25.0 ft.								
878.65	30									
873.65	35									

Figure



PROJECT: LFUCG Lansdowne South Trunk Sewer PROJECT NO.: 2018019
 CLIENT: LFUCG and ESCI, LLC DATE: April 24-26, 2018
 LOCATION: LFUCG Lansdowne South Trunk Sewer - Belleau Wood Crossing
 DRILLER: Danny and Bobby LOGGED BY: SEM
 ELEVATION: 904.544 DRILLING METHOD: 4" SFA
 DEPTH TO WATER > INITIAL: 4.0 AFTER 24 HOURS: 4.0 CAVING > C

BORING No. B-6

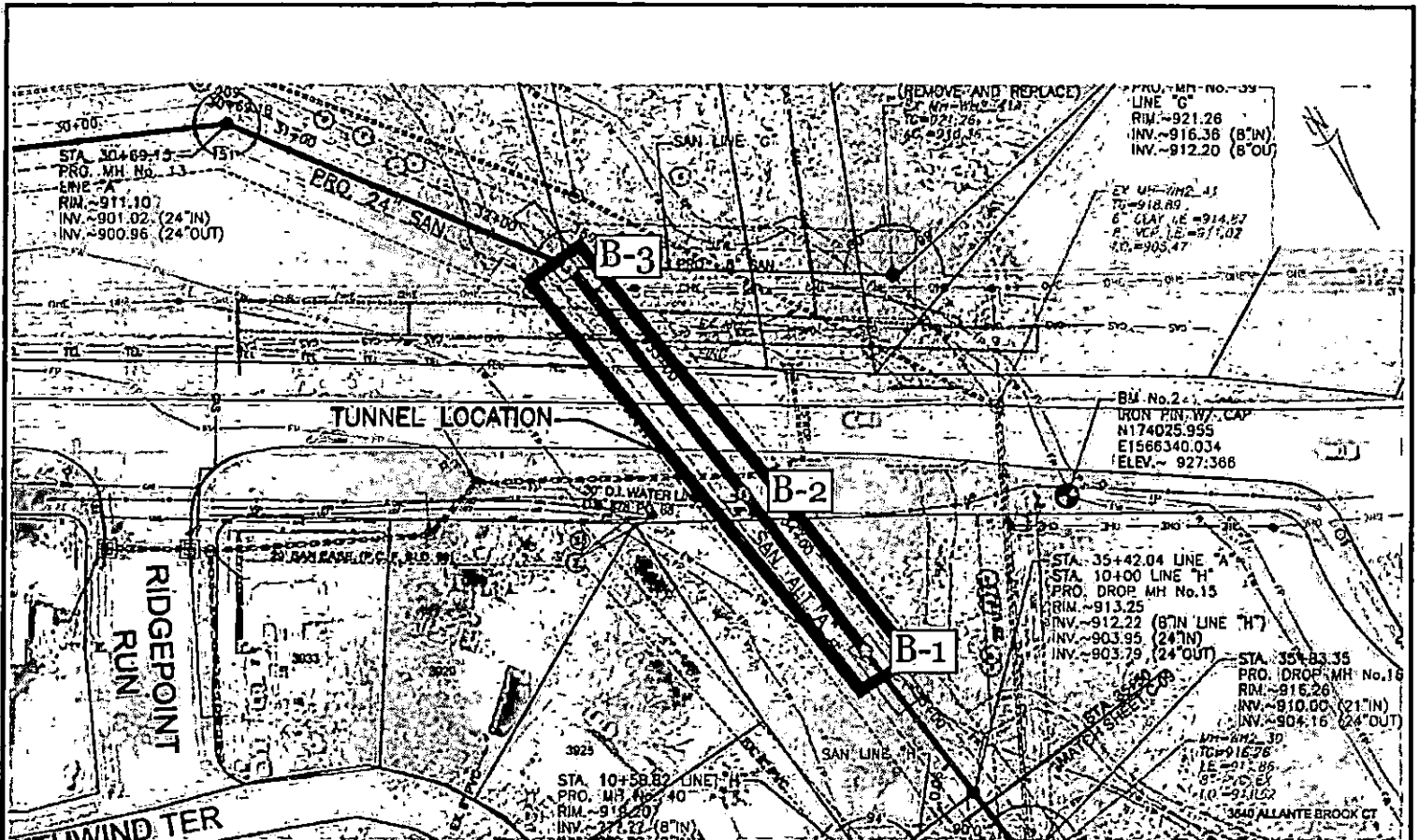
This information pertains only to this boring and should not be interpreted as being indicative of the site.

ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	TEST RESULTS				Undrained Shear Strength (psf)	
					Plastic Limit Water Content - Penetration -	Liquid Limit	NM	LL		PI
894.54	0	Topsoil (0.0-1.0)								
		Fill - Lean clay with rock fragments, silty, brown, firm, moist	3 2 3	1	19.0				5	
899.54	5	Weathered shale and limestone layers, gray, hard	33 30 1/2	2	14.4				50+	
894.54	10	Auger refusal at 8.1 ft. Begin core recovery. Run 1 - 8.1-13.1 ft. Limestone, fine to medium grained, thinly interbedded with with shale.	REC: 100% RQD 42%							
889.54	15	Run 2 - 13.1-18.1 ft. Limestone, fine to medium grained, thinly interbedded with with shale.	REC: 94% RQD 44%							
884.54	20	Run 3 - 18.1-23.1 ft. Limestone, fine to medium grained, thinly interbedded with with shale.	REC: 100% RQD 58%							
879.54	25	Core recovery terminated at 23.1 ft.								
874.54	30									
869.54	35									

Figure

APPENDIX C

**Site Location Map
Drawings**

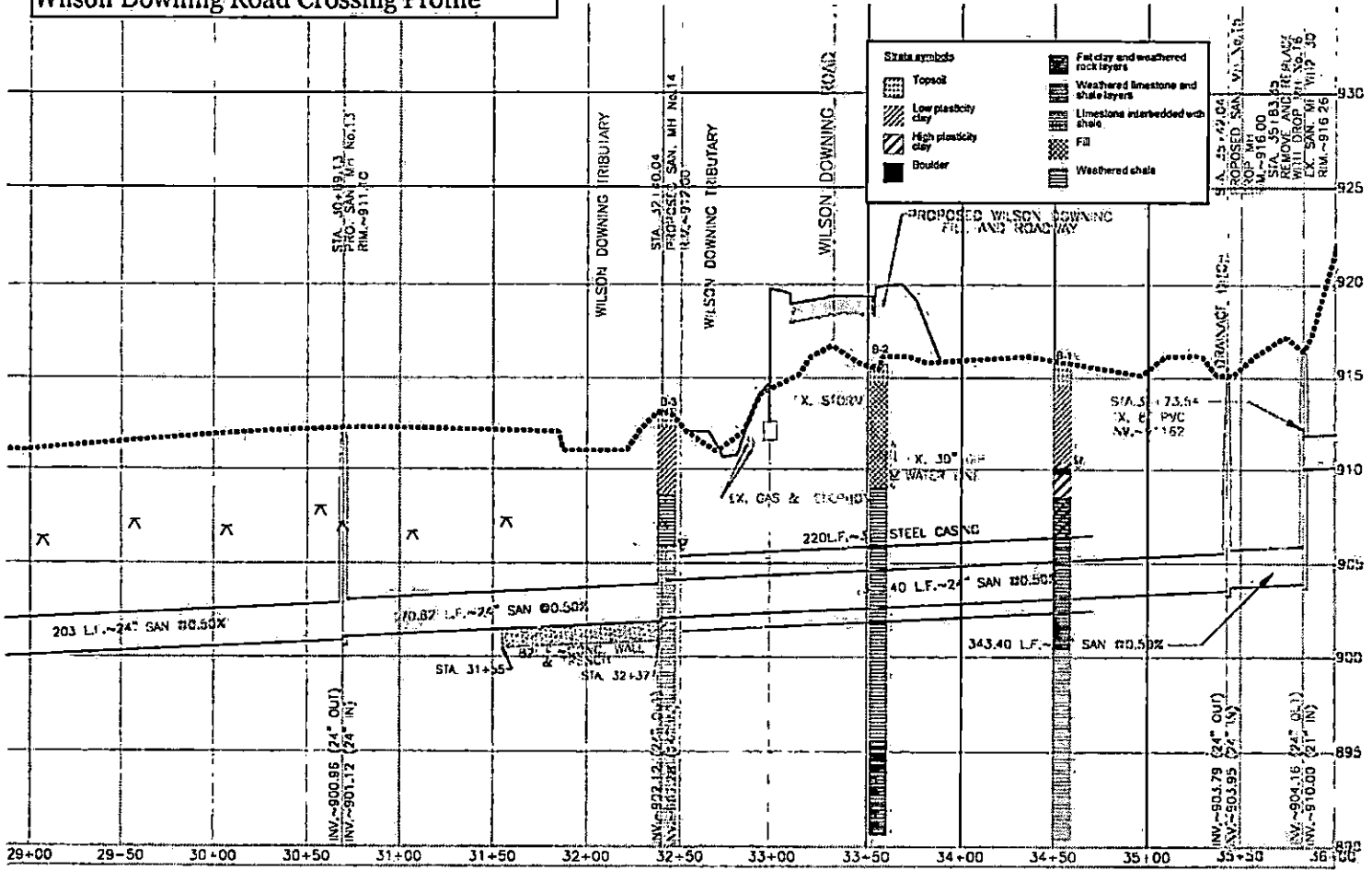


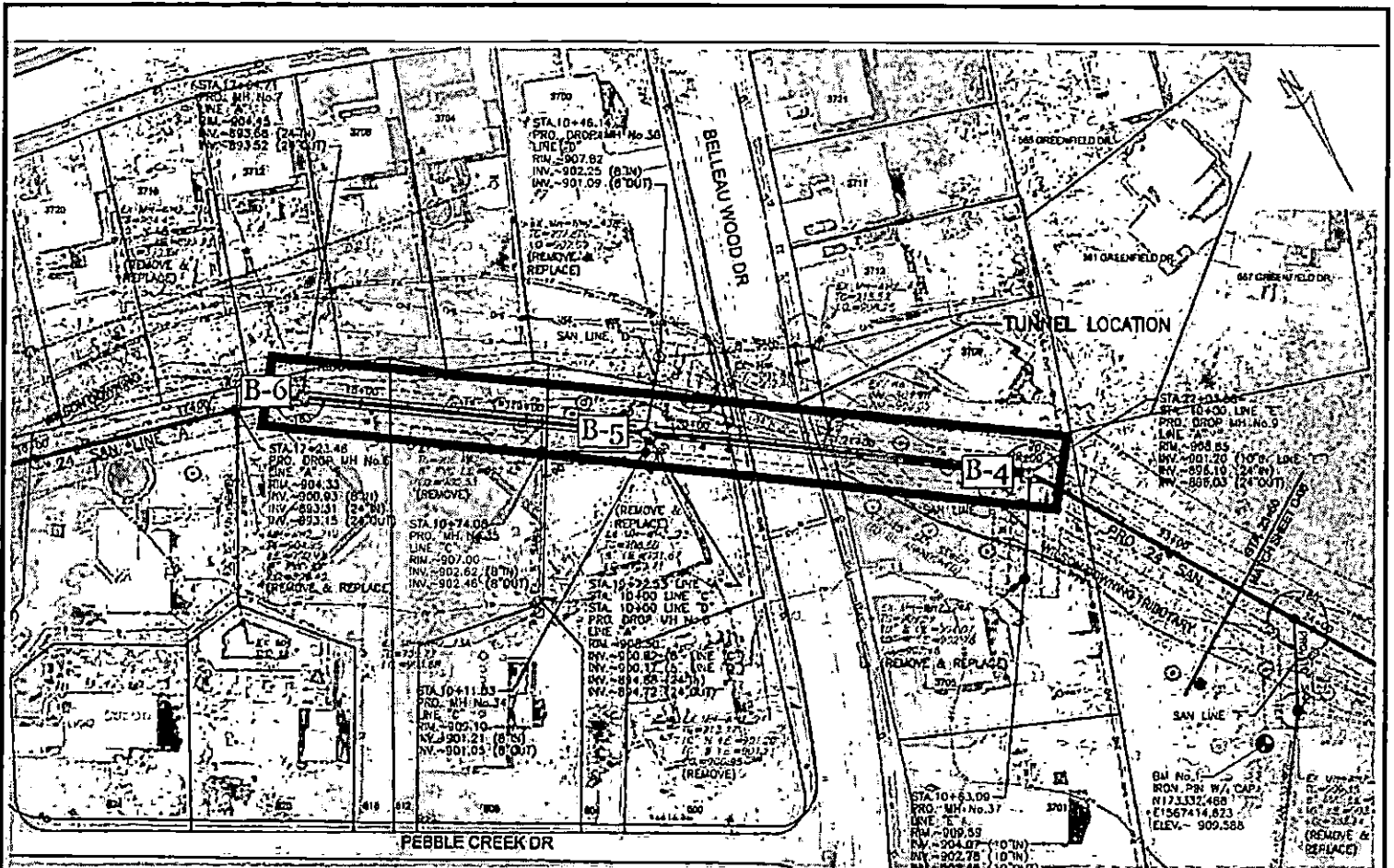

L.E. Gregg Associates, Inc.
 2456 Fortune Drive, Suite 155
 Lexington, Kentucky 40509

LFUCG Lansdowne South Trunk Sewer
Wilson Downing Crossing
Lexington, KY

Project #2018019	Boring Layout
------------------	---------------

Wilson Downing Road Crossing Profile





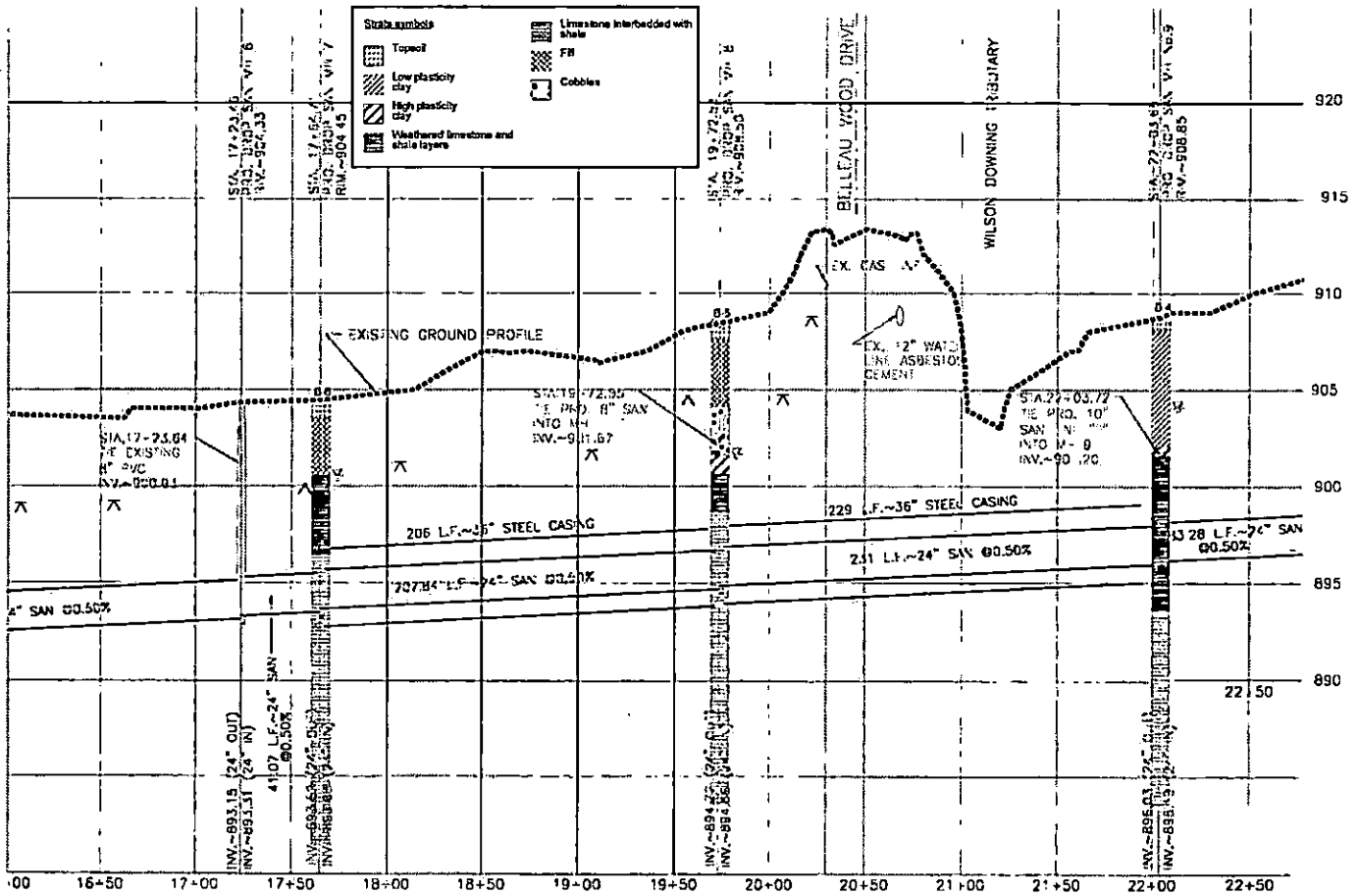
L.E. Gregg Associates, Inc.
 2456 Fortune Drive, Suite 155
 Lexington, Kentucky 40509

LFUCG Lansdowne South Trunk Sewer
 Belleau Wood Crossing
 Lexington, KY

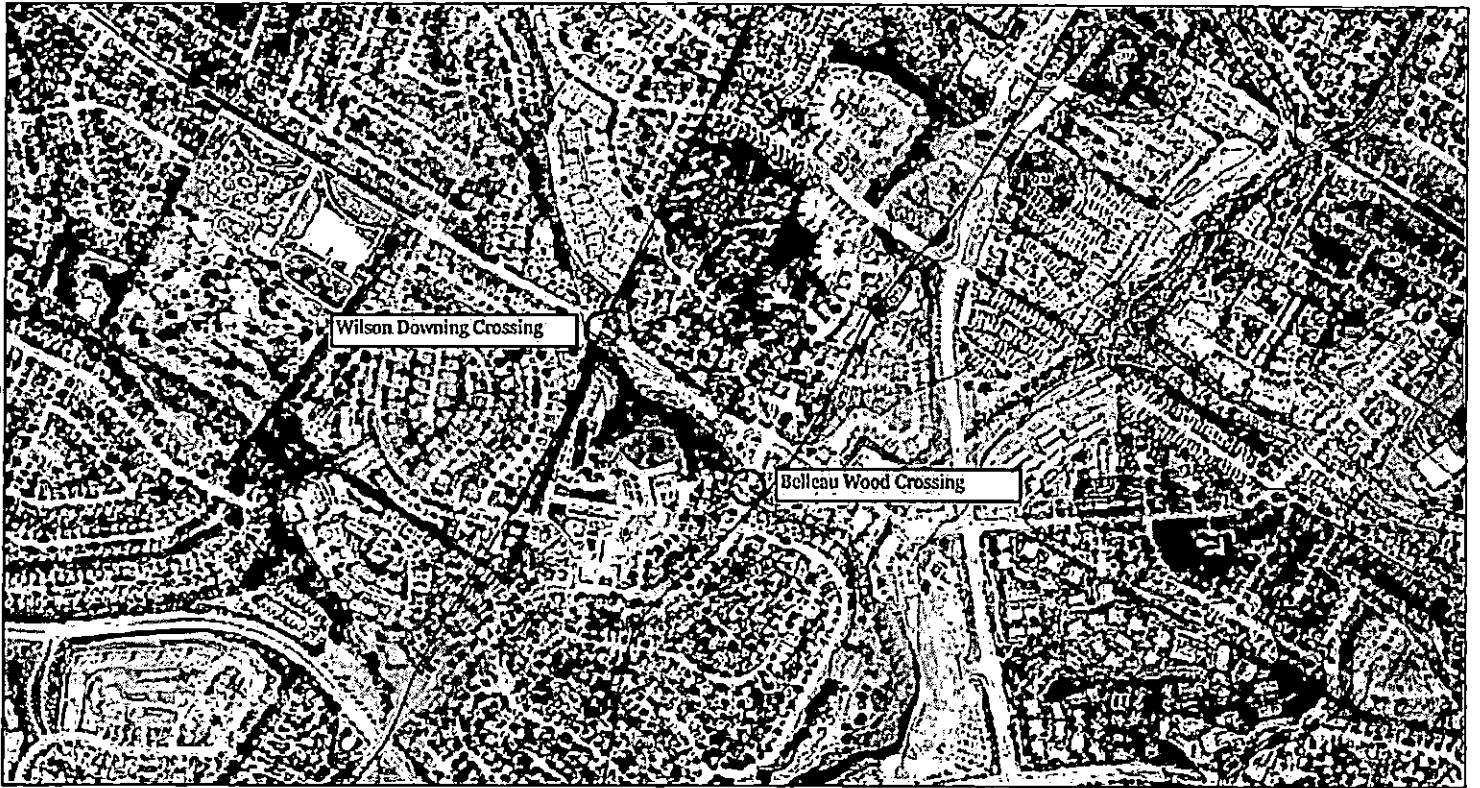
Project #2018019

Boring Layout

Belleau Wood Drive Crossing Profile

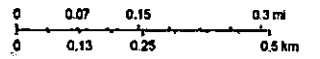


Kentucky Geologic Map Information Service



June 14, 2018

1:7,125



Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, DGI, USDA-NRIS, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors, Kentucky Geological Survey

Author: Kentucky Geological Survey
Copyright: Kentucky Geological Survey

APPENDIX D

Seismic Design Information

USGS Design Maps Summary Report

User-Specified Input

Report Title LFUCG Lansdowne South Trunk Sewer

Wed June 13, 2018 14:47:32 UTC

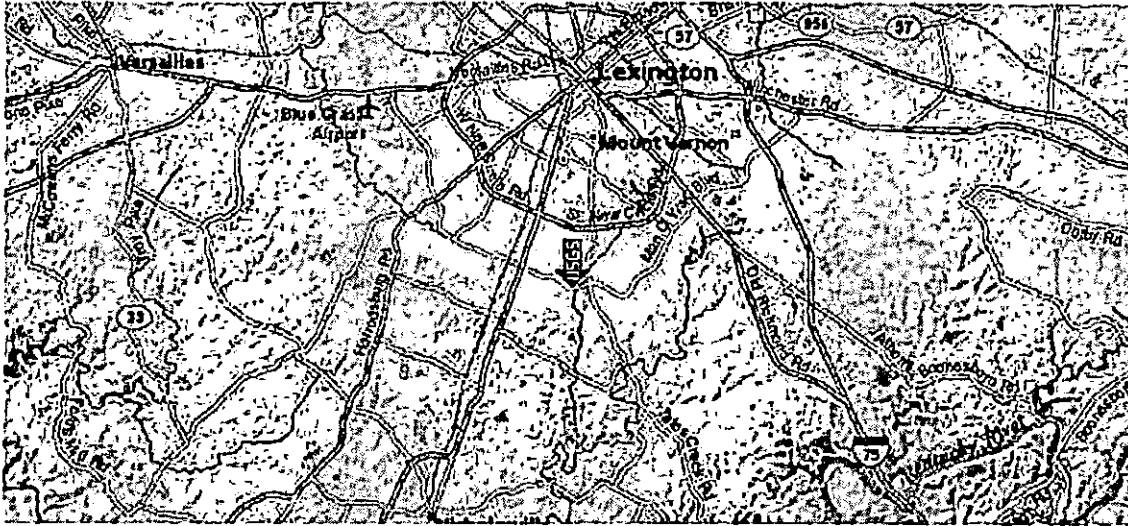
Building Code Reference Document 2012/2015 International Building Code

(which utilizes USGS hazard data available in 2008)

Site Coordinates 37.97742°N, 84.50586°W

Site Soil Classification Site Class B – "Rock"

Risk Category I/II/III



USGS-Provided Output

$$S_S = 0.187 \text{ g}$$

$$S_{MS} = 0.187 \text{ g}$$

$$S_{DS} = 0.124 \text{ g}$$

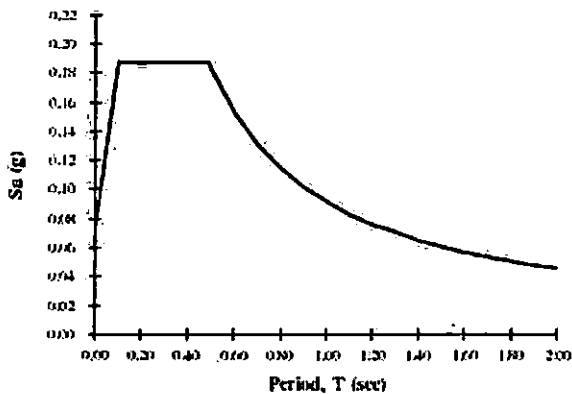
$$S_1 = 0.092 \text{ g}$$

$$S_{M1} = 0.092 \text{ g}$$

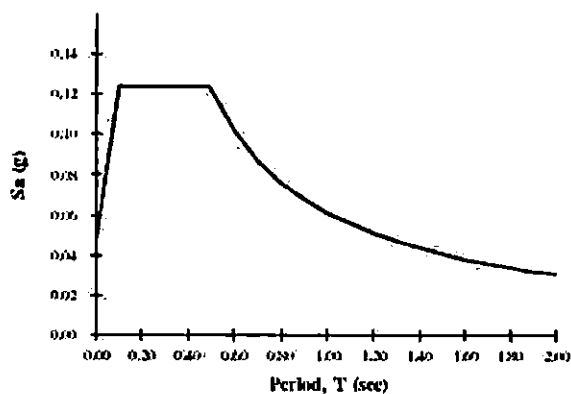
$$S_{D1} = 0.061 \text{ g}$$

For information on how the S_S and S_1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum



Design Response Spectrum



Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

USGS Design Maps Detailed Report

2012/2015 International Building Code (37.97742°N, 84.50586°W)

Site Class B – “Rock”, Risk Category I/II/III

Section 1613.3.1 — Mapped acceleration parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_s) and 1.3 (to obtain S_1). Maps in the 2012/2015 International Building Code are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 1613.3.3.

From **Figure 1613.3.1(1)** ^[1]

$$S_s = 0.187 \text{ g}$$

From **Figure 1613.3.1(2)** ^[2]

$$S_1 = 0.092 \text{ g}$$

Section 1613.3.2 — Site class definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class B, based on the site soil properties in accordance with Section 1613.

2010 ASCE-7 Standard – Table 20.3-1
SITE CLASS DEFINITIONS

Site Class	\bar{v}_s	\bar{N} or \bar{N}_{ch}	\bar{s}_u
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf

Any profile with more than 10 ft of soil having the characteristics:

- Plasticity Index $PI > 20$,
- Moisture content $w \geq 40\%$, and
- Undrained shear strength $\bar{s}_u < 500$ psf

F. Soils requiring site response analysis in accordance with Section 21.1

See Section 20.3.1

$$\text{For SI: } 1\text{ft/s} = 0.3048 \text{ m/s } \quad 1\text{lb/ft}^2 = 0.0479 \text{ kN/m}^2$$

Section 1613.3.3 — Site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters

TABLE 1613.3.3(1)
VALUES OF SITE COEFFICIENT F_s

Site Class	Mapped Spectral Response Acceleration at Short Period				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_s

For Site Class = B and $S_s = 0.187$ g, $F_s = 1.000$

TABLE 1613.3.3(2)
VALUES OF SITE COEFFICIENT F_v

Site Class	Mapped Spectral Response Acceleration at 1-s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = B and $S_1 = 0.092$ g, $F_v = 1.000$

Equation (16-37):

$$S_{MS} = F_a S_s = 1.000 \times 0.187 = 0.187 \text{ g}$$

Equation (16-38):

$$S_{M1} = F_v S_1 = 1.000 \times 0.092 = 0.092 \text{ g}$$

Section 1613.3.4 — Design spectral response acceleration parameters

Equation (16-39):

$$S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 0.187 = 0.124 \text{ g}$$

Equation (16-40):

$$S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.092 = 0.061 \text{ g}$$

Section 1613.3.5 — Determination of seismic design category

TABLE 1613.3.5(1)

SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATION

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

For Risk Category = I and $S_{DS} = 0.124 g$, Seismic Design Category = A

TABLE 1613.3.5(2)

SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

For Risk Category = I and $S_{D1} = 0.061 g$, Seismic Design Category = A

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is E for buildings in Risk Categories I, II, and III, and F for those in Risk Category IV, irrespective of the above.

Seismic Design Category \equiv "the more severe design category in accordance with Table 1613.3.5(1) or 1613.3.5(2)" = A

Note: See Section 1613.3.5.1 for alternative approaches to calculating Seismic Design Category.

References

1. Figure 1613.3.1(1): [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1\(1\).pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(1).pdf)
2. Figure 1613.3.1(2): [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1\(2\).pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/IBC-2012-Fig1613p3p1(2).pdf)

ROCK SOUNDING DATA

STATION	OFFSET FROM CENTERLINE	NORTHING	EASTING	REFUSAL DEPTH
10+00.00	0'	172,337.70	1,568,246.50	7.5'
10+50.00	0'	172,386.90	1,568,237.40	5.5'
11+00.00	0'	172,436.00	1,568,228.30	2.5'
11+50.00	0'	172,485.20	1,568,219.30	2'
12+00.00	0'	172,534.40	1,568,210.20	2'
13+56.72	0'	172,672.30	1,568,156.60	3.8'
13+79.55	0'	172,691.90	1,568,145.50	3.5'
15+57.00	5'	172,789.30	1,567,998.50	5.8'
16+06.97	5'	172,805.10	1,567,951.10	4.6'
16+56.92	5'	172,820.80	1,567,903.60	4.3'
17+56.97	5'	172,853.60	1,567,809.40	4.3'
18+07.05	5'	172,881.10	1,567,769.70	3.6'
19+06.97	5'	172,941.50	1,567,690.10	4.8'
19+56.83	3'	172,972.70	1,567,651.20	3.1'
20+06.82	5'	173,003.40	1,567,611.50	6'
20+21.95	5'	173,012.40	1,567,599.60	4.2'
23+06.96	0'	173,208.80	1,567,400.90	5.8'
24+56.92	0'	173,338.60	1,567,325.70	5.5'
25+56.80	0'	173,425.10	1,567,275.50	3.9'
26+06.85	0'	173,468.40	1,567,250.40	5.5'
26+45.63	0'	173,501.90	1,567,231.00	6'
27+06.98	0'	173,527.00	1,567,175.10	5.7'
27+56.99	0'	173,547.40	1,567,129.50	4.8'
28+06.89	0'	173,567.90	1,567,083.90	5.4'
28+56.84	0'	173,588.40	1,567,038.30	4.2'
29+06.93	0'	173,609.70	1,566,993.00	4.9'
29+56.89	0'	173,631.10	1,566,947.90	4.3'
30+06.90	0'	173,652.60	1,566,902.70	4.9'
30+56.96	0'	173,674.00	1,566,857.50	4.1'
30+69.13	0'	173,679.30	1,566,846.50	5'
31+07.00	0'	173,710.00	1,566,824.40	5.5'
31+56.95	0'	173,750.60	1,566,795.30	4.7'
32+40.04	0'	173,818.00	1,566,746.70	4.7'
36+37.72	0'	174,213.50	1,566,705.10	4.4'
37+06.97	0'	174,263.60	1,566,657.30	1.3'
37+56.97	0'	174,299.70	1,566,622.70	5.3'
38+06.90	0'	174,335.80	1,566,588.20	2.3'
38+56.98	0'	174,372.00	1,566,553.60	1.1'
39+06.91	0'	174,408.10	1,566,519.10	1.2'
39+56.99	0'	174,444.30	1,566,484.50	1.2'
40+06.93	0'	174,480.40	1,566,450.00	4.7'
40+54.82	0'	174,515.00	1,566,416.90	8.3'
41+06.98	0'	174,565.20	1,566,402.70	8.4'

ROCK SOUNDING DATA

STATION	OFFSET FROM CENTERLINE	NORTHING	EASTING	REFUSAL DEPTH
41+56.94	0'	174,613.30	156,638.20	7.2'
42+06.91	0'	174,661.40	1,566,375.60	4.2'
42+49.76	0'	174,702.60	1,566,363.90	7.1'
43+06.92	0'	174,756.10	1,566,343.60	2.5'
43+56.86	0'	174,802.80	1,566,325.90	1.3'
45+07.00	0'	174,943.10	1,566,272.60	5.7'
45+56.93	0'	174,991.70	1,566,261.70	6.3'
46+06.96	0'	175,040.90	1,566,252.60	6.3'
46+56.88	0'	175,090.00	1,566,243.40	6.9'
47+06.92	0'	175,139.20	1,566,234.30	6.3'
48+06.92	0'	175,236.60	1,566,231.60	7.6'
48+56.86	0'	175,284.40	1,566,246.30	7.8'
49+06.84	0'	175,332.20	1,566,260.90	7.3'
49+56.96	0'	175,372.70	1,566,285.90	9.6'
50+06.97	5'	175,408.90	1,566,320.40	4.7'
50+56.94	0'	175,455.30	1,566,323.40	10'
51+06.93	0'	175,503.20	1,566,309.10	9.3'
51+56.94	0'	175,551.10	1,566,294.80	7.1'
52+06.94	0'	175,599.00	1,566,280.50	6.4'
52+56.89	0'	175,646.90	1,566,266.20	7'
53+00.62	0'	175,688.80	1,566,253.70	9'
53+56.94	0'	175,739.90	1,566,230.10	7.9'
54+06.96	0'	175,785.30	1,566,209.10	9'
54+56.94	0'	175,832.60	1,566,193.20	10'
55+06.98	0'	175,880.40	1,566,178.40	11'
55+56.99	0'	175,928.20	1,566,163.70	10.5'
56+35.43	0'	176,003.10	1,566,140.50	10'
60+07.03	0'	176,316.70	1,565,941.50	13.2'
60+57.00	5'	176,359.90	1,565,915.90	12.7'
61+07.04	5'	176,400.10	1,565,886.10	14'
61+57.00	0'	176,440.20	1,565,856.30	5.7'

SECTION 00410 – BID FORM

Lansdowne South Trunk Replacement

**Division of Water Quality
Lexington-Fayette Urban County Government**

LFUCG Bid No. 174-2018

1.01 GENERAL

Place: 200 East Main, 3rd Floor Conference Room, Lexington, Kentucky Date: March 7, 2019

The following Bid Form shall be followed exactly in submitting a Bid for this Work.

This Bid Form Submitted by _____

(Name and Address of Bidder)

(Hereinafter called "Bidder"), organized and existing under the laws of the State of _____, doing

business as _____
"a corporation," "a partnership", or an "individual" as applicable

To: Lexington-Fayette Urban County Government
(Hereinafter called "Owner")
Office of the Director of Central Purchasing
200 East Main Street, Room 338
Lexington, KY 40507

The Bidder, in compliance with your Advertisement for Bids for the **Lansdowne South Trunk Replacement**; Lexington, Kentucky, having examined the Contract Documents including the Plans and Specifications with related documents, having examined the site for proposed Work, and being familiar with all of the conditions and any and all addendums surrounding the construction of the proposed Project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the Project in accordance with the Contract Documents, within the time set forth therein, and at the unit prices stated hereinafter. These prices are to cover all expenses incurred in performing the Work required under the Contract Documents, of which this Bid is a part.

The Bidder hereby agrees to commence Work under this Contract on a date to be specified in a written "Notice to Proceed" of the Owner and to substantially complete the Project within [Four Hundred (400)] consecutive calendar days. Bidder further agrees to pay liquidated damages, the sum of One Thousand Dollars and Zero cents (\$1,000.00)] for each consecutive day thereafter.

The Bidder hereby acknowledges receipt of the following addenda:

Addendum No. ____ Date _____; Addendum No. ____ Date _____
Addendum No. ____ Date _____; Addendum No. ____ Date _____
Addendum No. ____ Date _____; Addendum No. ____ Date _____
Addendum No. ____ Date _____; Addendum No. ____ Date _____

Insert above the number and the date of any Addendum issued and received. If none has been issued and received, the word "NONE" should be inserted.

1.02 LEGAL STATUS OF BIDDER

Bidder _____

Date _____

*A. A corporation duly organized and doing business under the laws of the State of _____,
for whom _____, bearing the
official title of _____, whose signature is
affixed to this Bid is duly authorized to execute contracts.

*B. A Partnership, all of the members of which, with addresses are: (Designate general partners
as such)

*C. An individual, whose signature is affixed to this Bid. (Print name)

* The Bidder shall fill out the appropriate form and strike out the other two.

1.03 BIDDERS AFFIDAVIT

Comes the Affiant, _____, and after being first duly sworn, states under penalty of perjury as follows:

- A. His/her name is _____ and he/she is the individual submitting the Bid or is the authorized representative of _____, the entity submitting the Bid (hereinafter referred to as "Bidder").
- B. Bidder will pay all taxes and fees, which are owed to the Lexington-Fayette Urban County Government at the time the Bid is submitted, prior to award of the Agreement and will maintain a "current" status in regard to those taxes and fees during the life of the Agreement.
- C. Bidder will obtain a Lexington-Fayette Urban County Government business license, if applicable, prior to award of the Agreement.
- D. Bidder has authorized the Division of Central Purchasing to verify the above-mentioned information with the Division of Revenue and to disclose to the Urban County Council that taxes and/or fees are delinquent or that a business license has not been obtained.
- E. Bidder has not knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky within the past five (5) years and the award of an Agreement to the Bidder will not violate any provision of the campaign finance laws of the Commonwealth.
- F. Bidder has not knowingly violated any provision of Chapter 25 of the Lexington-Fayette Urban County Government Code of Ordinances, known as the "Ethics Act."
- G. Bidder acknowledges that "knowingly" for purposes of this Affidavit means, with respect to conduct or to circumstances described by a statute or ordinance defining an offense, that a person is aware or should have been aware that his/her conduct is of that nature or that the circumstance exists.

Further, Affiant sayeth naught.

Affiant Signature

STATE OF _____

COUNTY OF _____

The foregoing instrument was subscribed, sworn to and acknowledged before me by

_____ on this the _____ day of _____, 20__.

My Commission expires: _____

NOTARY PUBLIC, STATE AT LARGE

1.04 BID SCHEDULE

The Bidder agrees to perform all the Work described in the Specifications and shown on the Plans for the following proposed lump sum and/or unit prices, if applicable, which shall include the furnishing of all labor, materials, supplies, equipment and/or vehicle usage, services, all items of cost, overhead, taxes (federal, state, local), and profit for the Contractor and any Subcontractor involved, within the time set forth herein. If unit prices are applicable, Bidder must make the extensions and additions showing the total amount of Bid. In all cases of discrepancies or math errors the amount written in for the unit price of an item shall govern.

If a discrepancy between the unit price and the item total exists, the unit price prevails except:

If the unit price is illegible, omitted, or the same as the item total, item total prevails, and the unit price is the quotient of the item total and the quantity.

If the unit price and the item total are illegible or are omitted, the bid may be determined nonresponsive. If a lump sum total price is illegible or is omitted, the bid may be determined nonresponsive.

By submitting a Bid, the Bidder acknowledges that the trenchless constructability of all tunnels shown on the Contract Drawings have been vetted by the Bidder and that the Bidder's own design has been advanced to the extent necessary to establish, in the Bidder's own opinion, the ability to safely construct by means of tunneling methods.

A Preliminary Tunnel Plan shall be developed by the Bidder, concurrent with the development of the Bid, to document the Bidder's awareness and understanding of the quantity of, location of, and access to the portions of the Contract that are required to be built by trenchless means. The Preliminary Tunnel Plan is a conceptual plan establishing the capability to accomplish the tunnel construction required by Contract. Following award of the Contract, the Contractor shall modify the Preliminary Tunnel Plan as needed to develop the most efficient construction plan of operation in accordance with Contract Documents. Requirements for submittal of and content of the Preliminary Tunnel Plan shall be in accordance with this Section.

Apparent Low Bidder shall submit, no later than 48 hours after Bid Opening, a Preliminary Tunnel Work Plan as part of its Bid. The Preliminary Tunnel Work Plan shall consist of sketches, markups, and/or narrative explanations. Legible hand-written notes on Bid Documents (e.g.: Bid Drawings) are acceptable. The Preliminary Tunnel Work Plan shall include the following:

- A. Indication of diameter, type, and material of initial tunnel support, casings, or jacking pipe for Tunnels T-1, T-2, T-3 and T-3.
- B. Indication of tunnel drive direction.
- C. Indication of basic tunnel equipment type, size, make, and model anticipated such as tunnel boring machine size, microtunnel boring machine, pipe jacked shield, auger boring machine, or utility hand tunneling methods.
- D. Indication of conceptual understanding of all shaft locations, size (e.g.: diameter, length and width), orientation, anticipated conceptual method of support, staging/storage, and means of site access for each tunnel shaft as required for the Bidder's specific means and methods.
- E. Conceptual markup of plan, profile, or detail drawings of the following:
 - 1. groundwater removal process and safe discharge locations,
 - 2. spoils handling and storage,
 - 3. method of installation and blocking of carrier pipe, and
 - 4. Annular space grouting (if required).

- F. Preliminary indication all areas where potential ground modification strategies are anticipated or will be further explored by the Bidder upon award of the Contract.

For a lump sum based bid, the item total is the bid amount the Owner uses for bid comparison.

For a unit price based bid, the sum of the item totals is the bid amount the Owner uses for bid comparison.

The Owner's decision on the bid amount is final.

BID SCHEDULE

Item	Description	Unit	Approx. Quantity	Unit Price	Item Price
1	Mobilization	LS	1		
2	Bonds and Insurance	LS	1		
3	General Requirements	LS	1		
4	Demobilization	LS	1		
5	Erosion and Sediment Control and Conformance with SWPPP	LS	1		
6	Clearing & Grubbing	LS	1		
7	4-inch Gravity Sewer Lateral, PVC (SDR 35), 6.1'-10' depth	LF	82		
8	8-inch Gravity Sewer Pipe, PVC (SDR 35), 6.1'-10' depth	LF	793		
9	8-inch Gravity Sewer Pipe, PVC (SDR 26), 10.1'-14' depth	LF	63		
10	10-inch Gravity Sewer Pipe, PVC (SDR 35), 6.1'-10' depth	LF	146		
11	21-inch (PVC) or 20-inch (DIP, FRP, PCCP) Gravity Sewer Pipe, 6.1'-10' depth	LF	288		
12	21-inch (PVC) or 20-inch (DIP, FRP, PCCP) Gravity Sewer Pipe, 10.1'-14' depth	LF	1,414		
13	21-inch (PVC) or 20-inch (DIP, FRP, PCCP) Gravity Sewer Pipe, greater than 14' depth	LF	291		
14	24-inch Gravity Sewer Pipe (DIP, FRP, PVC, PCCP), 6.1'-10' depth	LF	235		
15	24-inch Gravity Sewer Pipe (DIP, FRP, PVC, PCCP), 10.1'-14' depth	LF	1044		
16	24-inch Gravity Sewer Pipe (DIP, FRP, PVC, PCCP), greater than 14' depth	LF	167		
17	8-inch Tee Fittings for Gravity Sewer Lateral Connection (FRP, PVC, PCCP)	EA	8		
18	21-inch Tee Fittings for Gravity Sewer Lateral	EA	8		

Connection (FRP, PVC, PCCP)					
19A	<p>Tunnel Line Segment T-1, Sta. 13+76.54 to Sta. 17+23.46, 347± LF of 36-inch minimum casing pipe with a 24-inch carrier pipe. See Tunneling Method Table in the Project Specific Notes for additional information.</p> <p>Tunneling Method (Check One)</p> <p><input type="checkbox"/> Micotunneling Boring Machine (MTBM)</p> <p><input type="checkbox"/> Guided Bore and Jack (GB&J)</p>	347	LF		
19B	<p>Tunnel Line Segment T-2, Sta. 17+64.71 to Sta. 19+72.53, 208± LF of 36-inch minimum casing pipe with a 24-inch carrier pipe. See Tunneling Method Table in the Project Specific Notes for additional information.</p> <p>Tunneling Method (Check One)</p> <p><input type="checkbox"/> Micotunneling Boring Machine (MTBM)</p> <p><input type="checkbox"/> Guided Bore and Jack (GB&J)</p>	208	LF		
19C	<p>Tunnel Line Segment T-3, Sta. 19+72.53 to Sta. 22+03.68, 231± LF of 36-inch minimum casing pipe with a 24-inch carrier pipe. See Tunneling Method Table in the Project Specific Notes for additional information.</p> <p>Tunneling Method (Check One)</p> <p><input type="checkbox"/> Micotunneling Boring Machine (MTBM)</p> <p><input type="checkbox"/> Guided Bore and Jack (GB&J)</p>	231	LF		
19D	<p>Tunnel Line Segment T-4, Sta. 32+40.04 to Sta. 34+60, 220± LF of 36-inch minimum casing pipe with a 24-inch carrier pipe. See Tunneling Method Table in the Project Specific Notes for additional information.</p> <p>Tunneling Method (Check One)</p> <p><input type="checkbox"/> Micotunneling Boring Machine (MTBM)</p> <p><input type="checkbox"/> Guided Bore and Jack (GB&J)</p>	220	LF		
20	Connect to existing 8-inch sewer	EA	11		
21	Connect to existing 10-inch sewer	EA	5		
22	Connect to existing 15-inch sewer	EA	2		

23	Manhole Abandonment	EA	9		
24	Standard Manhole, 4-foot diameter (depth 5.1 to 6.0 ft)	EA	4		
25	Standard Manhole, 4-foot diameter (depth 6.1 to 10.0 ft)	EA	11		
26	Standard Manhole, 4-foot diameter (depth 10.1 to 14.0 ft)	EA	19		
27	Standard Manhole, 4-foot diameter (depth greater than 14 ft)	EA	5		
28	Standard Manhole, 5-foot diameter (depth 10.1 to 14.0 ft)	EA	1		
29	Standard Manhole, 5-foot diameter (depth greater than 14.0 ft)	EA	1		
30	Manhole Drop Connection (8"-10")	EA	12		
31	Manhole Drop Connection (12"-21")	EA	3		
32	Manhole accessories for location within 100- year floodplain	EA	35		
33	Reconnect existing service lateral to new MH	EA	2		
34	Pipe Abandonment, Plug, 8"	EA	1		
35	Pipe Abandonment, Plug, 15"	EA	12		
36	Creek Crossing and Bank / Bed Restoration	LS	7		
37	Video inspection of new sewer pipe	LF	5,270		
38	Tree Removal, > 12-inch diameter	EA	30		
39	Bituminous Concrete: Private Parking Lots/Driveways	SY	2,045		
40	Storm Sewer Removal and Replacement (12"), (PVC)	LF	80		
41	Storm Sewer Removal and Replacement (15"), (RCP)	LF	60		
42	Precast Concrete Headwall (15")	LF	1		
43	Seeding, Temporary, Extra as directed by Engineer	SY	14,849		
44	Site Restoration Method B	SY	12,764		
45	Sod	SY	2,085		
46	Dense Graded Aggregate - DGA, Extra as directed by Engineer	Ton	100		
47	No. 9 Crushed Stone, Extra as directed by Engineer	Ton	100		
48	No. 57 Crushed Stone, Extra as directed by Engineer	Ton	100		
49	No. 2 Crushed Stone, Extra as directed by Engineer	Ton	100		
50	Flowable (Controlled Density) Fill	CY	50		
51	4.0 ft. Chain Link Fence	LF	100		

52	Privacy Fence (Wooden)	LF	100		
53	Safety Fence	LF	1,000		
54	Bypass Pumping and Setup	LS	1		
55	Backhoe/Extend-a-hoe, extra as directed by Engineer	HR	10		
56	Hoe Ram, extra as directed by Engineer	HR	10		
57	Dump Truck, Single Axle, extra as directed by Engineer	HR	10		
58	Dump Truck, Tandem or Tri-Axle, extra as directed by Engineer	HR	10		
59	Large Track Hoe, CAT 311 or Equivalent, extra as directed by Engineer	HR	10		
60	Small Track Hoe, CAT 301.6C or Equivalent, extra as directed by Engineer	HR	10		
61	Skid-Steer Loader, extra as directed by Engineer	HR	10		
62	Roller/Compactor, extra as directed by Engineer	HR	10		
63	Traffic Maintenance - Type 1 (Flagger), extra as directed by Engineer	HR	10		
64	Rock Removal	CY	4,344		
65	Class "A" Concrete	CY	140		
66	Obstruction Standby Time	DAY	1		
67	Obstruction Removal and Shaft	VLF	25		
68	Miscellaneous Site Improvements	LS	1	\$400,000	
69	Laborer, Extra as directed by Engineer	HR	10		
70	Foreman, Extra as directed by Engineer	HR	10		
71	Superintendent, Extra as directed by Engineer	HR	10		
72	Carpenter, Extra as directed by Engineer	HR	10		
TOTAL BID (Items 1 thru 72)					

TOTAL BID AMOUNT:

_____ Dollars (\$ _____)

Respectfully Submitted,

FIRM: _____

ADDRESS: _____

CITY/STATE/ZIP: _____

DATE: _____

BY: _____

(must be original signature)

TITLE: _____

PHONE: _____ FAX: _____
(area code, number & extension)

EMAIL ADDRESS: _____

OFFICIAL ADDRESS AND PHONE:

_____ (Seal if Bid is by Corporation)

By signing this form you agree to all of the terms and associated forms.

1.05 STATEMENT OF BIDDER'S QUALIFICATIONS

The following statement of the Bidder's qualifications is required to be filled in, executed, and submitted with the Bid:

- A. Name of Bidder: _____
- B. Permanent Place of Business: _____
- C. When Organized: _____
- D. Where Incorporated: _____
- E. Financial Condition:

If specifically requested by the Owner, the apparent low Bidder is required to submit its latest three (3) years audited financial statements to the Owner's Division of Central Purchasing within seven (7) calendar days following the Bid opening.

- F. In the event the Agreement is awarded to the undersigned, Performance, Payment, Erosion and Sediment Control, and Warranty bonds will be furnished by:

_____ (Surety)

Signed: _____ (Representative of Surety)

- G. The following is a list of similar projects performed by the Bidder: (Attach separate sheet if necessary).

<u>NAME</u>	<u>LOCATION</u>	<u>CONTRACT SUM</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

- H. The Bidder has now under contract and bonded the following projects:

<u>NAME</u>	<u>LOCATION</u>	<u>CONTRACT SUM</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

I. List Key Bidder Personnel who will work on this Project.

<u>NAME</u>	<u>POSITION DESCRIPTION</u>	<u>NO. OF YEARS WITH BIDDER</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

J. MWDBE Participation on current bonded projects under contract:

<u>SUBCONTRACTORS (LIST)</u>	<u>PROJECT (SPECIFIC TYPE)</u>	<u>MWDBE</u>	<u>% of WORK</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

(USE ADDITIONAL SHEETS IF NECESSARY)

K. We acknowledge that, if we are the apparent low Bidder, we may be required to submit to the Owner within seven (7) calendar days following the Bid Opening, a sworn statement regarding all office management and field management personnel. Additionally, if requested by the Owner, we will within seven (7) days following the request submit audited financial statements and loss history for insurance claims for the three (3) most recent years (or a lesser period if stipulated by the Owner)

1.06 LIST OF PROPOSED SUBCONTRACTORS

The following list of proposed subcontractors is required by the Owner to be executed, completed and submitted with the Bid Form. All subcontractors are subject to approval of the Lexington-Fayette Urban County Government. Failure to submit this list completely filled out may be cause for rejection of Bid.

<u>BRANCH OF WORK**</u> (List each major item)	<u>SUBCONTRACTOR</u>	<u>MWDBE (yes/no)</u>	<u>% of WORK</u>
1. _____	Name: _____	_____	_____
	Address: _____		

2. _____	Name: _____	_____	_____
	Address: _____		

3. _____	Name: _____	_____	_____
	Address: _____		

4. _____	Name: _____	_____	_____
	Address: _____		

5. _____	Name: _____	_____	_____
	Address: _____		

6. _____	Name: _____	_____	_____
	Address: _____		

** Such as: Grading, bituminous paving, concrete, seeding and protection, construction staking, etc.

1.07 AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST

I hereby swear (or affirm) under the penalty for false swearing:

- A. That I am the Bidder (if the Bidder is an individual), a partner of the Bidder (if the Bidder is a partnership), or an officer or employee of the Bidding corporation having authority to sign on its behalf (if the Bidder is a corporation);
- B. That the attached Bid has been arrived at by the Bidder independently, and has been submitted without collusion with, and without any agreement, understanding or planned common course of action, with any other contractor, vendor of materials, supplies, equipment or services described in the Advertisement for Bid, designed to limit independent bidding or competition;
- C. That the contents of the Bid or Bids have not been communicated by the Bidder or its employees or agents to any person not an employee or agent of the Bidder or its surety on any bond furnished, with the Bid or Bids, and will not be communicated to any such person, prior to the official opening of the Bid or Bids;
- D. That the Bidder is legally entitled to enter into the contracts with the Lexington-Fayette Urban County Government, and is not in violation of any prohibited conflict of interest;
- E. (Applicable to corporation only) That as a foreign corporation, we are registered with the Secretary of State, Commonwealth of Kentucky, and authorized to do business in the State _____ or, that as a domestic corporation, we are in good standing with the Secretary of State, Commonwealth of Kentucky _____. [Check the statement applicable.]
- F. This offer is for ninety (90) calendar days from the date this Bid is opened. In submitting the above, it is expressly agreed that, upon proper acceptance by the Lexington-Fayette Urban County Government of any or all items Bid above, an Agreement shall thereby be created with respect to the items accepted.
- G. That I have fully informed myself regarding the accuracy of the statements made in this statement.
- H. That I certify that Subcontractors have not and will not be awarded to any firm(s) that have been debarred from noncompliance with the Federal Labor Standards, Title VI of the Civil Rights Act of 1964 As Amended, Executive Order 11246 As Amended or any other Federal Law.

Company	Date	Representative

1.08 STATEMENT OF EXPERIENCE

NAME OF INDIVIDUAL: _____

POSITION/TITLE: _____

STATEMENT OF EXPERIENCE: _____

NAME OF INDIVIDUAL: _____

POSITION/TITLE: _____

STATEMENT OF EXPERIENCE: _____

NAME OF INDIVIDUAL: _____

POSITION/TITLE: _____

STATEMENT OF EXPERIENCE: _____

NAME OF INDIVIDUAL: _____

POSITION/TITLE: _____

STATEMENT OF EXPERIENCE: _____

* Include all officers, office management, Affirmative Action officials, and field management personnel.
Attach separate sheets if necessary.

1.09 TUNNELING CONTRACTOR QUALIFICATIONS

Tunneling Company Name:	
Kentucky Contractor's License Number:	

This Tunneling Contractor Qualifications is required to be completed for each Tunneling Contractor and included with the Bidder's Bid for the Project. To be considered for award of the Contract, Bidder shall provide all information that is requested in Attachment A. If all information is not provided, the Bid will be deemed non-responsive.

Time (in years) that organization has been doing business under present name	
Name of designated Project Manager	
Name of designated Field Superintendent	
Number of Regular Employees of the Organization	

In addition to completing the above form, the Contractor shall provide, as attachments, the following items:

- Resume of designated Project Manager.
- Resume of designated Field Superintendent.
- Company's existing work commitments.

1.10 TUNNELING CONTRACTOR QUALIFICATIONS – EXPERIENCE

This Tunneling Contractor’s Qualifications – Experience Information (Attachment B) is required to be completed and included with the Bidder’s Bid for the Project. To be considered for award of the Contract, Tunneling Contractor shall demonstrate it has experience performing similar work on other projects.

For each tunnel installation method that the Bidder is intending to use on the Project, the Tunneling Contractor shall complete the Project Experience Summary Table(s) outlining experience that the Tunneling Contractor has utilizing that specific tunnel installation method. The table shall be populated with Projects that the Tunneling Contractor completed within the past 10 years. The experience requirements shall meet the minimum requirements set forth in the specific tunnel specification section.

If the Bidder wishes to include more information than what is specified in the summary table, it may be included as an attachment to the end of Attachment B.

PROJECT EXPERIENCE SUMMARY TABLE

	Project 1	Project 2	Project 3
Project Name			
Tunnel Installation Method(s)			
Year(s) Project Occurred			
Owner			
Owner’s Phone Number			
Original & Final Contract Price			
Original & Final Contract Times (days)			
Carrier Pipe Material and Diameter			
Casing or Tunnel Lining Type and Diameter			
Carrier Pipe Grouted in Place (Y / N)			
Total Tunnel Length (feet)			
Range of Tunnel Depth (feet)			
Rock Excavation Required (Y / N)			
Temporary or Permanent Shaft w/invert below groundwater table (Y / N)			

1.11 EQUAL OPPORTUNITY AGREEMENT

The Law

- * Title VII of the Civil Rights Act of 1964 (amended 1972) states that it is unlawful for an employer to discriminate in employment because of race, color, religion, sex, age (40-70 years) or national origin.
- * Executive Order No. 11246 on Nondiscrimination under Federal contract prohibits employment discrimination by contractor and subcontractor doing business with the Federal Government or recipients of Federal funds. This order was later amended by Executive Order No. 11375 to prohibit discrimination on the basis of sex.
- * Section 503 of the Rehabilitation Act of 1973 States:

The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap.

- * Section 2012 of the Vietnam Era Veterans Readjustment Act of 1973 requires Affirmative Action on behalf of disabled veterans and veterans of the Vietnam Era by contractors having Federal Contracts.
- * Section 206 (A) of Executive Order 12086, Consolidation of Contract Compliance Functions for Equal Employment Opportunity, states:

The Secretary of Labor may investigate the employment practices of any Government contractor or sub-contractor to determine whether or not the contractual provisions specified in Section 202 of this order have been violated.

The Lexington-Fayette Urban County Government practices Equal Opportunity in recruiting, hiring and promoting. It is the Government's intent to affirmatively provide employment opportunities for those individuals who have previously not been allowed to enter into the mainstream of society. Because of its importance to the local Government, this policy carries the full endorsement of the Mayor, Commissioners, Directors, and all supervisory personnel. In following this commitment to Equal Employment Opportunity and because the Government is the benefactor of the Federal funds, it is both against the Urban County Government policy and illegal for the Government to let contracts to companies which knowingly or unknowingly practice discrimination in their employment practices. Violation of the above mentioned ordinances may cause an Agreement to be canceled and the contractor may be declared ineligible for future consideration.

Please sign this statement in the appropriate space acknowledging that you have read and understand the provisions contained herein. Return this document as part of your application packet.

Bidders

I/We agree to comply with the Civil Rights Laws listed above that govern employment rights of minorities, women, Vietnam veterans, handicapped, and aged persons.

Signature

Name of Business

The Entity (regardless of whether construction Contractor, non-construction Contractor or supplier) agrees to provide equal opportunity in employment for all qualified persons, to prohibit discrimination in employment because of race, color, creed, national origin, sex or age, and to promote equal employment through a positive, continuing program from itself and each of its sub-contracting agents. This program of equal employment opportunity shall apply to every aspect of its employment policies and practices.

The Kentucky Equal Employment Opportunity Act of 1978 (KRS 45.560-45.640) requires that any county, city, town, school district, water district, hospital district, or other political subdivision of the state shall include in directly or indirectly publicly funded contracts for supplies, materials, services, or equipment hereinafter entered into the following provisions:

During the performance of this contract, the contractor agrees as follows:

- (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age or national origin;*
- (2) The contractor will state in all solicitations or advertisements for employees placed by or on behalf of the contractors that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age or national origin;*
- (3) The contractor will post notices in conspicuous places, available to employees and applicants for employment, setting forth the provisions of the non-discrimination clauses required by this section; and*
- (4) The contractor will send a notice to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding advising the labor union or workers' representative of the contractor's commitments under the nondiscrimination clauses.*

The Act further provides:

KRS 45.610. Hiring minorities - Information required

- (1) For the length of the contract, each contractor shall hire minorities from other sources within the drawing area, should the union with which he has collective bargaining agreements be unwilling to supply sufficient minorities to satisfy the agreed upon goals and timetable.*
- (2) Each contractor shall, for the length of the contract, furnish such information as required by KRS 45.560 to KRS 45.640 and by such rules, regulations and orders issued pursuant thereto and will permit access to all books and records pertaining to his employment practices and work sites by the contracting agency and the department for purposes of investigation to ascertain compliance with KRS 45.560 to 45.640 and such rules, regulations and orders issued pursuant thereto.*

KRS 45.620. Action against contractor - Hiring of minority contractor or subcontractor

- (1) If any contractor is found by the department to have engaged in an unlawful practice under this chapter during the course of performing under a contract or subcontract covered under KRS 45.560 to 45.640, the department shall so certify to the contracting agency and such certification shall be binding upon the contracting agency unless it is reversed in the course of judicial review.*
- (2) If the contractor is found to have committed an unlawful practice under KRS 45.560 to 45.640, the contracting agency may cancel or terminate the contract, conditioned upon a program for future compliance approved by the contracting agency and the department. The contracting agency may declare such a contractor ineligible to bid on further contracts with that agency until such time as the contractor complies in full with the requirements of KRS 45.560 to 45.640.*
- (3) The equal employment provisions of KRS 45.560 to 45.640 may be met in part by a contractor by subcontracting to a minority contractor or subcontractor. For the provisions of KRS 45.560 to 45.640, a minority contractor or subcontractor shall mean a business that is owned and controlled by one or more persons disadvantaged by racial or ethnic circumstances.*

KRS 45.630 Termination of existing employee not required, when

Any provision of KRS 45.560 to 45.640 notwithstanding, no contractor shall be required to terminate an existing employee upon proof that that employee was employed prior to the date of the contract.

KRS 45.640 Minimum skills

Nothing in KRS 45.560 to 45.640 shall require a contractor to hire anyone who fails to demonstrate the minimum skills required to perform a particular job.

In the case of an Agreement exceeding \$250,000, the Contractor will be required within seven (7) days following the Bid Opening to furnish evidence that its work-force in Kentucky is representative of the available work-force in the area from which it draws employees, or to supply an Affirmative Action plan which will achieve such representation during the life of the Contract.

1.12 LFUCG MWDBE PARTICIPATION FORM



LFUCG Bid/RFP/Quote Reference No. _____

The MWDBE and/or Veteran subcontractors listed have agreed to participate on this Bid/RFP/Quote. If any substitution is made or the total value of the Work is changed prior to or after the job is in progress, it is understood that those substitutions must be submitted to Central Purchasing for approval immediately. **Failure to submit a completed form may cause rejection of the bid.**

MWDBE Company, Name, Address, Phone, Email	Work to be Performed	Total Dollar Value of the Work	% Value of Total Contract

The undersigned company representative submits the above list of MWDBE firms to be used in accomplishing the work contained in this Bid/RFP/Quote. Any misrepresentation may result in the termination of the Contract and/or be subject to applicable Federal and State laws concerning false statements and false claims.

Company

Company Representative

Date

Title

1.13 LFUCG MWDBE SUBSTITUTION FORM



LFUCG Bid/RFP/Quote Reference No. _____

The substituted MWDBE and/or Veteran subcontractors listed below have agreed to participate on this Bid/RFP/Quote. These substitutions were made prior to or after the job was in progress. These substitutions were made for reasons stated below and are now being submitted to Central Purchasing for approval. By the authorized signature of a representative of our company, we understand that this information will be entered into our file for this project.

SUBSTITUTED MWDBE Company Name, Address, Phone, Email	MWDBE Formally Contracted/ Name, Address, Phone, Email	Work to Be Performed	Reason for the Substitution	Total Dollar Value of the Work	% Value of Total Contract

The undersigned acknowledges that any misrepresentation may result in termination of the Contract and/or be subject to applicable Federal and State laws concerning false statements and false claims.

Company

Company Representative

Date

Title

1.14 MWD BE QUOTE SUMMARY FORM



LFUCG Bid/RFP/Quote Reference No. _____

The undersigned acknowledges that the minority and/or veteran subcontractors listed on this form did submit a quote to participate on this project. **Failure to submit a completed form may cause rejection of the bid.**

Company Name	Contact Person
Address/Phone/Email	Bid Package / Bid Date

MWD BE Company Address	Contact Person	Contact Information (work phone, Email, cell)	Date Contacted	Services to be performed	Method of Communication (email, phone meeting, ad, event, etc)	Total dollars (\$) Do Not Leave Blank (Attach Documentation)	DBE * AA HA AS NA Female	Veteran

*(DBE designation / AA=African American / HA= Hispanic American/AS = Asian American/Pacific Islander/ NA= Native American)

The undersigned acknowledges that all information is accurate. Any misrepresentation may result in termination of the Contract and/or be subject to applicable Federal and State laws concerning false statements and claims.

Company

Company Representative

Date

Title

1.15 LFUCG SUBCONTRACTOR MONTHLY PAYMENT REPORT

LFUCG Bid/RFP/Quote No. _____



The LFUCG has a 10% goal plan adopted by city council to increase the participation of minority and women owned businesses in the procurement process. The LFUCG also has a 3% goal plan adopted by cited council to increase the participation of veteran owned businesses in the procurement process. In order to measure that goal LFUCG will track spending with MWDBE and Veteran vendors on a monthly basis. By the signature below of an authorized company representative, you certify that the information is correct, and that each of the representations set forth below is true. Any misrepresentation may result in termination of the contract and/or prosecution under applicable Federal and State laws concerning false statements and false claims. Please submit this form monthly to the Division of Central Purchasing/ 200 East Main Street / Room 338 / Lexington, KY 40507.

Total Contract Amount Awarded to Prime Contractor for this Project _____

Project Name/ Contract #	Work Period/ From: _____ To: _____
Company Name:	Address:
Federal Tax ID:	Contact Person:

Subcontractor Vendor ID (name, address, phone, email)	Description of Work	Total Subcontract Amount	% of Total Contract Awarded to Prime for this Project	Total Amount Paid for this Period	Purchase Order number for subcontractor work (please attach PO)	Scheduled Project Start Date	Scheduled Project End Date

By the signature below of an authorized company representative, you certify that the information is correct, and that each of the representations set forth below is true. Any misrepresentations may result in the termination of the Contract and/or prosecution under applicable Federal and State laws concerning false statements and false claims.

Company

Company Representative

Date

Title

1.16 LFUCG STATEMENT OF GOOD FAITH EFFORTS

LFUCG Bid/RFP/Quote No. _____



By the signature below of an authorized company representative, we certify that we have utilized the following Good Faith Efforts to obtain the maximum participation by MWDBEs and/or Veterans on the project and can supply the appropriate documentation.

- _____ Advertised opportunities to participate in the contract in at least two (2) publications of general circulation media; trade and professional association publications; small and minority business or trade publications; and publications or trades targeting minority, women and disadvantaged businesses not less than fifteen (15) days prior to the deadline for submission of bids to allow MWDBE firms and Veteran-Owned businesses to participate.
- _____ Included documentation of advertising in the above publications with the bidders good faith efforts package
- _____ Attended LFUCG Central Purchasing Economic Inclusion Outreach event
- _____ Attended pre-bid meetings that were scheduled by LFUCG to inform MWDBEs and/or Veteran-Owned Businesses of subcontracting opportunities
- _____ Sponsored Economic Inclusion event to provide networking opportunities for prime contractors and MWDBE firms and Veteran-Owned businesses
- _____ Requested a list of MWDBE and/or Veteran subcontractors or suppliers from LFUCG Economic Engine and showed evidence of contacting the companies on the list(s).
- _____ Contacted organizations that work with MWDBE companies for assistance in finding certified MWBDE firms and Veteran-Owned businesses to work on this project. Those contacted and their responses should be a part of the bidder's good faith efforts documentation.
- _____ Sent written notices, by certified mail, email or facsimile, to qualified, certified MWDBEs soliciting their participation in the contract not less than seven (7) days prior to the deadline for submission of bids to allow them to participate effectively.
- _____ Followed up initial solicitations by contacting MWDBEs and Veteran-Owned businesses to determine their level of interest.
- _____ Provided the interested MWBDE firm and/or Veteran-Owned business with adequate and timely information about the plans, specifications, and requirements of the contract.
- _____ Selected portions of the work to be performed by MWDBE firms and/or Veteran-Owned businesses in order to increase the likelihood of meeting the contract goals. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate MWDBE participation, even when the prime contractor may otherwise perform these work items with its own workforce
- _____ Negotiated in good faith with interested MWDBE firms and Veteran-Owned businesses not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities. Any rejection should be so noted in writing with a description as to why an agreement could not be reached.
- _____ Included documentation of quotations received from interested MWDBE firms and Veteran-Owned businesses which were not used due to uncompetitive pricing or were

rejected as unacceptable and/or copies of responses from firms indicating that they would not be submitting a bid.

_____ Bidder has to submit sound reasons why the quotations were considered unacceptable. The fact that the bidder has the ability and/or desire to perform the contract work with its own forces will not be considered a sound reason for rejecting a MWDBE quote. Nothing in this provision shall be construed to require the bidder to accept unreasonable quotes in order to satisfy MWDBE goals.

_____ Made an effort to offer assistance to or refer interested MWDBE firms and Veteran-Owned businesses to obtain the necessary equipment, supplies, materials, insurance and/or bonding to satisfy the work requirements of the bid proposal

_____ Made efforts to expand the search for MWBE firms and Veteran-Owned businesses beyond the usual geographic boundaries.

_____ Other - any other evidence that the bidder submits which may show that the bidder has made reasonable good faith efforts to include MWDBE participation and Veteran participation.

Failure to submit any of the documentation requested in this section may be cause for rejection of bid. Bidders may include any other documentation deemed relevant to this requirement which is subject to approval by the MBE Liaison. **Documentation of Good Faith Efforts must be submitted with the Bid, if the participation Goal is not met.**

The undersigned acknowledges that all information is accurate. Any misrepresentations may result in termination of the contract and/or be subject to applicable Federal and State laws concerning false statements and claims.

Company

Company Representative

Date

Title

1.17 EQUAL EMPLOYMENT OPPORTUNITY AFFIRMATIVE ACTION POLICY

It is the policy of _____
(Name of Bidder)

to assure that all applicants for employment and all employees are treated on a fair and equitable basis without regard to their race, religion, sex, color, handicap, natural origin or age.

Such action shall include employment, promotion, demotion, recruitment or recruitment advertising, layoff or termination, rates of pay and other forms of compensation, and selection for training, whether apprenticeship and/or on-the-job-training.

Furthermore, this company agrees to make special recruitment efforts to hire the protected class whenever feasible. This company also agrees to adhere to all applicable federal, state, and local laws relating to Equal Employment Opportunity for all individuals.

Name of Organization: _____

Categories	Total	White (not Hispanic or Latino)		Hispanic or Latino		Black or African-American (not Hispanic or Latino)		Native Hawaiian and other Pacific Islander (not Hispanic or Latino)		Asian (not Hispanic or Latino)		American Indian or Alaskan Native (not Hispanic or Latino)		Two or more races (not Hispanic or Latino)		Total	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Administrators																	
Professionals																	
Superintendents																	
Supervisors																	
Foremen																	
Technicians																	
Protective Service																	
Para-Professionals																	
Office/Clerical																	
Skilled Craft																	
Service/Maintenance																	
Total																	

Prepared By: _____ Date: ____ / ____ / ____

RMP Specifications (non-KIA)

00410-27

Lansdowne South Trunk Sewer Replacement

Names Insured: _____
 Address: _____
 Project to be insured: _____

In lieu of obtaining certificates of insurance at this time, the undersigned agrees to provide the above Named Insured with the minimum coverage listed below. These are outlined in the Insurance and Risk Management of Section 00600 - Bonds and Certifications, including all requirements, and conditions:

Article Items	Coverage	Minimum Limits and Policy Requirements	Limits Provided to Insured	Name of Insurer	A.M. Best's	
					Code	Rating
1.05.D.1	CGL	\$1,000,000/per occ., \$2,000,000/aggregate or \$2,000,000 combined single limit Requirements (a) through (e)				
1.05.D.1	Auto	Combined single \$1,000,000/per occ. aggregate Requirements (a) through (c)				
1.05.D.1	WC	\$ _____ Statutory				
1.05.D.1	Employer's Liability	\$500,000				

Section 00600 includes required provisions, statements regarding insurance requirements, and the undersigned agrees to abide by all provisions for the coverage's checked above unless stated otherwise when submitting

Agency or Brokerage _____ Name of Authorized Representative _____
 Street Address _____ Title _____
 City _____ Authorized Signature _____
 Telephone Number _____ Date _____

NOTE: Authorized signatures may be the agent's if agent has placed insurance through an agency agreement with the insurer. If insurance is brokered, authorized signature must be that of authorized representative of insurer.

IMPORTANT: CONTRACT MAY NOT BE AWARDED IF A COMPLETED AND SIGNED COPY OF THIS FORM FOR ALL COVERAGES LISTED ABOVE IS NOT PROVIDED.

1.20 DEBARRED FIRMS

PROJECT NAME: Lansdowne South Trunk Replacement

LFUCG BID NO.: 174-2018

**LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
LEXINGTON, KY**

All prime Contractors shall certify that Subcontractors have not and will not be awarded to any firms that has been debarred for noncompliance with the Federal Labor Standards, Title VI of the Civil Rights Act of 1964 As Amended, Executive Order 11246 As Amended or any other Federal Law.

All Bidders shall complete the Debarment Certification in duplicate and submit both copies to the Owner with the Bid Form. The Owner (grantee) shall transmit one copy to the Lexington-Fayette Urban County Government, Division of Community Development within fourteen (14) days after Bid opening.

The undersigned hereby certifies that the firm of _____ has not and will not award a subcontract, in connection with any Agreement award to it as the result of this bid, to any firm that has been debarred for noncompliance with the Federal Labor Standards, Title VI of the Civil Rights Act of 1964, Executive Order 11246 As Amended or any Federal Law.

Name of Firm Submitting Bid

Signature of Authorized Official

Title

Date

1.21 DEBARMENT CERTIFICATION

All Contractors/Subcontractors shall complete this certification.

The Contractor/Subcontractor certifies in accordance with Executive Order 12549 (Debarment and Suspension 2/18/86) that to the best of its knowledge and belief, that it and its principals:

- 1) Are not presently debarred, suspended, proposed for debarment, declared negligible, or voluntarily excluded from covered transactions or contract by any Federal department or agency for noncompliance with the Federal Labor Standards, Title VI of the Civil Rights Act of 1964 As Amended, Executive Order 11246 As Amended or any other Federal Law.
 - a) Have not within a three year period preceding this Bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property;
 - b) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(a) of this certification; and
 - c. Have not within a three (3) year period preceding this Bid has one or more public (Federal, State or local) transactions or contracts terminated for cause or default.
- 2) Where the Contractor is unable to certify to any of the statements in this certification, such prospective contractors shall attach an explanation to this certification form.

Firm Name: _____

Project: Lansdowne South Trunk Replacement

Printed Name: _____

Title of Authorized Representative: _____

Signature: _____

Date: _____

1.22 CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty for not less than \$10,000 and not more than \$100,000 for each such failure.

Typed Name & Title of Authorized Representative

Signature of Authorized Representative

Date

_____ I am unable to certify to the above statements. My explanation is attached.

1.23 BID BOND

BID BOND

Bond Number: _____

KNOW ALL MEN BY THESE PRESENTS, that we _____

as principal (the "Principal") and _____

hereinto called Surety, are held and firmly bound unto

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
200 East Main Street, Third Floor
Lexington, Kentucky 40507

as obligee (the "Obligee"), in the penal sum of _____ dollars for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for Lansdowne South Trunk Replacement

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal within the period specified therein, or, if no period be specified, within ninety (90) days after opening, and the Principal shall enter into a contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or contract documents, or in the event of the failure of the Principal to enter into such contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference in money not to exceed the penal sum hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void; otherwise to remain in full force and effect. In no event shall the liability hereunder exceed the penal sum thereof.

PROVIDED AND SUBJECT TO THE CONDITION PRECEDENT, that any claim by Obligee under this bond must be submitted in writing by registered mail, to the attention of the Surety Law Department at the address above, within 120 days of the date of this bond. Any suit under this bond must be instituted before the expiration of one (1) year from the date of this bond. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall apply.

DATED as of this _____ day of _____, 20_____.

WITNESS / ATTEST:

Principal (Secretary)

Principal

By: _____ (seal)

Name:
Title:

Surety (Secretary)

Surety

By: _____ (seal)

Name:
Title:

POWER OF ATTORNEY

(Attach to Bid Bond)

END OF SECTION

SECTION 00510 – NOTICE OF AWARD

CONTRACTOR: _____

OWNER: Lexington-Fayette Urban County Government
Division of Water Quality
Lexington, Kentucky

PROJECT: Lansdowne South Trunk Sewer Replacement
Lexington-Fayette Urban County Government

LFUCG Bid No. 174-2018

You are hereby notified that the Owner has considered the Bid submitted by you for the above-described project in response to its Advertisement for Bids dated January 29, 2019

It appears that it is to the best interest of said Owner to accept your Bid in the amount of _____ dollars (\$ _____), and you are hereby notified that your Bid has been accepted for

Lansdowne South Trunk Sewer Replacement

LFUCG Bid No. 174-2018

The Contractor is required by these Contract Documents to execute and deliver the formal Agreement (Contract) with the undersigned Owner and to furnish the required Contractor's Performance, Payment, Warranty, and Erosion and Sediment Control Bonds within fifteen (15) days from the date of the delivery of this Notice.

If you fail to execute said Agreement (Contract) and to furnish said Bonds within fifteen (15) days from the date of delivery of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Bid as abandoned and to award the Work covered by your Bid to another, or to re-advertise the Work or otherwise dispose thereof as the Owner may deem appropriate.

Dated this _____ day of _____, 20____.

Lexington-Fayette Urban County Government

By: _____

Title: _____

NOTICE OF ACCEPTANCE

Receipt of the above Notice of Award is hereby acknowledged this _____ day of _____, 20____.

By: _____

Title: _____

END OF SECTION

SECTION 00520 – AGREEMENT (CONTRACT)

THIS AGREEMENT, made on the th day of May, 2019, by and between Lexington Fayette Urban County Government, acting herein called "OWNER" and Cleary Construction Inc., doing business as a corporation located in the City of Tompkinsville, County of Monroe, State of Kentucky, hereinafter called "CONTRACTOR".

WITNESSETH: That the CONTRACTOR and the OWNER in consideration of Three Million Nine Hundred Ninety Four Thousand Seven Hundred and Fifty Four dollars (\$3,994,754.00) quoted in the BID by the CONTRACTOR, dated March 7, 2019, hereby agree to commence and complete the construction described as follows:

1.01 SCOPE OF WORK

The CONTRACTOR shall furnish all the materials, supplies, machinery, equipment, tools, supervision, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the BID, the Contract Documents, and the Specifications prepared by ECSI, LLC, the Engineer for the Lansdowne South Trunk Sewer Replacement LFUCG Bid No. 174-2018.

1.02 TIME OF COMPLETION

The time period estimated and authorized by the OWNER for Substantial Completion of Work by the AGREEMENT, in full, is hereby fixed as 400 consecutive calendar days. The time shall begin ten (10) calendar days after CONTRACTOR is issued the Notice to Proceed.

1.03 ISSUANCE OF NOTICE TO PROCEED

Notice to Proceed for Work will be issued in whole or in part of the Work as determined by the OWNER pending the availability of funds. The order of construction will be as determined by the Engineer after consultation with the CONTRACTOR and the OWNER.

1.04 AGREEMENT (CONTRACT) AMOUNT

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the AGREEMENT as quoted in the BID, subject to any additions and deductions, as provided therein.

1.05 PROGRESS PAYMENTS

The OWNER shall make payments on account of the AGREEMENT in accordance with the General Conditions, as recommended by the Engineer and authorized by the OWNER, less the aggregate of previous payments.

1.06 ACCEPTANCE AND FINAL PAYMENT

Final payment shall be due within ninety (90) days after Final Completion of the Work, provided the Work is deemed "Final Completion" and fully accepted by the OWNER.

Before issuance of final certificate, the CONTRACTOR shall submit evidence satisfactory to the Engineer that all payrolls, material bills, and other indebtedness connected with the AGREEMENT (CONTRACT) has been paid.

If, after the Work has been substantially completed, full completion thereof is materially delayed through no fault of the CONTRACTOR, and the ENGINEER so certifies, the OWNER shall upon certificate of the ENGINEER, and without terminating the AGREEMENT (CONTRACT), make payment of the balance due for that portion of the Work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

1.07 EXTRA WORK

The OWNER, without invalidating the AGREEMENT (CONTRACT) may order extra work or make changes by altering, adding to or deducting from the Work, the AGREEMENT (CONTRACT) amount being adjusted accordingly. All such work shall be executed and paid for in accordance with the General Conditions.

1.08 LIQUIDATED DAMAGES

If the CONTRACTOR shall fail or refuse to complete the Work within the AGREEMENT (CONTRACT) Time, or extension of time granted by the OWNER, then the CONTRACTOR agrees as a partial consideration for the awarding of this AGREEMENT (CONTRACT) that the OWNER may retain the compensation otherwise to be paid to the CONTRACTOR the amount of One Thousand dollars (\$1,000.00) per consecutive calendar day that the CONTRACTOR shall be in default after the Final Completion time stipulated in the Contract Documents. The said amount is fixed and agreed upon by and between the CONTRACTOR and the OWNER because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the OWNER would in such event sustain.

1.09 CONSENT DECREE REQUIREMENTS

- A. The OWNER, the United States Environmental Protection Agency, and the Commonwealth of Kentucky have entered into a Consent Decree in a case styled *United States, et al. v. Lexington-Fayette Urban County Government*, United States District Court for the Eastern District of Kentucky, Case No. 5:06-CV-00386 ("CONSENT DECREE"), that requires OWNER to complete numerous projects related to its sanitary sewer system and stormwater management program within specific periods of time.
- B. **Time is of the essence in the performance of this Agreement (CONTRACT).** CONTRACTOR is aware that the OWNER is subject to penalties for non-compliance with the CONSENT DECREE deadlines. The CONTRACTOR shall be specifically liable and responsible for payment of any and all penalties, fines, or fees assessed against or incurred by the OWNER as a result of any delay in, or non-performance of, any of the CONTRACTOR's obligations or responsibilities under this AGREEMENT (CONTRACT), or for any other damages suffered by OWNER as a result of such delay or non-performance. This shall specifically include, but shall not be limited to, any penalty, fine, fee, or assessment against the OWNER by the U.S. Department of Justice, U.S. Environmental Protection Agency, and/or the Kentucky Energy and Environment Cabinet related to the CONSENT DECREE.
- C. The provisions of the Contract Documents and the various rates of compensation for CONTRACTOR's services provided for elsewhere in this AGREEMENT (CONTRACT) have been agreed to in anticipation of the orderly and continuous progress of the AGREEMENT (CONTRACT) through completion.

- D. If delays result by reason of acts of the OWNER or approving agencies, which are beyond the control of the CONTRACTOR, an extension of time for such delay will be considered. If delays occur, the CONTRACTOR shall immediately notify the OWNER and within five (5) business days from the date of the delay apply in writing to the OWNER for an extension of time for such reasonable period as may be mutually agreed upon between the parties, and if approved, the AGREEMENT (CONTRACT) schedule shall be revised to reflect the extension. Such extension of time to the completion date shall in no way be construed to operate as a waiver on the part of the OWNER of any of its rights in the AGREEMENT (CONTRACT). In the event the parties cannot agree upon an extension of time, the Dispute shall be addressed in the manner outlined hereinafter under this Article.

In the event that the overall delay resulting from the above-described causes is sufficient to prevent complete performance of the AGREEMENT (CONTRACT) within six (6) months of the time specified herein, the fees to be paid to CONTRACTOR shall be subject to adjustment as agreed upon by the parties.

- E. If delays result solely by reason of acts of the CONTRACTOR, the CONTRACTOR shall be held liable for any financial penalties incurred by the OWNER as a result of the delay, including but not limited to those assessed pursuant to the CONSENT DECREE. Disputes as outlined hereinafter in this Article shall apply in the event the parties cannot mutually agree upon the cause(s) associated with delays in completing project deliverables. The CONTRACTOR must immediately notify the OWNER in the event of such delay, and provide the OWNER a written action plan within five (5) business days on how it will attempt to resolve the delay.

F. DISPUTES

Except as otherwise provided in this AGREEMENT (CONTRACT), any dispute hereunder may be resolved by agreement of the OWNER's Agent (Charles H. Martin, P.E., Director of Water Quality) and the CONTRACTOR. In the absence of such an agreement, the dispute shall be submitted to the OWNER's Commissioner, Department of Public Works and Environmental Quality, whose decision shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, capricious, arbitrary, or so grossly erroneous as necessarily to imply bad faith. Pending a final decision of a dispute hereunder the CONTRACTOR shall proceed diligently with the performance of the AGREEMENT (CONTRACT) in accordance with the direction of the OWNER.

1.10 RIGHT TO REVIEW, AUDIT, AND INSPECT

The CONTRACTOR shall provide to the OWNER or its duly authorized representative(s), at any time during the course of the contract and up to five (5) years thereafter, access to any books, documents, papers, emails, and/or other records or communications which are directly pertinent to this specific contract for the purpose of making audit, examination, excerpts, and transcriptions.

1.11 CONTRACT DOCUMENTS

In general, the Advertisement for Bids, Information Available to Bidders, the Bid, the General Conditions, Performance, Payment, Erosion and Sediment Control and Warranty Bonds, AGREEMENT (CONTRACT), Supplementary Conditions, Supplemental General Conditions for SRF, Technical Specifications, any and all Addenda, and Plan Drawings form the AGREEMENT (CONTRACT) and they are fully a part of the AGREEMENT (CONTRACT) as if hereto attached or herein repeated.

A full listing of the Contract Documents consist of the following:

Specifications:	Per Table of Contents
Drawings (Plans):	Per Table of Contents

IN WITNESSETH WHEREOF, the parties hereto have executed this AGREEMENT (CONTRACT) as of the date and year above written.

(Seal)

Lexington-Fayette Urban County Government
Lexington, Kentucky

(Owner)

ATTEST

[Handwritten Signature]
Clerk of Urban County Council

By: *Linda Gorton*
(Signature of Mayor)

_____, Mayor

(Name/Title)

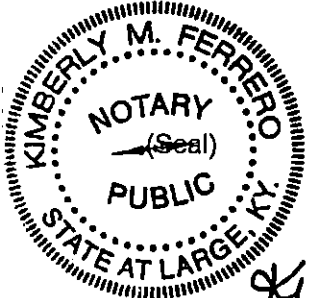
CLEARV CONSTRUCTION INC
(Contractor)

By: *Wesley Co*
(Contractor's Signature)

V.P.

(Name/Title)

2006 EDMONTON RD TOMPKINSVILLE KY 40167
(Address)



Kimberly M Ferrero
~~NOTARY PUBLIC (Secretary)~~

[Handwritten Signature]
(Witness)

*IMPORTANT: Strike out any non-applicable terms:

Secretary of the OWNER should attest. If the CONTRACTOR is corporation, Secretary should attest. Give proper title of each person-executing AGREEMENT (CONTRACT).

END OF SECTION



CLEACON-01

DKITTREDGE

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

3/28/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Insurance Group of America LLC 6640 Carothers Parkway, Suite 160 Franklin, TN 37067	CONTACT NAME: Deidre Kittredge	
	PHONE (A/C, No, Ext): (615) 905-1687	FAX (A/C, No): (615) 905-1698
	E-MAIL ADDRESS: Deidre.Kittredge@IGA.biz	
	INSURER(S) AFFORDING COVERAGE	NAIC #
INSURED Cleary Construction Inc. 2006 Edmonton Road Tompkinsville, KY 42167	INSURER A: United Fire & Casualty Co	13021
	INSURER B: Bridgefield Casualty Ins Co	10335
	INSURER C: Navigators Specialty Ins Co	36056
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES

CERTIFICATE NUMBER:

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR			60513619	2/24/2019	2/24/2020	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 100,000 MED EXP (Any one person) \$ 5,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER:						
A	<input checked="" type="checkbox"/> AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> NON-OWNED AUTOS ONLY			60513619	2/24/2019	2/24/2020	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$
A	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE DED <input checked="" type="checkbox"/> RETENTION \$ 10,000			60513619	2/24/2019	2/24/2020	EACH OCCURRENCE \$ 5,000,000 AGGREGATE \$ 5,000,000
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) <input checked="" type="checkbox"/> Y/N If yes, describe under DESCRIPTION OF OPERATIONS below		N/A	0196-42220	1/1/2019	1/1/2020	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000
C	Excess Liability			HO19EXC8976981C	2/24/2019	2/24/2020	Ea Occurrence/Agg \$ 5,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

CANCELLATION

City of Lexington
200 East Main
Lexington, KY 40507

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

1.01 PERFORMANCE BOND

BONDS EXECUTED IN FIVE (5) ORIGINAL COUNTERPARTS

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that

Cleary Construction, Inc.

(Name of CONTRACTOR)

2006 Edmonton Road, Tompkinsville, Kentucky 42167

(Address of CONTRACTOR)

a _____ corporation, hereinafter
(Corporation, Partnership, or Individual)

called Principal, and Westfield Insurance Company

(Name of Surety)

One Park Circle, Westfield Center, Ohio 44251

(Address of Surety)

hereinto called Surety, are held and firmly bound unto

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
200 East Main Street, Third Floor
Lexington, Kentucky 40507

Obligee, hereinafter called "OWNER" in the penal sum of: Three Million Nine Hundred Ninety-Four

Thousand Seven Hundred Fifty-Four and No/100 _____ dollars (\$ 3,994,754.00),

for the payment of whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal by written agreement is entering into an Agreement (Contract) with OWNER for the Lansdowne South Trunk Sewer Replacement, LFUCG Bid No. 174-2018 in accordance with Contract Documents prepared by ECSI, LLC and dated January 28, 2019, which Agreement (Contract) is by reference made a part hereof, and is hereinafter referred to as the Agreement (Contract).

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall promptly and faithfully perform said Agreement (Contract), then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the OWNER.

Whenever, Principal shall be, and declared by OWNER to be in default under the Agreement (Contract), the OWNER having performed OWNER'S obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

1. Complete the Agreement (Contract) in accordance with its terms and conditions or
2. Obtain a Bid or Bids for completing the Agreement (Contract) in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or if the OWNER elects, upon determination by the OWNER and Surety jointly of the lowest responsible bidder, arrange for an Agreement (Contract) between such bidder and OWNER, and make available as Work progresses (even though there may be a default or a succession of defaults under the Agreement (Contract) or Agreements (Contracts) of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Agreement (Contract) Amount; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "Balance of the Agreement (Contract) Amount", as used in this paragraph shall mean the total amount payable by OWNER to Principal under the Agreement (Contract) and any amendments thereto, less the amount properly paid by OWNER to Principal.

Any suit under this bond must be instituted before the expiration of one (1) year from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the OWNER named herein or the heirs, executors, administrators or successors of OWNER.

IN WITNESS WHEREOF, this instrument is executed in five (5) counterparts, each one of (number)

which shall be deemed an original, this the _____ day of _____, 20_____.

ATTEST:

Cleary Construction, Inc.
Principal

Shirley Cleary
(Principal) Secretary

By: [Signature] (s)

2006 Edmonton Road
Address

Tompkinsville, Kentucky 42167

Marilyn W. Spurlin
Witness as to Principal

2006 Edmonton Road
Address

Tompkinsville, Kentucky 42167

Westfield Insurance Company
Surety

By: Pamela D. Puskarich
Pamela D. Puskarich, Attorney-in-Fact

ATTEST:

See Power of Attorney
(Surety) Secretary

One Park Circle
Address

Westfield Center, Ohio 44251

(SEAL)
Oliver Lyons
Witness to Surety

Title: Not Applicable
Surety

6640 Carothers Parkway, Suite 160
Address

By: Not Applicable

Franklin, Tennessee 37067

Title: Account Manager

NOTE: The number of executed counterparts of the bond shall coincide with the number of executed counterparts of the Agreement (Contract).

1.02 PAYMENT BOND

BONDS EXECUTED IN FIVE (5) ORIGINAL COUNTERPARTS

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that

Cleary Construction, Inc.
(Name of CONTRACTOR)

2006 Edmonton Road, Tompkinsville, Kentucky 42167
(Address of CONTRACTOR)

a corporation, hereinafter
(Corporation, Partnership, or Individual)

called Principal, and Westfield Insurance Company
(Name of Surety)

One Park Circle, Westfield Center, Ohio 44251
(Address of Surety)

hereinto called Surety, are held and firmly bound unto

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
200 East Main Street, Third Floor
Lexington, Kentucky 40507

Obligee, hereinafter called "OWNER" in the penal sum of: Three Million Nine Hundred Ninety-Four
Thousand Seven Hundred Fifty-Four and No/100 dollars (\$ 3,994,754.00),
for the payment of whereof Principal and Surety bind themselves, their heirs, executors, administrators,
successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal by written agreement is entering into an Agreement (Contract) with OWNER for the
Lansdowne South Trunk Sewer Replacement, LFUCG Bid No. 174-2018 in accordance with Contract
Documents prepared by ECSI, LLC and dated January 28, 2019 which Agreement (Contract) is by
reference made a part hereof, and is hereinafter referred to as the Agreement (Contract).

NOW, THEREFORE THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly
make payment to all claimants as hereinafter defined for all labor and material used or reasonably
required for use in the performance of the Agreement (Contract), then this obligation shall be void;
otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the
Principal for labor material, or both, used or reasonably required for use in the performance of the
Agreement (Contract), labor and material being construed to include that part of water, gas, power,
light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Agreement
(Contract).

2. The above named Principal and Surety hereby jointly and severally agree with the OWNER that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant and have execution thereon. The OWNER shall not be liable for the payment of any costs or expenses of any such suit.
3. No suit or action shall be commenced hereunder by any claimant:
 - (a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: The Principal, the OWNER, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the Work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the Work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, OWNER, or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.
 - (b) After the expiration of one (1) year following the date on which Principal ceased Work on said Agreement (Contract), it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
 - (c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

IN WITNESS WHEREOF, this instrument is executed in five (5) counterparts, each one of (number)

which shall be deemed an original, this the _____ day of _____, 20____.

ATTEST:

Cleary Construction, Inc.
Principal

Shirley Cleary
(Principal) Secretary

By: [Signature] (s)

2006 Edmonton Road
Address

Tompkinsville, Kentucky 42167

[Signature]
Witness as to Principal

2006 Edmonton Road
Address

Tompkinsville, Kentucky 42167

Westfield Insurance Company
Surety

ATTEST:

By: [Signature]
Pamela D. Puskarich, Attorney-in-Fact

See Power of Attorney
(Surety) Secretary

One Park Circle
Address

Westfield Center, Ohio 44251

(SEAL)
[Signature]
Witness to Surety

Title: Not Applicable
Surety

6640 Carothers Parkway, Suite 160
Address

By: Not Applicable

Franklin, Tennessee 37067

Title: Account Manager

NOTE: The number of executed counterparts of the bond shall coincide with the number of executed counterparts of the Agreement (Contract).

1.03 EROSION AND SEDIMENT CONTROL PERFORMANCE BOND

BONDS EXECUTED IN FIVE (5) ORIGINAL COUNTERPARTS
EROSION AND SEDIMENT CONTROL PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that

Cleary Construction, Inc.

(Name of CONTRACTOR)

2006 Edmonton Road, Tompkinsville, Kentucky 42167

(Address of CONTRACTOR)

a corporation, hereinafter
(Corporation, Partnership, or Individual)

called Principal, and Westfield Insurance Company
(Name of Surety)

One Park Circle, Westfield Center, Ohio 44251

(Address of Surety)

hereinto called Surety, are held and firmly bound unto

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
200 East Main Street, Third Floor
Lexington, Kentucky 40507

Obligee, hereinafter called "OWNER" in the penal sum of: Thirty-Nine Thousand Nine Hundred Forty-Seven and 54/100

[1% of Total Bid Price] dollars (\$ 39,947.54), for the
payment of whereof Principal and Surety bind themselves, their heirs, executors, administrators,
successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal by written agreement is entering into an Agreement (Contract) with OWNER for the
Lansdowne South Trunk Sewer Replacement, LFUCG Bid No. 174-2018 in accordance with Contract
Documents prepared by ECSI, LLC and dated January 28, 2019, which Agreement (Contract) is by
reference made a part hereof, and is hereinafter referred to as the Agreement (Contract).

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall promptly
and faithfully perform said Agreement (Contract), then this obligation shall be null and void; otherwise it
shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the OWNER.

Whenever, Principal shall be, and declared by OWNER to be in default under the Agreement (Contract),
the OWNER having performed OWNER's obligations thereunder, the Surety may promptly remedy the
default, or shall promptly:

1. Complete the installation, maintenance, and removal of the soil erosion and sediment controls and
final stabilization of the site in accordance with the Agreement (Contract), the LFUCG Land
Disturbance Permit, Chapter 16 Article X Division 5 of the LFUCG Code of Ordinances, and the
KPDES General Permit for Stormwater Discharges Associated with Construction Activities (KYR 10).

2. Obtain a Bid or Bids for completing the installation, maintenance, and removal of the soil erosion and sediment controls and final stabilization of the site in accordance with the Agreement's (Contract's) terms and conditions, and upon determination by Surety of the lowest responsible bidder, or if the OWNER elects, upon determination by the OWNER and Surety jointly of the lowest responsible bidder, arrange for an Agreement (Contract) between such bidder and OWNER, and make available as Work progresses (even though there may be a default or a succession of defaults under the Agreement (Contract) or Agreements (Contracts) of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Agreement (Contract) Amount; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Agreement (Contract) Amount", as used in this paragraph shall mean the total amount payable by OWNER to Principal under the Agreement (Contract) and any amendments hereto, less the amount properly paid by OWNER to Principal.

Any suit under this bond must be instituted before the expiration one (1) year from the date on which final payment under the Agreement (Contract) falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the OWNER named herein or the heirs, executors, administrators or successors of OWNER.

IN WITNESS WHEREOF, this instrument is executed in five (5) counterparts, each one of (number)

which shall be deemed an original, this the _____ day of _____, 20_____.

ATTEST:

Cleary Construction, Inc.
Principal

Shirley Cleary
(Principal) Secretary

By: *[Signature]* (s)

2006 Edmonton Road
Address

Tompkinsville, Kentucky 42167

Mary Jo Sparker
Witness as to Principal

2006 Edmonton Road
Address

Tompkinsville, Kentucky 42167

ATTEST:

Westfield Insurance Company
Surety

See Power of Attorney
(Surety) Secretary

By: *[Signature]*
Pamela D. Puskarich, Attorney-in-Fact

One Park Circle
Address

Westfield Center, Ohio 44251

(SEAL)
[Signature]
Witness to Surety

Title: Not Applicable
Surety

6640 Carothers Parkway, Suite 160
Address

By: Not Applicable

Franklin, Tennessee 37067

Title: Account Manager

NOTE: The number of executed counterparts of the bond shall coincide with the number of executed counterparts of the Agreement (Contract).

1.04 WARRANTY BOND

BONDS EXECUTED IN FIVE (5) ORIGINAL COUNTERPARTS
WARRANTY BOND

KNOW ALL MEN BY THESE PRESENTS, that

Cleary Construction, Inc.

(Name of CONTRACTOR)

2006 Edmonton Road, Tompkinsville, Kentucky 42167

(Address of CONTRACTOR)

a corporation _____, hereinafter

(Corporation, Partnership, or Individual)

called Principal, and Westfield Insurance Company

(Name of Surety)

One Park Circle, Westfield Center, Ohio 44251

(Address of Surety)

hereinto called Surety, are held and firmly bound unto

LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT
200 East Main Street, Third Floor
Lexington, Kentucky 40507

Obligee, hereinafter called "OWNER" in the penal sum of: One Hundred Ninety-Nine Thousand

Seven Hundred Thirty-Seven and 70/100 -- dollars (\$ 199,727.70),

for the payment of whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents. The warranty bond shall be in the amount of five percent (5%) of the final construction cost amount (based on contractor's final pay request).

WHEREAS, Principal by written agreement is entering into an Agreement (Contract) with OWNER for the Lansdowne South Trunk Sewer Replacement, LFUCG Bid No. 174-2018 in accordance with Contract Documents prepared by ECSI, LLC and dated January 28, 2019, which Agreement (Contract) is by reference made a part hereof, and is hereinafter referred to as the Agreement (Contract).

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that, if the Principal shall well and faithfully do and perform the required maintenance and shall indemnify and save harmless the OWNER against all claims, loss or damage, and expenses of reconstruction or additional work required to restore the Project to its acceptable condition within a period of one (1) year from the date of acceptance by OWNER of the Project, then this obligation shall be void; otherwise, it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the OWNER.

Any suit under this bond must be instituted before the expiration of one (1) year from the date on which final payment under the Contract falls due.

No right of action shall accrue on this Bond to or for the use of any person or corporation other than the OWNER named herein or the heirs, executors, administrators, successors, or assigns of the OWNER.

IN WITNESS WHEREOF, this instrument is executed in five (5) counterparts, each one of (number)

which shall be deemed an original, this the _____ day of _____, 20____.

ATTEST:

Cleary Construction, Inc.
Principal

Shirley Cleary
(Principal) Secretary

By: [Signature] (s)

2006 Edmonton Road
Address

Tompkinsville, Kentucky 42167

Mary Jo Spork
Witness as to Principal

2006 Edmonton Road
Address

Tompkinsville, Kentucky 42167

Westfield Insurance Company
Surety

ATTEST:

By: Pamela D. Puskarich
Pamela D. Puskarich, Attorney-in-Fact

See Power of Attorney
(Surety) Secretary

One Park Circle
Address

Westfield Center, Ohio 44251

(SEAL)
Oliver Lyons
Witness to Surety

6640 Carothers Parkway, Suite 160
Address

Franklin, Tennessee 37067

Title: Not Applicable
Surety

By: Not Applicable

Title: Account Manager

NOTE: The number of executed counterparts of the bond shall coincide with the number of executed counterparts of the Agreement (Contract).

THIS POWER OF ATTORNEY SUPERCEDES ANY PREVIOUS POWER BEARING THIS SAME POWER # AND ISSUED PRIOR TO 03/01/17, FOR ANY PERSON OR PERSONS NAMED BELOW.

POWER NO. 4110812 07

General Power of Attorney

Westfield Insurance Co. Westfield National Insurance Co. Ohio Farmers Insurance Co. Westfield Center, Ohio

CERTIFIED COPY

Know All Men by These Presents, That WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY, corporations, hereinafter referred to individually as a "Company" and collectively as "Companies," duly organized and existing under the laws of the State of Ohio, and having its principal office in Westfield Center, Medina County, Ohio, do by these presents make, constitute and appoint JAMES L. NOE, III, STEPHANIE RICHARDSON, ANDREW C. BENNETT, DEIDRE KITTREDGE, CRAIG M. WHITLOW, PAMELA D. PUSKARICH, JOINTLY OR SEVERALLY

of FRANKLIN and State of TN its true and lawful Attorney(s)-in-Fact, with full power and authority hereby conferred in its name, place and stead, to execute, acknowledge and deliver any and all bonds, recognizances, undertakings, or other instruments or contracts of suretyship-

LIMITATION: THIS POWER OF ATTORNEY CANNOT BE USED TO EXECUTE NOTE GUARANTEE, MORTGAGE DEFICIENCY, MORTGAGE GUARANTEE, OR BANK DEPOSITORY BONDS.

and to bind any of the Companies thereby as fully and to the same extent as if such bonds were signed by the President, sealed with the corporate seal of the applicable Company and duly attested by its Secretary, hereby ratifying and confirming all that the said Attorney(s)-in-Fact may do in the premises. Said appointment is made under and by authority of the following resolution adopted by the Board of Directors of each of the WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY:

"Be It Resolved, that the President, any Senior Executive, any Secretary or any Fidelity & Surety Operations Executive or other Executive shall be and is hereby vested with full power and authority to appoint any one or more suitable persons as Attorney(s)-in-Fact to represent and act for and on behalf of the Company subject to the following provisions:

The Attorney-in-Fact, may be given full power and authority for and in the name of and on behalf of the Company, to execute, acknowledge and deliver, any and all bonds, recognizances, contracts, agreements of indemnity and other conditional or obligatory undertakings and any and all notices and documents canceling or terminating the Company's liability thereunder, and any such instruments so executed by any such Attorney-in-Fact shall be as binding upon the Company as if signed by the President and sealed and attested by the Corporate Secretary."

"Be it Further Resolved, that the signature of any such designated person and the seal of the Company heretofore or hereafter affixed to any power of attorney or any certificate relating thereto by facsimile, and any power of attorney or certificate bearing facsimile signatures or facsimile seal shall be valid and binding upon the Company with respect to any bond or undertaking to which it is attached." (Each adopted at a meeting held on February 8, 2000).

In Witness Whereof, WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY have caused these presents to be signed by their National Surety Leader and Senior Executive and their corporate seals to be hereto affixed this 01st day of MARCH A.D., 2017 .

Corporate Seals Affixed



WESTFIELD INSURANCE COMPANY WESTFIELD NATIONAL INSURANCE COMPANY OHIO FARMERS INSURANCE COMPANY

By: Dennis P. Baus

Dennis P. Baus, National Surety Leader and Senior Executive

State of Ohio County of Medina ss.:

On this 01st day of MARCH A.D., 2017 , before me personally came Dennis P. Baus to me known, who, being by me duly sworn, did depose and say, that he resides in Wooster, Ohio; that he is National Surety Leader and Senior Executive of WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY, the companies described in and which executed the above instrument; that he knows the seals of said Companies; that the seals affixed to said instrument are such corporate seals; that they were so affixed by order of the Boards of Directors of said Companies; and that he signed his name thereto by like order.

Notarial Seal Affixed



David A. Kotnik

David A. Kotnik, Attorney at Law, Notary Public My Commission Does Not Expire (Sec. 147.03 Ohio Revised Code)

State of Ohio County of Medina ss.:

I, Frank A. Carrino, Secretary of WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY, do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney, executed by said Companies, which is still in full force and effect; and furthermore, the resolutions of the Boards of Directors, set out in the Power of Attorney are in full force and effect.

In Witness Whereof, I have hereunto set my hand and affixed the seals of said Companies at Westfield Center, Ohio, this day of



Frank A. Carrino Secretary

Frank A. Carrino, Secretary

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by



AMERICAN COUNCIL OF ENGINEERING COMPANIES

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A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

- c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the

Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule, indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
2. a preliminary Schedule of Submittals; and
3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete

and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of

the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
1. A Field Order;
 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
 3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
 2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

**ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS;
HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS**

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

- 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
- 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

- 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
- 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
- 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and

contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the

consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also

meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

- a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
 5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
 6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors,

members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.
- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's

interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. "*Or-Equal*" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
- 3) it has a proven record of performance and availability of responsive service.

b. Contractor certifies that, if approved and incorporated into the Work:

- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
- 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

- c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
 - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be

required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner,

Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought

by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are

required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.
1. *Shop Drawings:*
 - a. Submit number of copies specified in the General Requirements.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
 2. *Samples:*
 - a. Submit number of Samples specified in the Specifications.
 - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Submittal Procedures:*
1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer's Review:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any

disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 - 1. observations by Engineer;
 - 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. use or occupancy of the Work or any part thereof by Owner;
 - 5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
 - 6. any inspection, test, or approval by others; or
 - 7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the

extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and

tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing

in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance:*
1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and

testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract

Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
 2. correct such defective Work; or
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's

recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid

or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due:

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 Final Completion Delayed

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

- A. The making and acceptance of final payment will constitute:
 1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees

specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
 1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.

- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.

- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
 - 1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agrees with the other party to submit the Claim to another dispute resolution process; or
 - 3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00800 – SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700) (2007 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

1.01.A.12 Replace in its entirety with the following:

"12. Contract Documents – The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), Contractor's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and Engineer's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hardcopies of the items listed in this paragraph are Contract Documents. Files in electronic format of text, data, graphics, and the like that may be furnished by Owner to Contractor are not Contract Documents".

1.01.A.44 First sentence, change: "in the opinion of the Engineer", to "in the opinion of Engineer and Owner".

1.02 Terminology

Delete 1.02.E and replace with the following:

1.02.E The words "furnish", "furnish and install", "install", and "provide" or words with similar meaning shall be interpreted, unless otherwise specifically stated, to mean "furnish and install complete in place and ready for service".

Add the following:

1.02.G The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract (EJCDC C-700, (2007 Edition) have the meanings assigned to them in the General Conditions.

ARTICLE 2 – PRELIMINARY MATTERS

Add the following:

2.00 Execution of Agreement

2.00.A At least six (6) counterparts of the Agreement will be executed and delivered by the Contractor to the OWNER within fifteen (15) days of the Notice of Award and receipt of the Contract Documents by the Contractor for execution; and OWNER will execute and deliver one counterpart to Contractor within ten (10) days of receipt of the executed Agreement from Contractor.

2.01 Delivery of Bonds and Evidence of Insurance

- 2.01.B Replace "Before any Work at the Site is started, Contractor and Owner shall each deliver to the other" with "When Contractor delivers the executed counterparts of the Agreement to the Owner, Contractor shall deliver to the Owner", and replace "and Owner respectively are" with "is".
- 2.02 Copies of Documents
- 2.02A Revise as follows:
- Owner shall furnish to Contractor up to ~~ten~~ three printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.
- 2.03 Commencement of Contract Times; Notice to Proceed:
- 2.03.A Delete in its entirety and substitute the following:
- 2.03.A The Contract Time will commence to run on the day indicated in the Notice to Proceed; but in no event will the Contract Time commence to run later than the ninetieth day after the day of Bid opening or the thirtieth day after the effective date of the Agreement. By mutual consent of the parties to the Contract, these time limits may be changed.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING AND REUSE

3.01 Intent

Add the following:

- 3.01.D It is the intent of the Specification and Contract Documents to obtain an operable Project. Equipment, components, systems, etc., therein shall be made operable by the Contractor.
- 3.01.E The Contract Drawings may be supplemented from time to time with additional Drawings by the Engineer as may be required to illustrate the work or, as the work progresses, with additional Drawings, by the Contractor, subject to the approval of the Engineer. Supplementary Drawings, when issued by the Engineer or by the Contractor, after approval by the Engineer, shall be furnished in sufficient quantity to all those who, in the opinion of the Engineer, are affected by such Drawings.

3.03 Reporting and Resolving Discrepancies

Add the following:

- 3.03.B.2 In resolving such conflicts, errors and discrepancies, the Contract Documents shall be given precedence in the following order:
- a. Agreement
 - b. Field and Change Orders
 - c. Addenda
 - d. Special Conditions
 - e. Instruction to Bidders
 - f. General Conditions
 - g. Project Specifications and Drawings
 - h. LFUCG standard specifications and standard details

Figure dimensions on drawings shall govern over scale dimensions and detailed Drawings shall govern over general Drawings.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS.

4.02 Subsurface and Physical Conditions

4.02.A Delete: “the Supplementary Conditions”, and substitute “Section 00320 – Geotechnical Data”.

4.02.B Second sentence, delete: “Supplementary Conditions” and substitute “Specifications and Contract Drawings”.

4.04 Underground Facilities

Add the following:

4.04.B.3 The Owner, Engineer, and Engineer’s Consultants shall not be liable to Contractor for any claims, costs, losses or damages incurred or sustained by Contractor on or in connection with any other project or anticipated project.

4.06 Hazardous Environmental Condition at Site

4.06.A First sentence, delete “Supplementary Conditions” and substitute “Section 00300 – Information Available To Bidders.”

4.06.B Second sentence, delete “Supplementary Conditions: and substitute “Specifications and Contract Drawings.”

4.06.G First sentence, insert “Kentucky” between “by” and “Laws”.

Add the following at the end of this section: “The parties understand and acknowledge that no Kentucky case, statute, or Constitutional provision authorizes a local government to indemnify a contractor and that this contract provision may be unenforceable.

ARTICLE 5 – BONDS AND INSURANCE

Delete Article 5 in its entirety and substitute the following:

5.01 Performance and Payment Bonds

5.01A Concurrent with execution of the Agreement and within fifteen (15) days of the Notice of Award, the successful Contractor shall procure, execute and deliver to the OWNER and maintain, at his own cost and expense, the following bonds in the forms attached, of a surety company approved by the State of Kentucky as a Surety:

5.01.B Performance Bond – in an amount not less than 100% of the total amount payable to the Contractor by the terms of the Contract as security for the faithful performance of the work. Bond must be valid until one (1) year after the date of issuance of the Certificate of Substantial Completion.

5.01.C Payment Bond – in an amount not less than 100% of the total amount payable to the Contractor by the terms of the Contract as security for the payment of all persons performing labor and furnishing material in connection with the work. Bond must be valid until one (1) year after date of issuance of the Certificate of Substantial Completion.

5.01.D All Bonds signed by an agent must be accompanied by a certified copy of the authority to act.

- 5.01.E If the Surety on any Bond furnished by the Contractor is declared bankrupt or becomes insolvent or its right to do business in the State of Kentucky is revoked, the Contractor shall within five (5) days thereafter substitute another Bond or Surety, both of which shall be acceptable to the OWNER.
- 5.02 Insurance Requirements
See Section 00600 – Bonds and Certificates for Insurance Requirements.
- 5.03 Contractor's Liability Insurance
See Section 00600 – Bonds and Certificates for Insurance Requirements.
- 5.04 Indemnification Agreement
See Section 00600 – Bonds and Certificates for Indemnification.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

- 6.06 Concerning Subcontractors, Suppliers and Others
- 6.06.B First sentence, delete: "If the Supplementary Conditions", and substitute "The Bid Form". The seventh line, delete "Supplementary Conditions", and substitute "Bid Form".
- 6.06.G Delete in its entirety and substitute the following:
- 6.06.G All work performed for Contractor by a Subcontractor shall be pursuant to an appropriate agreement between the Contractor and Subcontractor. The Subcontractor shall not commence work until Contractor has obtained all insurance as required by Paragraphs 5.02 through 5.03 inclusive.
- 6.07 Patent Fees and Royalties
- 6.07 Delete 6.07.A, 6.07.B, and 6.07.C in their entirety and substitute the following:
- 6.07.A Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work of any invention, design, process, products or device which is the subject of patent rights or copyrights held by others. Contractor shall indemnify and hold harmless OWNER and Engineer and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses, including attorney's fees, arising out of any infringement of patent rights or copyrights incident to the use in the performance of the Work or furnished by him in fulfillment of the requirements of this Contract. In the event of any claim or action by law on account of such patents or fees, it is agreed that the OWNER may retain out of the monies which are or which may become due the Contractor under this Contract, a sum of money sufficient to protect itself against loss, and to retain the same until said claims are paid or are satisfactorily adjusted.
- 6.08 Permits
- 6.08.A Third sentence of paragraph delete, "or if there are no Bids.....to the Work.", and substitute "and the Contractor shall pay all charges of utility owners for connections to the Work."
- 6.09 Laws and Regulations
- 6.09.B Delete 6.09B in its entirety and substitute the following:
- 6.09.B If Contractor observes that the Specifications or Drawings are at variance with any Laws or Regulations, he shall give Engineer prompt written notice thereof. If Contractor performs

any Work knowing it to be contrary to such Laws or Regulations, and without such notice to Engineer, he shall bear all costs arising therefrom. The Contractor shall, at all times, observe and comply with and shall cause all his agents and employees and all his Subcontractors to observe and comply with all such existing Laws or Regulations, and shall protect and indemnify the OWNER and the Engineer and the municipalities in which work is being performed, and their officers and agents against any claim, civil penalty, fine or liability arising from or based on the violation of any such Law or Regulation, whether by himself or his employees or any of his Subcontractors.

6.13 Safety and Protection

6.13.B First sentence, after "CONTRACTOR" add the following:

" , subject to provisions 6.09.B," ,

6.19 Contractor's General Warranty and Guarantee

6.19.A After the first sentence of Section 6.19.A add the following:

"All materials or equipment delivered to the site shall be accompanied by certificates, signed by an authorized officer of the supplier, and notarized guaranteeing that the materials or equipment conform to specification requirements, Such certificates shall be immediately turned over to the Engineer. Materials or equipment delivered to the site without such certificates will be subject to rejection. The warranty and guarantee period shall be for a period of one (1) year, or such longer period of time as may be prescribed by Law, from the date of Substantial Completion."

6.20 Indemnification

6.20.A First sentence, after "...claims, costs" add the following:

" , civil penalties, fines,"

6.20.C Add the following:

6.30.C.3 Nothing in the Contract Documents shall create or give to third parties any claim or right of action against the Contractor, the OWNER or the Engineer beyond such as may legally exist irrespective of the Contract.

ARTICLE 7 – OTHER WORK AT THE SITE

7.02 Coordination

Delete in its entirety.

7.03 Legal Relationships

7.03.B Delete "Owner and".

7.03.C Delete "Owner and".

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.02 Replacement of Engineer

8.02.A Delete in its entirety.

- 8.06 Insurance
- 8.06.A Delete in its entirety.
- 8.11 Evidence of Financial Arrangements
- 8.11.A Delete in its entirety.

ARTICLE 9 – ENGINEER’S STATUS DURING CONSTRUCTION

- 9.01 OWNER’S Representative
- 9.01.A Delete in its entirety and substitute the following:
- 9.01.A Engineer will be the OWNER’S representative during the construction period, and his instructions shall be carried into effect promptly and efficiently.
- 9.03 Project Representative

Add the following:

- 9.03.B The Resident Project Representative will serve as the Engineer’s liaison with the Contractor, working principally through the Contractor’s resident superintendent to assist him in understanding the intent of the Contract Documents.
- 9.03.C The Resident Project Representative shall conduct on-site observations of the work in progress to confirm that the work is proceeding in accordance with the Contract Documents. He will verify that tests, equipment and systems start-ups and operating maintenance instructions are conducted as required by the Contract Documents. He will have the authority to disapprove or reject defective work in accordance with Article 13.
- 9.09 Limitations on Engineer’s Authority and Responsibilities

Add the following:

- 9.09.F Except upon written instructions of the Engineer, the Resident Project Representative:
 1. Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment.
 2. Shall not exceed limitations of Engineer’s authority as set forth in the Contract Documents.
 3. Shall not undertake any of the responsibilities of Contractor, Subcontractors, or Contractor’s superintendent, or expedite the Work.
 4. Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract.
 5. Shall not advise on or issue directions as to safety precautions and programs in connection with the Work.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES, UNIT PRICE WORK

- 11.01 Cost of the Work

- 11.01.A Last sentence, following "...in Paragraph 11.01.B," insert the following:
 "or claims for extra cost shall be considered based on an escalation of labor costs throughout the period of the Contract,"
- 11.01.A.2 Add the following at the end of the paragraph:
 "No claims for extra cost shall be considered based on an escalation of material costs throughout the period of the Contract."
- 11.01.A.3 Delete second sentence "If required...be acceptable."
- 11.01.A.4 Delete in its entirety.
- 11.01.A.5.a Delete in its entirety.
- 11.01.A.5.c Add the following before last sentence of paragraph:
 "These rates shall include all fuel, lubricants, insurance, etc. Equipment rental charges shall not exceed the prorated monthly rental rates listed in the current edition of the 'Compilation of Rental Rates for Construction Equipment' as published by the Associated Equipment Distributors. Charges per hour shall be determined by dividing the monthly rates by 176."
- 11.01.A.5.f Delete in its entirety.
- 11.01.A.5.g Delete in its entirety.
- 11.01.A.5.h Delete in its entirety.
- 11.03 Unit Price of Work:
- 11.03.D.1 Delete "materially and significantly", and insert "by more than plus or minus twenty percent (20%)".

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

- 12.01 Change of Contract Price
- 12.01.A Add the following after the last sentence:
 Section 01025 shall be given precedence over section 00700 in regards to changes in contract price.
- 12.03 Delays
- 12.03.B Delete in its entirety and substitute the following:
- 12.03.B Delays beyond the control of the Contractor, as provided in paragraph 12.03.A, shall not entitle the Contractor to obtain additional project overhead costs unless such delays extend the Project as described below:
1. beyond the original Contract Times,
 2. beyond the Contract Times for which the overhead costs have been previously approved, or
 3. beyond Contract Times that are extended as a result of delays described in 12.03.C.

For the purpose of this paragraph, overhead costs shall be the supplemental costs defined in 11.01.A.5, paragraphs a, b, c, g, h and i. The Contractor's bid shall include all overhead costs as necessary to be on the Project for the original Contract Times.

12.03.C Add the following after the last sentence:

If the Contractor and the Owner cannot agree upon an equitable adjustment in the Contract Times, delays described in this Paragraph 12.03.C shall be determined as follows:

1. Contractor shall obtain weather history for the most recent five (5) years (minimum) preceding the Bid date. Weather history shall be obtained from the National Oceanic & Atmospheric Administration (NOAA) or other source approved by the Engineer. Historical weather shall be based on data from the weather reporting station closest to the project site.
2. For delays to be considered that are associated with an abnormal amount of rain, the Contractor shall use the weather history to calculate an average number of days that rainfall exceeded 0.1-inches for the period (month, quarter, year, etc.) in question. The average value calculated shall be rounded up to the next full day. A time extension may be considered equal to the number of days, above the calculated average, that the period in question experienced rainfall in excess of 0.1-inches. A Contract Time extension will not be considered for rain amounts less than 0.1-inches.
3. For daily rain amounts in excess of 1-inch, a time extension of one day beyond the number of days calculated as described above may be considered.
4. For delays associated with other abnormal weather events, the weather history shall be used to calculate an average number of days for the type of weather considered to be the cause of a delay. (Calculation of the average number of days shall be as described above.) Where the Contractor can demonstrate that the abnormal weather event has impaired his ability to perform work, beyond the day of the abnormal event, to perform site maintenance as necessary to restore the site to a workable condition may be considered.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.03 Tests and Inspections

13.03.B Delete in its entirety and substitute the following:

13.03.B Contractor shall employ and pay for inspections and testing services specifically noted as such in the Contract.

13.03.C Delete in its entirety and substitute the following:

13.03.C If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be specifically inspected, tested, or approved by some public body, Contractor shall assume full responsibility therefore, pay all costs in connection therewith and furnish Engineer the required certificates of inspection, testing or approval.

Add the following:

13.03.G The OWNER reserves the right to independently perform at its own expense, laboratory tests on random samples of material or performance tests on equipment delivered to the site. These tests if made will be conducted in accordance with the appropriate referenced standards or Specification requirements. The entire shipment represented by a given

sample, samples or piece of equipment may be rejected on the basis of the failure of samples or pieces of equipment to meet specified test requirements. All rejected materials or equipment shall be removed from the site, whether stored or installed in the Work, and the required replacement shall be made, all at no additional cost to the OWNER.

13.05 OWNER May Stop the Work:

13.05A First sentence, after "...conform to the Contract Documents", insert "or if the Work interferes with the operation of the existing facility".

13.06 Correction or Removal of Defective Work

Add the following:

13.06.C At any time during the progress of the Work and up to the date of final acceptance, the Engineer shall have the right to reject any work which does not conform to the requirements of the Contract Documents, even though such work has been previously inspected and paid for. Any omissions or failure on the part of the Engineer to disapprove or reject any Work or materials at the time of inspection shall not be construed as an acceptance of any defective work or materials.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

Add the following:

14.01.B The Contractor shall submit for the Engineer's approval, a complete breakdown of all Lump Sum Items in the Proposal. This breakdown, modified as directed by the Engineer, will be used as a basis for preparing estimates and establishing progress payments.

14.02 Progress Payments

14.02.A.3 Delete in its entirety and replace with the following:

14.02.A.3 Progress payment request shall include the percentage of the total amount of the Contract which has been completed from initiation of construction of the Project to and including the last day of the preceding month, or other mutually agreed upon day of the month accompanied by such data and supporting evidence as OWNER or Engineer may require.

Add the following:

14.02.A.4 Forms to be used shall be prepared by the Contractor and submitted to the Engineer for approval.

14.02.A.5 At the option of the OWNER, partial payment up to the estimated value, less retainage, may be allowed for any materials and equipment not incorporated in the Work, pursuant to the following conditions:

- a. Equipment or materials stored on the site shall be properly stored, protected and maintained.
- b. For any partial payment the Contractor shall submit, with his monthly progress payment from each material or equipment manufacturer, bills or invoices indicating actual material cost.
- c. Contractor shall submit evidence that he has paid for materials or equipment stored and for which the Engineer has authorized partial payment and previous progress

payments, prior to submission to the next monthly payment request. (See example letter at the end of this Section 00800).

- 14.02.A.6 The OWNER will retain ten percent (10%) of the amount of each such estimate until Work covered by the Contract is fifty percent (50%) complete. After fifty percent (50%) of the Work of the original Contract has been completed as evidenced by approved Partial Payment Requests exclusive of stored materials and in the opinion of the OWNER, satisfactory progress is being made, the OWNER may adjust future partial payment so that five percent (5%) of the original Contract Price is retained.
- 14.02.A.7 If the OWNER determines it is appropriate to reduce retainage, the method used for such adjustment shall be to fix retainage at five percent (5%) of the original Contract amount (when the work is 50% complete) and to pay all subsequent Partial Payment Requests to the full approved amount. The intent of such an adjustment is to gradually reduce retainage to five percent (5%) of the original Contract amount when the work is one hundred percent (100%) complete.
- 14.02.A.8 The OWNER may reinstate up to ten percent (10%) retainage if it is determined that the Contractor is not making satisfactory progress or there is other specific cause for retainage.
- 14.02.B.1 Review of Applications:
First sentence, delete "10 days", insert "30 days".
- 14.02.C.1 Payment Becomes Due:
First sentence, delete "Ten days" and insert "Thirty Days".
- 14.02.D.3 Delete in its entirety.
- 14.04 Substantial Completion
- 14.04 Delete paragraphs A, B, C, and D in their entirety and substitute the following:
- 14.04.A Contractor may, in writing to OWNER and Engineer, certify that the entire project is substantially complete and request that Engineer issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, Contractor and Engineer shall make an inspection of the Project to determine the status of completion. If Engineer and OWNER do not consider the Project substantially complete, Engineer will notify Contractor in writing giving his reasons therefore. If Engineer and OWNER consider the Project substantially complete, Engineer will prepare and deliver to OWNER a tentative certificate of Substantial Completion and the responsibilities between OWNER and Contractor for maintenance, heat and utilities. There shall be attached to the certificate a tentative list of items to be completed or corrected before Substantial Completion, and the certificate shall fix the time within which such items shall be completed or corrected, said time to be within Contract Time.
- 14.04.B In accordance with KRS 371.410, Substantial Completion is the point at which, as certified in writing by the contracting entity, a project is at the level of completion, in strict compliance with the contract, where:
1. Necessary approval by public regulatory authorities has been given;
 2. The Owner has received all required warranties and documentation; and
 3. The Owner may enjoy beneficial use or occupancy and may use, operate, and maintain the project in all respects, for its intended purpose.
- 14.05 Partial Utilization
- 14.05.A Delete in its entirety and substitute the following:

- 14.05.A Prior to Substantial Completion of the Project, OWNER may request Contractor in writing to permit him to use a specified part of the Project which he believes he may use without significant interference with construction of the other parts of the Project. If Contractor agrees, he will certify to OWNER and Engineer that said part of the Project is substantially complete and request the Engineer to issue a certificate of Substantial Completion for that part of the Project. Within a reasonable time thereafter, OWNER, Contractor and Engineer shall make an inspection of that part of the Project to determine its status of completion. If Engineer and OWNER do not consider that it is substantially complete, Engineer will notify Contractor in writing giving his reasons therefor. If Engineer and OWNER consider that part of the Project to be substantially complete, Engineer will execute and deliver to OWNER and Contractor a certificate to that effect, fixing the date of Substantial Completion as to that part of the Project, attaching thereto a tentative list of items to be completed or corrected before Substantial Completion of the entire Project and fixing the responsibility between OWNER and Contractor for maintenance, heat, and utilities as to that part of the Project. OWNER shall have the right to exclude Contractor from any part of the Project which Engineer has so certified to be substantially complete, but OWNER shall allow Contractor reasonable access to complete items on the tentative list.
- 14.05.B Equipment Warranty will not begin until after successful start-up, training, and acceptance by Owner for Partial Utilization. Any manufacturer's request to initiate warranty period earlier than Owner's acceptance will not be valid.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 Owner May Suspend Work

Add the following:

- 15.01.B Should the OWNER suspend Work due to repeated unsafe Work conducted by the Contractor which is confirmed by subsequent inspection by OSHA, the Contractor shall not be allowed any adjustment in Contract Price or extension of Contract Time attributed to the delay.

15.02 Owner May Terminate for Cause

- 15.02.A.2 Add the following to the end of first sentence after "jurisdiction":

"(including those governing employee safety)"

- 15.02D Delete in its entirety.

Add the following:

15.05 Assignment of Contract

- 15.05 Contractor shall not assign, transfer, convey or otherwise dispose of the Contract, or of his legal right, title, or interest in or to the same or to any part thereof, without the prior written consent of the OWNER. Contractor shall not assign by power of attorney or otherwise any monies due him and payable under this Contract without the prior written consent of the OWNER. Such consent, if given, will in no way relieve the Contractor from any of the obligations of this Contract. OWNER shall not be bound to abide by or observe the requirements of any such assignment.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 Methods and Procedures

16.01.A Replace the first sentence with the following:

"If required by applicable laws and regulations, and not specifically excluded elsewhere, either OWNER or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding."

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice

Add the following:

17.01.B No oral statement of any person whomsoever shall in any manner or degree modify or otherwise affect the terms of this Contract. Any notice to the Contractor, form OWNER and Engineer, relative to any part of this Contract shall be in writing.

Add the following:

17.07 Claims for Injury or Damage

17.07.A Should OWNER or Contractor suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph 17.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

17.08 Non-Discrimination in Employment

17.08.A The Contractor shall comply with the following requirements prohibiting discrimination:

17.08.A.1 That no person (as defined in KRS 344.010) shall Bid on Lexington-Fayette Urban County Government Construction projects, or bid to furnish materials or supplies to the Lexington-Fayette Urban County Government, if, within six months prior to the time of opening of Bids, said person shall have been found, by declamatory judgment action in Fayette Circuit Court, to be presently engaging in an unlawful practice, as hereinafter defined. Such declamatory judgment action may be brought by an aggrieved individual or upon an allegation that an effort at conciliation pursuant to KRS 344.200 has been attempted and failed, by the Lexington-Fayette County Human Rights Commission.

17.08.A.2 That it is an unlawful practice for any employer:

- a. to fail or refuse to hire, or to discharge any individual or otherwise to discriminate against an individual, with respect to his compensation, terms, conditions, or privileges of employment, because of such individual's race, color, religion, sex, age, or national origin; or
- b. to limit, segregate or classify his employees in any way which would deprive or tend to deprive an individual of employment opportunities or otherwise adversely affect his status as an employee because of such individual's sex, race, color, religion, age, or national origin.

17.08.A.3 That it is unlawful practice for an employer, labor organization, or joint-labor management committee controlling apprenticeship or other training or retraining, including on-the-job training programs to discriminate against an individual because of his race, color, religion,

sex, age, or national origin in admission to, or employment in, any program established to provide apprenticeship or other training.

- 17.08.A.4 That a copy of the LFUCG Ordinance shall be available for viewing at the Lexington-Fayette Urban County Government offices.
- 17.09 Temporary Street Closing or Blockage
- 17.09.A The Contractor will notify the Engineer, Owner, and LFUCG Division of Traffic Engineering at least 72 hours prior to making any temporary street closing or blockage. This will permit orderly notification to all concerned public agencies.
- 17.10 Percentage of Work Performed by Prime Contractor
- 17.10.A The Contractor shall perform on site, and with its own organization, Work equivalent to at least fifty percent (50%) of the total amount of Work to be performed under the Contract. This percentage may be reduced by a supplemental agreement to this Contract if, during performing the Work, the Contractor requests a reduction and the Engineer determines that the reduction would be to the advantage of the OWNER.
- 17.11 Clean-Up
- 17.11.A Clean-up shall progress, to the greatest degree practicable, throughout the course of the Work. The Work will not be considered as completed, and final payment will not be made, until the right-of-way and all ground occupied or affected by the Contractor in connection with the Work has been cleared of all rubbish, equipment, excess materials, temporary structures, and weeds. Rubbish and all waste materials of whatever nature shall be disposed of, off of the project site, in an acceptable manner. All property, both public and private, which has been damaged in the prosecution of the Work, shall be restored in an acceptable manner. All areas shall be draining, and all drainage-ways shall be left unobstructed, and in such a condition that drift will not collect or scour be induced.
- 17.12 General
- 17.12.A The duties and obligations imposed by the Contract Documents and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon Contractor, and all of the rights and remedies available to OWNER and Engineer, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representations, warranties and guarantees made in the Contract Documents will survive final payment and termination or completion of the Agreement.
- 17.13 Debris Disposal
- 17.13.A For all LFUCG projects any fill, trash, construction demolition debris, yard waste, dirt or debris of any kind that is removed from the project site must be disposed of in accordance with local, state, and federal regulations. The disposal site or facility must be approved in advance by the LFUCG and disposal documentation is required. The Contractor will be responsible for payment of any fines associated with improper disposal of material removed from the project site.
- 17.14 Maintenance of Traffic

- 17.14.A Traffic shall be maintained on state and LFUCG highways and streets at all times during construction. For all work that impacts traffic, the Contractor shall obtain a traffic permit at least two (2) working days in advance from the Division of Traffic Engineering (859) 258-3489.
- 17.14.B It shall be the Contractor's responsibility to notify LFUCG Police Department's Safety Officer (859) 258-3600 prior to performing any construction work, which might interfere with traffic or compromise the public safety.

Add the following:

ARTICLE 18 – LIQUIDATED DAMAGES FOR FAILURE TO COMPLETE WORK ON TIME

18.01 Liquidated Damages

- 18.01.A If the Contractor shall fail to complete the Work within the Contract Time, or extension of time granted by the OWNER in accordance with Article 12, then the Contractor will pay to the OWNER the amount for liquidated damages as specified in the Contract for each calendar day that the Contractor shall be in default after the time stipulated in the Contract Documents.

(Reference Section 00800, Article 14.02.A.5.c)

PUT ON CONTRACTOR'S LETTERHEAD

DATE: _____

TO: OWNER: _____

ADDRESS: _____

RE: Project Title: Lansdowne South Trunk Sewer Replacement
Lexington Fayette Urban County Government
Lexington, Kentucky
LFUCG Bid No.: 174-2018

We hereby certify that the labor and materials listed on this request for payment have been used in the construction of this work, or that all materials included in this request for payment and not yet incorporated into the construction are now on the site or stored at an approved location with proper insurance to protect these stored materials; and that all lawful charges for labor, materials etc., covered by previous Certificates of Payment have been paid and that all other lawful charges on which this request for payment is based have been paid for in full or will be paid for in full from the funds received in payment of this request within ten (10) calendar days from receipt of this partial payment from the OWNER.

CONTRACTOR: _____

BY: _____

TIME: _____

State of: _____

County of: _____

Sworn to and subscribed before me this _____ day of _____, 20____.

Notary Public (Seal)

My Commission Expires: _____

END OF SECTION

SECTION 00890 – PERMITS

Insert Applicable Permits for Project

(i.e. Categorical Exclusion, 401 Water Quality Certifications

Highway Encroachment Permits, etc.)

END OF SECTION



DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, LOUISVILLE
CORPS OF ENGINEERS
P.O. BOX 59
LOUISVILLE KY, 40201-0059

Reply to
Attention of:

July 12, 2017

Regulatory Division
South Branch
ID No. LRL-2017-272-cat

Mr. Kevin Levesque
Lexington-Fayette Urban County Government
Division of Water Quality
125 Lisle Industrial Avenue, Suite 180
Lexington, Kentucky 40511

Dear Mr. Levesque:

This is in response to The Lexington-Fayette Urban County Government's (LFUCG) request for authorization to construct the Lansdowne South Sanitary Trunk Sewer requiring 14 open trench crossings of 2 unnamed tributaries to West Hickman Creek located in Fayette County, Kentucky (N. 38.97741, -84.50578). The project will result in temporary impacts to 218 linear feet of streams (0.05 acre) and the discharge of 60 cubic yards of fill material. The information supplied by ECSI, LLC was reviewed to determine whether a Department of the Army (DA) permit will be required under the provisions of Section 404 of the Clean Water Act.

The LFUCG's project is considered a discharge of backfill or bedding material for utility lines. The project is authorized under the provisions of 33 CFR 330 Nationwide Permit (NWP) No. 12, Utility Line Activities, as published in the Federal Register January 6, 2017. Under the provisions of this authorization, LFUCG must comply with the enclosed Terms and General Conditions for Nationwide Permit No. 12, and the following Special Condition:

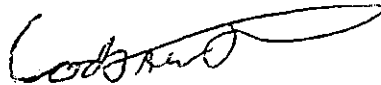
The permittee shall provide receipt of a \$167.50 contribution to the Imperiled Bat Conservation Fund (IBCF). The contribution must be made before any tree clearing occurs on site. The proposed tree clearing period for this project is August 16 - October 14, 2017. If tree clearing will take place outside of the above referenced period or if the contribution to the IBCF will be made on or after August 2017, then the applicant should contact the U.S. Fish and Wildlife Service: Kentucky Ecological Services Field Office (FWS) for an updated mitigation cost value.

The LFUCG must also comply with the enclosed Water Quality Certification (WQC) Conditions for Nationwide Permit No. 12, dated March 19, 2017, issued by the Kentucky Division of Water (KDOW). Once LFUCG obtains their certification, or if no application was required, they may proceed with the project without further contact or verification from us.

This verification is valid until March 18, 2022. The enclosed Compliance Certification must be submitted to the District Engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later. Please note that we also perform periodic inspections to ensure compliance with our permit conditions and applicable Federal laws. A copy of this letter will be forwarded to your agent and to the KDOW (see enclosure for addresses).

If you have any questions, please contact this office by writing to the above address, ATTN: CELRL-RDS, or by calling me at 502-315-6690. All correspondence pertaining to this matter should refer to our ID No. LRL-2017-272-cat.

Sincerely,



Cody Thayer
Project Manager, South Branch
Regulatory Division

Enclosures

Terms for Nationwide Permit No. 12

Utility Line Activities

Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project.

Utility lines: This NWP authorizes discharges of dredged or fill material into waters of the United States and structures or work in navigable waters for crossings of those waters associated with the construction, maintenance, or repair of utility lines, including outfall and intake structures. There must be no change in pre-construction contours of waters of the United States. A "utility line" is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and internet, radio, and television communication. The term "utility line" does not include activities that drain a water of the United States, such as drainage tile or french drains, but it does apply to pipes conveying drainage from another area.

Material resulting from trench excavation may be temporarily sidecast into waters of the United States for no more than three months, provided the material is not placed in such a manner that it is dispersed by currents or other forces. The district engineer may extend the period of temporary side casting for no more than a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. The trench cannot be constructed or backfilled in such a manner as to drain waters of the United States (e.g., backfilling with extensive gravel layers, creating a french drain effect). Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line crossing of each waterbody.

Utility line substations: This NWP authorizes the construction, maintenance, or expansion of substation facilities associated with a power line or utility line in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not result in the loss of greater than 1/2-acre of waters of the United States. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters of the United States to construct, maintain, or expand substation facilities.

Foundations for overhead utility line towers, poles, and anchors: This NWP authorizes the construction or maintenance of foundations for overhead utility line towers, poles, and anchors in all waters of the United States, provided the foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) are used where feasible.

Access roads: This NWP authorizes the construction of access roads for the construction and maintenance of utility lines, including overhead power lines and utility line substations, in non-tidal waters of the United States, provided the activity, in

combination with all other activities included in one single and complete project, does not cause the loss of greater than 1/2-acre of non-tidal waters of the United States. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters for access roads. Access roads must be the minimum width necessary (see Note 2, below). Access roads must be constructed so that the length of the road minimizes any adverse effects on waters of the United States and must be as near as possible to pre-construction contours and elevations (e.g., at grade corduroy roads or geotextile/gravel roads). Access roads constructed above pre-construction contours and elevations in waters of the United States must be properly bridged or culverted to maintain surface flows.

This NWP may authorize utility lines in or affecting navigable waters of the United States even if there is no associated discharge of dredged or fill material (See 33 CFR part 322). Overhead utility lines constructed over section 10 waters and utility lines that are routed in or under section 10 waters without a discharge of dredged or fill material require a section 10 permit.

This NWP authorizes, to the extent that Department of the Army authorization is required, temporary structures, fills, and work necessary for the remediation of inadvertent returns of drilling fluids to waters of the United States through sub-soil fissures or fractures that might occur during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines. These remediation activities must be done as soon as practicable, to restore the affected waterbody. District engineers may add special conditions to this NWP to require a remediation plan for addressing inadvertent returns of drilling fluids to waters of the United States during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines.

This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the utility line activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After construction, temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if any of the following criteria are met: (1) the activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1/10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials. (See general condition 32.) (Authorities: Sections 10 and 404)

Note 1: Where the utility line is constructed or installed in navigable waters of the United States (i.e., section 10 waters) within the coastal United States, the Great Lakes, and United States territories, a copy of the NWP verification will be sent by the Corps to the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), for charting the utility line to protect navigation.

Note 2: For utility line activities crossing a single waterbody more than one time at separate and distant locations, or multiple waterbodies at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. Utility line activities must comply with 33 CFR 330.6(d).

Note 3: Utility lines consisting of aerial electric power transmission lines crossing navigable waters of the United States (which are defined at 33 CFR part 329) must comply with the applicable minimum clearances specified in 33 CFR 322.5(i).

Note 4: Access roads used for both construction and maintenance may be authorized, provided they meet the terms and conditions of this NWP. Access roads used solely for construction of the utility line must be removed upon completion of the work, in accordance with the requirements for temporary fills.

Note 5: Pipes or pipelines used to transport gaseous, liquid, liquescent, or slurry substances over navigable waters of the United States are considered to be bridges, not utility lines, and may require a permit from the U.S. Coast Guard pursuant to section 9 of the Rivers and Harbors Act of 1899. However, any discharges of dredged or fill material into waters of the United States associated with such pipelines will require a section 404 permit (see NWP 15).

Note 6: This NWP authorizes utility line maintenance and repair activities that do not qualify for the Clean Water Act section 404(f) exemption for maintenance of currently serviceable fills or fill structures.

Note 7: For overhead utility lines authorized by this NWP, a copy of the PCN and NWP verification will be provided to the Department of Defense Siting Clearinghouse, which will evaluate potential effects on military activities.

Note 8: For NWP 12 activities that require pre-construction notification, the PCN must include any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings that require Department of the Army authorization but do not require pre-construction notification (see paragraph (b) of general condition 32). The district engineer will evaluate the PCN in accordance with Section D, "District Engineer's Decision." The district engineer may require mitigation to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see general condition 23).

2017 Nationwide Permits Regional and Permit-Specific Conditions COMMONWEALTH OF KENTUCKY

These regional conditions are in addition to, but do not supersede, the requirements in the Federal Register (Volume 82, No. 4 of January 6, 2017, pp 1860).

Notifications for all Nationwide Permits (NWP) shall be in accordance with General Condition No. 32.

1. For activities that would impact Outstanding State or National Resource Waters (OSNRWs), Exceptional Waters (EWs), Coldwater Aquatic Habitat Waters (CAHs) under the Endangered Species Act for the NWP listed below, a Pre-Construction Notification (PCN) will be required to the Corps. The Corps will coordinate with the appropriate resource agencies (see attached list) on these NWP (Section 404 activities), for impacts to these waters.

NWP 3 (Maintenance)

NWP 4 (Fish and Wildlife Harvesting, Enhancement, and Attraction Devices and Activities)

NWP 5 (Scientific Measurement Devices)

NWP 6 (Survey Activities)

NWP 7 (Outfall Structures and Associated Intake Structures)

NWP 12 (Utility Line Activities)

NWP 13 (Bank Stabilization)

NWP 14 (Linear Transportation Projects)

NWP 15 (U.S. Coast Guard Approved Bridges)

NWP 16 (Return Water from Upland Contained Disposal Areas)

NWP 17 (Hydropower Projects)

NWP 18 (Minor Discharges)

NWP 19 (Minor Dredging)

NWP 20 (Response Operations for Oil or Hazardous Substances)

NWP 21 (Surface Coal Mining Activities)

NWP 22 (Removal of Vessels)

NWP 23 (Approved Categorical Exclusions)

NWP 25 (Structural Discharges)

NWP 27 (Aquatic Habitat Restoration, Establishment, and Enhancement Activities)

NWP 29 (Residential Developments)

NWP 30 (Moist Soil Management for Wildlife)

NWP 31 (Maintenance of Existing Flood Control Facilities)

NWP 32 (Completed Enforcement Actions)

NWP 33 (Temporary Construction, Access, and Dewatering)

NWP 34 (Cranberry Production Activities)

NWP 36 (Boat Ramps)

NWP 37 (Emergency Watershed Protection and Rehabilitation)

NWP 38 (Cleanup of Hazardous and Toxic Waste)

NWP 39 (Commercial and Institutional Developments)

NWP 40 (Agricultural Activities)

NWP 41 (Reshaping Existing Drainage Ditches)
NWP 42 (Recreational Facilities)
NWP 43 (Stormwater Management Facilities)
NWP 44 (Mining Activities)
NWP 45 (Repair of Uplands Damaged by Discrete Events)
NWP 46 (Discharges in Ditches)
NWP 48 (Commercial Shellfish Aquaculture Activities)
NWP 49 (Coal Remining Activities)
NWP 50 (Underground Coal Mining Activities)
NWP 51 (Land-Based Renewable Energy Generation Facilities)
NWP 52 (Water-Based Renewable Energy Generation Pilot Projects)
NWP 53 (Removal of Low-Head Dams)
NWP 54 (Living Shorelines)

2. In addition to the notification and agency coordination requirements in the NWPs, for impacts greater than 0.25 acres in all "waters of the U.S." for the NWPs listed below, a PCN will be required to the Corps. The Corps will coordinate with the appropriate resource agencies (see attached list) on these NWPs:

NWP 3 (Maintenance)
NWP 7 (Outfall Structures and Associated Intake Structures)
NWP 12 (Utility Line Activities)
NWP 14 (Linear Transportation Projects)
NWP 29 (Residential Developments)
NWP 39 (Commercial and Institutional Developments)
NWP 40 (Agricultural Activities)
NWP 41 (Reshaping Existing Drainage Ditches)
NWP 42 (Recreational Facilities)
NWP 43 (Stormwater Management Facilities)
NWP 44 (Mining Activities)
NWP 51 (Land-Based Renewable Energy Generation Facilities)
NWP 52 (Water-Based Renewable Energy Generation Pilot Projects)
NWP 53 (Removal of Low-Head Dams)

3. For activities in all "waters of the U.S." for the NWPs listed below, a PCN will be required to the Corps. The Corps will coordinate with the appropriate resource agencies (see attached list) on these NWPs:

NWP 21 (Surface Coal Mining Activities)
NWP 27 (Aquatic Habitat Restoration, Establishment & Enhancement Activities)
NWP 49 (Coal Remining Activities)
NWP 50 (Underground Coal Mining Activities)

4. Nationwide Permit No. 14 – Linear Transportation Projects.

- (a) New road alignments or realignments are limited to a permanent loss of 500 linear feet of intermittent or perennial stream length at each crossing. Road crossings with permanent losses greater than 500 linear feet of intermittent or perennial stream associated with new

alignments or realignments will be evaluated as an individual permit (i.e., a Letter of Permission or as a Standard Individual Permit).

- (b) In addition to the notification requirements contained in NWP 14, the permittee must submit a PCN to the district engineer prior to commencing the activity for the permanent loss of greater than 300 feet of ephemeral, intermittent and perennial stream of all "waters of the U.S." (See General Condition 32 and the definition of "loss of waters of the United States" in the Nationwide Permits for further information.)
5. Notification in accordance with General Condition 32 is required to the Corps for all activities which are subject to jurisdiction under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
 6. All applications are required as both a paper copy and in an electronic media format, including electronic mail or compact disc.
 7. For all activities, the applicant shall review the U.S. Fish and Wildlife Service's IPaC website: <http://ecos.fws.gov/ipac> to determine if the activity might affect threatened and/or endangered species or designated critical habitat. If federally-listed species or designated critical habitat are identified, a PCN in accordance with General Condition 18 and 32 would be triggered and the official species list generated from the IPaC website must be submitted with the PCN.

Further information:

Outstanding State or National Resource Water (OSNRWs), Exceptional Waters (EWs), and Coldwater Aquatic Habitat Waters (CAHs) are waters designated by the Commonwealth of Kentucky, Natural Resources and Environmental Protection Cabinet. The list can be found at the following link: <http://eppcapp.ky.gov/spwaters/>

Information on Pre-Construction Notification (PCN) can be found at NWP General Condition No. 32 in the Federal Register (Volume 81, No. 105 of June 1, 2017, pp 35211).

COORDINATING RESOURCE AGENCIES

Chief, Wetlands Regulatory Section
U.S. Environmental Protection Agency
Region IV
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303

Supervisor
U.S. Fish & Wildlife Service
JC Watts Federal Building, Room 265
330 West Broadway
Frankfort, Kentucky 40601

Supervisor
401 Water Quality Certification
Kentucky Division of Water
300 Sower Boulevard, 3rd Floor
Frankfort, KY 40601

Commissioner
Department of Fish and Wildlife Resources
#1 Game Farm Road
Frankfort, Kentucky 40601

Executive Director and State Historic Preservation Officer
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

ADDITIONAL COORDINATING RESOURCE AGENCY
FOR NWPS 21, 49, AND 50

Kentucky Department for Natural Resources
Division of Mine Permits
300 Sower Boulevard
Frankfort, KY 40601



US Army Corps
of Engineers
Louisville District

2017 Nationwide Permit General Conditions

The following General Conditions must be followed in order for any authorization by NWP to be valid:

1. **Navigation.** (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the US Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. **Aquatic Life Movements.** No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species.

3. **Spawning Areas.** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. **Migratory Bird Breeding Areas.** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. **Shellfish Beds.** No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWP's 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. **Suitable Material.** No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

7. **Water Supply Intakes.** No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. **Adverse Effects From Impoundments.** If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. **Management of Water Flows.** To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. **Fills Within 100-Year Floodplains.** The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. **Equipment.** Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. **Soil Erosion and Sediment Controls.** Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. **Removal of Temporary Fills.** Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. **Proper Maintenance.** Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. **Single and Complete Project.** The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. **Wild and Scenic Rivers.** (a) No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. The permittee shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.

(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: <http://www.rivers.gov/>

17. **Tribal Rights.** No activity may impair tribal rights (including treaty rights), protected tribal resources, or tribal lands.

18. **Endangered Species.** (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless section 7 consultation addressing the effects of the proposed activity has been completed. Direct effects are the immediate effects on the listed species and critical habitat caused by the NWP activity. Indirect effects are those effects on listed species and critical habitat that are caused by the NWP activity and are later in time, but still are reasonably certain to occur.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

(c) Non-federal permittees must submit a pre-construction notification (PCN) to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the PCN must include the name(s) of the endangered or threatened species that might be affected by the proposed activity or that utilize the designated critical habitat that might be affected by the proposed work. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete PCN. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification the proposed activities will have "no effect" on listed species or critical habitat, or until Section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from Corps.

(d) As a result of formal or informal consultation with the USFWS or NMFS the district engineer may add species-specific permit conditions to the NWP.

(e) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the USFWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will review the ESA section 10(a)(1)(B) permit, and if he or she determines that it covers the proposed NWP activity, including any incidental take of listed species that might occur as a result of conducting the proposed NWP activity, the district engineer does not need to conduct a separate section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete PCN whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the USFWS and NMFS or their world wide web pages at <http://www.fws.gov/> or <http://www.fws.gov/ipac> and <http://www.nmfs.noaa.gov/pr/species/esa> respectively.

19. Migratory Birds and Bald and Golden Eagles. The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting appropriate local office of the U.S. Fish and Wildlife Service to determine applicable measures to reduce impacts to migratory birds or eagles, including whether "incidental take" permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. Historic Properties. (a) In cases where the district engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those

requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of Section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause an effect on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, and adverse effect. Where the non-Federal applicant has identified historic properties on which the activity might have the potential to cause effects and notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed.

(d) For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until Section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the activity on historic properties.

21. Discovery of Previously Unknown Remains and Artifacts. If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal and state coordination required to determine if the items or remains warrant recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters. Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the US are not authorized by NWP's 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWP's 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWP's only after it is determined that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation. The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse effects of the proposed activity are minimal, and provides a project-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse environmental effects.

(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation to ensure that the activity results in no more than minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g. conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. Restored riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on the both sides of a stream or if the waterbody is a lake or coastal waters. Then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g. riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWP's, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation if the use of mitigation bank or in-lieu fee program credits is not appropriate and practicable.

(2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f).)

(3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)).

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan only needs to address the baseline conditions at the impact site and the number of credits to be provided.

(6) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan.

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWP's. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any project resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the minimal impact requirement for the NWP's.

(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or separate permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-responsible compensatory mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. Safety of Impoundment Structures. To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. Water Quality. Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, Individual 401 Water Quality

Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. Coastal Zone Management. In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or USEPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. Use of Multiple Nationwide Permits. The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

29. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature: "When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

(Transferee)

(Date)

30. Compliance Certification. Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

- (a) A statement that the authorized work was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;
- (b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and
- (c) The signature of the permittee certifying the completion of the work and mitigation. The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

31. Activities Affecting Structures or Works Built by the United States. If an NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally

authorized Civil Works project (a "USACE project"), the prospective permittee must submit a pre-construction notification. See paragraph (b)(10) of general condition 32. An activity that requires Section 408 permission is not authorized by the NWP until the appropriate Corps office issues the section 408 permission to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

32. Pre-Construction Notification (PCN). (a) Timing. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

- (1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or
- (2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or in the vicinity of the project, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

- (1) Name, address and telephone numbers of the prospective permittee;
- (2) Location of the proposed activity;
- (3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;
- (4) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures. For single and complete linear projects, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other water for each single and complete crossing of those wetlands, other special aquatic sites, and other waters. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an

illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-federal permittees, if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed activity or utilize the designated critical habitat that may be affected by the proposed activity. For any NWP activity that requires pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;

(8) For non-federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. Federal permittees must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

(9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the "study river" (see general condition 16); and

(10) For an activity that requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from the Corps office having jurisdiction over that USACE project.

(c) Form of PCN Notification: The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is an NWP PCN and must include all of the information required in paragraphs (b)(1) through (10) of this general condition. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.

(d) Agency Coordination: (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects so that they are no more than minimal.

(2) Agency coordination is required for: (i) all NWP activities that require preconstruction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of stream bed; (iii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iv) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean water line or ordinary high water mark.

(3) When agency coordination is required, the district engineer will immediately provide (e.g., via e-mail, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural

resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or e-mail that they intend to provide substantive, sites specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of PCN notifications to expedite agency coordination.

Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).



MATTHEW G. BEVIN
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**ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION**

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**General Certification--Nationwide Permit # 12
Utility Line Backfill and Bedding**

This General Certification is issued March 19, 2017, in conformity with the requirements of Section 401 of the Clean Water Act of 1977, as amended (33 U.S.C. §1341), as well as Kentucky Statute KRS 224.16-050.

For this and all nationwide permits, the definition of surface water is as per 401 KAR 10:001 Chapter 10, Section 1(80): Surface Waters means those waters having well-defined banks and beds; either constantly or intermittently flowing; lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface. Lagoons used for waste treatment and effluent ditches that are situated on property owned, leased, or under valid easement by a permitted discharger are not considered to be surface waters of the commonwealth.

Agricultural operations, as defined by KRS 224.71-100(1) conducting activities pursuant to KRS 224.71-100 (3), (4), (5), (6), or 10 are deemed to have certification if they are implementing an Agriculture Water Quality Plan pursuant to KRS 224.71-145.

For all other operations, the Commonwealth of Kentucky hereby certifies under Section 401 of the Clean Water Act (CWA) that it has reasonable assurances that applicable water quality standards under Kentucky Administrative Regulations Title 401, Chapter 10, established pursuant to Sections 301, 302, 304, 306 and 307 of the CWA, will not be violated for the activity covered under NATIONWIDE PERMIT 12, namely Utility Line Backfill and Bedding, provided that the following conditions are met:

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.
2. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.

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3. This general water quality certification is limited to the crossing of surface waters by utility lines. This document does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.
4. For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.
5. This general certification shall not apply to projects where multiple nationwide permits are issued for individual crossings which are part of a single, larger utility line project where the cumulative impacts exceed ½ acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.
6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For utility line crossings and roads, only one bank length is used in calculation of the totals.
7. Any crossings must be constructed in a manner that does not impede natural water flow.
8. Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).
9. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.
10. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.
11. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.
12. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow construction within the 50 foot buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.

General Certification--Nationwide Permit # 12
Utility Line Backfill and Bedding
Page 3

13. Utility line stream crossings shall be constructed by methods that maintain 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 excavation shall not be allowed to enter the flowing portion of the stream.
14. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.
15. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.
16. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:
 - Projects requiring in-stream stormwater detention/retention basins shall require individual water quality certifications.
 - Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
 - Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.
 - Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
 - Removal of riparian vegetation shall be limited to that necessary for equipment access.
 - To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
 - 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 in which such in-stream work is unavoidable, then it shall

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be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.

- 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 rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
- If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
- 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.

Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

Compliance Certification:

Permit Number: LRL-2017-272-cat

Name of Permittee: Lexington-Fayette Urban County Government

Date of Issuance: July 12, 2017

Upon completion of the activity authorized by this permit and any mitigation required by this permit, sign this certification and return it to the following address.

U.S. Army Corps of Engineers
CELRL-RDS
P.O. Box 59
Louisville, Kentucky 40201

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit, you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit, has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

Signature of Permittee

Date

ADDRESS FOR AUTHORIZED AGENT

Mr. Frederick R. Eastridge
ECSL, LLC
340 South Broadway, Suite 200
Lexington, KY 40508

ADDRESS FOR COORDINATING AGENCY

Ms. Stephanie Hayes
Kentucky Energy & Environment Cabinet
Division of Water
300 Sower Boulevard, 3rd Floor
Frankfort, KY 40601

Imperiled Bat Conservation Fund Payment Instructions

Follow the steps below to submit your contribution:

1. Mail your IBCF contribution to: **Kentucky Natural Lands Trust
c/o Hugh Archer, Executive Director
433 Chestnut Street
Berea, KY 40403**

****Your contribution should be made via check or
money order****
2. You should send a cover letter or memo with your contribution, referencing the Project Proponent's Name, the Corps ID#LRL-2017-272; KFO Project Number, FWS# FWS 2017-B-0591, and "IBCF Contribution" in the letter or memo or on the check or money order. Additionally, a contact name and address should be included in the letter or memo so that a letter of receipt can be sent.
3. Provide a receipt of payment to the Corps project manager, Cody Thayer.

If you have any questions, please contact the project manager at 502-315-6690 or via email at Cody.A.Thayer@usace.army.mil

MATTHEW G. BEVIN
GOVERNOR



CHARLES G. SNAVELY
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

AARON B. KEATLEY
COMMISSIONER

300 SOWER BOULEVARD
FRANKFORT, KENTUCKY 40601

STREAM CONSTRUCTION PERMIT
For Construction In Or Along A Stream

Issued to: **LFUCG - Division of Water Quality**
Address: **125 Lisle Industrial Ave Suite 180**
Lexington, KY 40511

Permit expires on
June 22, 2018

Permit No. **26908P**

AI: **123077**

In accordance with KRS 151.250 and KRS 151.260, the Energy and Environment Cabinet approves the application dated **May 19, 2017** for installation of **2,081 LF of 21" sanitary sewer** and **2,591 LF of 24" sanitary sewer** including **10 stream crossings using directional boring method and open cut trench method in the floodplain of Wilson Downing Tributary, with average coordinates of 37.973556, -84.500639, at about 5.7 stream miles in Lexington Fayette County.**

There shall be no deviation from the plans and specifications submitted and hereby approved unless the proposed change shall first have been submitted to and approved in writing by the Cabinet. This approval is subject to the attached limitations. **Please read these limitations carefully!** If you are unable to adhere to these limitations for any reason, please contact this office prior to construction.

This permit is valid from the standpoint of stream obstruction only. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet and other state, federal and local agencies. Specifically if the project involves work in a stream, such as bank stabilization, dredging, relocation, or in designated wetlands, a 401 Water Quality Certification from the Division of Water will be required.

This permit is nontransferable and is not valid unless actual construction of this authorized work is begun prior to the expiration date noted above. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990.

If you have any questions regarding this permit, please call Mr. Solitha Dharman at 502-782-6936.

Issued June 22, 2017.

Ron Dutta, P.E., Supervisor
Floodplain Management Section
Surface Water Permit Branch
Division of Water

RD/SD/rd

pc: **Frankfort Regional Office**
Doug Burton – Fayette County Floodplain Coordinator
Fred Eastridge, P.E., PLS, by e-mail
File



LFUCG - Division of Water Quality floodplain application 26908A AI: 123077 permit 26908P

Stream Construction Permit

West Hickman Sewer Trunk

Facility Requirements

Permit Number: 26908P

Activity ID No.:APE20170002

STRC0000000003 (AI: 123077 - Sewer) installation of 2,081 LF of 21" sanitary sewer and 2,591 LF of 24" sanitary sewer including 10 stream crossings using directional boring method and open cut trench method in the floodplain of Wilson Downing Tributary, with average coordinates of 37.973556, -84.500639, at about 5.7 stream miles in Lexington Fayette County:

Submittal/Action Requirements:

Condition No.	Condition
S-1	LFUCG-Div of Water Quality must submit final construction report within 90 days after completion of construction. LFUCG-Div of Water Quality must certify in writing that the project has been completed in accordance with the approved plans and specifications. A Final Construction Report Form is enclosed. [401 KAR 4:060 Section 6]

Narrative Requirements:

Condition No.	Condition
T-1	The issuance of this permit by the cabinet does not convey any property rights of any kind or any exclusive privilege. [KRS 151.250 & 401 KAR 4:060]
T-2	This permit is issued from the standpoint of stream obstruction only and does not constitute certification of any other aspect of the proposed construction. The applicant is liable for any damage resulting from the construction, operation, or maintenance of this project. This permit has been issued under the provisions of KRS Chapter 151.250 and regulations promulgated pursuant thereto. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet and other state, federal and local agencies. [KRS 151.250]
T-3	A copy of this permit must be available at the construction site. [KRS 151.250]
T-4	Any work performed by or for LFUCG-Div of Water Quality that does not fully conform to the submitted application or drawings and the limitations set forth in this permit, is subject to partial or total removal and enforcement actions pursuant to KRS 151.280 as directed by the Kentucky Department for Environmental Protection. [KRS 151.280]
T-5	Any design changes or amendments to the approved plans must be submitted to the Division of Water and approved in writing prior to implementation. [KRS 151.250]
T-6	Since Fayette County participates in the National Flood Insurance Program, a local floodplain permit must be obtained prior to beginning of construction. Upon completion of construction LFUCG-Div of Water Quality must contact the local permitting agency for final approval of the construction for compliance with the requirements of the local floodplain ordinance. [401 KAR 4:060 Section 9(c)]

Stream Construction Permit

West Hickman Sewer Trunk

Facility Requirements

Permit Number: 26908P

Activity ID No.:APE20170002

STRC0000000003 (AI: 123077 - Sewer) installation of 2,081 LF of 21" sanitary sewer and 2,591 LF of 24" sanitary sewer including 10 stream crossings using directional boring method and open cut trench method in the floodplain of Wilson Downing Tributary, with average coordinates of 37.973556, -84.500639, at about 5.7 stream miles in Lexington Fayette County:

Narrative Requirements:

Condition No.	Condition
T-7	Areas disturbed by the boring equipment in the regulatory floodplain, on both banks shall be restored to its approximate original ground surface level. [401 KAR 4:060]
T-8	To prevent collapse of the stream bed, sufficient cover shall be maintained between the channel bottom and the bore hole tunnel. [401 KAR 4:060]
T-9	The permittee must obtain a Water Quality Certification (or a determination that none is required) through the Division of Water, Water Quality Branch before beginning construction. Contact the Water Quality Certification Supervisor at (502) 564-3410. [KRS 224.16-050 & Clean Water Act Section 401]
T-10	Erosion prevention measures, sediment control measures, and other site management practices shall be designed, installed, and maintained in an effective operating condition to prevent migration of sediment off site. [KRS 224.70-110]
T-11	To avoid secondary adverse impacts, all materials used shall be stable and inert, free from pollutants and floatable objects, and shall meet all appropriate engineering standards. (Inert here means materials that are not chemically reactive and that will not rot or decompose, such as soil, rock, broken concrete or similar materials.). [401 KAR 4:060 Section 7]
T-12	All debris and excess material shall be removed for disposal outside of the base floodplain. [401 KAR 4:060]
T-13	Upon completion of construction all disturbed areas shall be seeded and mulched or otherwise stabilized to prevent erosion. [401 KAR 4:060]
T-14	The entry of mobile equipment into the stream channel shall be limited as much as reasonably possible to minimize degradation of the waters of the Commonwealth. [401 KAR 4:060]
T-15	Construction other than as authorized by this permit shall require written approval from the Division of Water. [401 KAR 4:060]
T-16	The existing stream flow shall be maintained at all times during construction using standard flow diversion or pump around methods. Cofferdams or other structures placed in the stream shall be removed immediately if adverse flooding conditions result or if a flooding event is imminent. [401 KAR 4:060 Section 4]



Stream Construction Permit

West Hickman Sewer Trunk

Facility Requirements

Permit Number: 26908P

Activity ID No.:APE20170002

STRC0000000003 (AI: 123077 - Sewer) installation of 2,081 LF of 21" sanitary sewer and 2,591 LF of 24" sanitary sewer including 10 stream crossings using directional boring method and open cut trench method in the floodplain of Wilson Downing Tributary, with average coordinates of 37.973556, -84.500639, at about 5.7 stream miles in Lexington Fayette County:

Narrative Requirements:

Condition No.	Condition
T-17	The Sub-fluvial crossing must meet the following criteria whichever is applicable: (1) During the construction of the crossing, no material may be placed in the stream or in the flood plain of the stream to form construction pads, coffer dams, access roads, etc., unless prior approval has been obtained from the cabinet. (2) The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside of the flood plain unless the applicant has received prior approval from the cabinet to fill within the flood plain. (3) For subfluvial crossings of erodible channels, there shall be at least thirty (30) inches clear to the top of the pipe or conduit at all points. (4) For subfluvial crossings of nonerodible channels, there shall be at least six (6) inches of clear cover above the top of the pipe or conduit at all points, and the pipe or conduit shall be encased on all sides by at least six (6) inches of concrete. (5) The weight of a pipe and its contents during normal operating conditions at all points must exceed that of an equal volume of water, or the applicant must provide the division with sufficient information to show that the pipe and joints have sufficient strength. [401 KAR 4:050 Section 2]

FINAL CONSTRUCTION REPORT

NAME: LFUCG - Division of Water Quality

PERMIT NO: 26908P

AI NO: 123077

Has all work on this project been completed according to the plans and specifications on file with the Division of Water?

Yes: _____

No: _____ **If no, explain. You may include attachments if necessary.**

Mailing Instructions

- Fold the top edge of this page to the top edge of this box.
- Fold the bottom edge of the page up to meet the top fold and tape shut.
- Fill out return address portion
- Affix a stamp and mail.

Place
Stamp
Here

Floodplain Management Section
Division of Water
300 Sower Boulevard
Frankfort, KY 40601

SECTION 00910 - ADDENDA

(Insert Addenda as they are issued.)

END OF SECTION

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The Work to be done under this Contract and in accordance with these Specifications consists of furnishing all equipment, supervision, labor, skill, material and all other items necessary for the construction of the Lansdowne South Trunk Sewer Replacement Project.
- B. The Contractor shall perform all work required for such construction in accordance with the Contract Documents and subject to the terms and conditions of the Contract, complete and ready for use.
- C. The principal features of the Work to be performed under this Contract includes, but is not limited to:
 - 1. Installation of gravity sanitary sewers, reinforced concrete manholes, casing pipes and appurtenances.
 - 2. Connections to existing sanitary sewers and service laterals, as necessary.
 - 3. Maintenance of existing sanitary sewer flows during construction.
 - 4. Restoration of lawns, planter beds, open fields, creek beds and banks, fences, streets, sidewalks and other improvements disturbed during the performance of the work.
- D. The foregoing description(s) shall not be construed as a complete description of all work required.

1.02 CONTRACT DOCUMENTS

- A. Work to be done is shown on the set of Drawings entitled: Lansdowne South Trunk Replacement. The numbers and titles of all Drawings appear on the index sheet of the Drawings. All drawings so enumerated shall be considered an integral part of the Contract Documents as defined herein.

1.03 GENERAL ARRANGEMENT

- A. Drawings indicate the extent and general arrangement of the work. If any departures from the Drawings are deemed necessary by the Contractor to accommodate the materials and equipment he proposes to furnish, details of such departures and reasons therefore shall be submitted as soon as practicable to the Engineer for approval. No such departures shall be made without the prior written approval of the Engineer. Approved changes shall be made without additional cost to the Owner for this work or related work under other Contracts of the Project.

1.04 CONSTRUCTION PERMITS, EASEMENTS AND ENCROACHMENTS

- A. The Owner shall obtain or cause to be obtained all permanent and temporary construction easements as shown on the Drawings or required for completion of the Work. The Contractor shall verify that these easements have been obtained and shall comply with the conditions set forth in each easement.

- B. The Contractor shall obtain, keep current and pay all fees for any necessary construction permits from those authorities, agencies, or municipalities having jurisdiction over land areas, utilities, or structures which are located within the Contract limits and which will be occupied, encountered, used, or temporarily interrupted by the Contractor's operations unless otherwise stated. Record copies of all permits shall be furnished to the Engineer.
- C. When construction permits are accompanied by regulations or requirements issued by a particular authority, agency or municipality, it shall be the Contractor's responsibility to familiarize himself and comply with such regulations or requirements as they apply to his operations on this Project.

1.05 ADDITIONAL ENGINEERING SERVICES

- A. In the event that the Engineer is required to provide additional engineering services as a result of substitution of materials or equipment by the Contractor which are not "or equal", or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Engineer is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Engineer's charges in connection with such additional services shall be charged to the Contractor by the Owner.
- B. In the event that the Engineer is required to provide additional engineering services as a result of Contractor's errors, omissions, or failure to conform to the requirements of the Contract Documents, or if the Engineer is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Engineer's charges in connection with such additional services shall be charged to the Contractor by the Owner.

1.06 ADDITIONAL OWNER'S EXPENSES

- A. In the event the Work of this Contract is not completed within the time set forth in the Contract or within the time to which such completion may have been extended in accordance with the Contract Documents, the additional engineering or inspection charges incurred by the Owner may be charged to the Contractor and deducted from the monies due him. Extra work or supplemental Contract work added to the original Contract, as well as extenuating circumstances beyond the control of the Contractor, will be given due consideration by the Owner before assessing engineering and inspection charges against the Contractor.
- B. Unless otherwise specifically permitted, the normal time of work under this Contract is limited to 40 hours per week, Monday through Friday. Work beyond these hours will result in additional expense to the Owner. Any expenses and/or damages, including the cost of the Engineer's on site personnel, arising from the Contractor's operations beyond the hours and days specified above shall be borne by the Contractor.
- C. Charges assessed to the Contractor for additional engineering and inspection costs will be determined based on actual hours charged to the job by the Engineer. Daily rates will depend on the number and classifications of employees involved, but in no case shall such charges exceed \$500 per day for field personnel based on an eight hour workday. Additional charges will apply if multiple personnel are needed or if engineering time is required as part of the work outside the contract times.
- D. Charges for additional Owner's expenses shall be in addition to any liquidated damages assessed in accordance with the Contract.

1.07 TIME OF WORK

- A. The normal time of work for this Contract is limited to 40 hours per week and shall generally be between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday. The Contractor may work beyond these hours or on weekends with written approval from the Owner provided that all costs incurred by the Owner for any additional engineering shall be borne by the Contractor. The Owner shall deduct the cost of additional engineering from monies due the Contractor.
- B. If it shall become imperative to perform work outside of the normal working hours the Owner and Engineer shall be informed a reasonable time in advance of the beginning of such work. Temporary lighting and all other necessary facilities for performing and inspecting the work shall be provided and maintained by the Contractor.
- C. Unless otherwise specifically permitted, all work that would be subject to damage shall be stopped during inclement, stormy or freezing weather. Only such work as will not suffer injury to workmanship or materials will be permitted. Contractor shall carefully protect his work against damage or injury from the weather, and when work is permitted during freezing weather, he shall provide and maintain approved facilities for heating the materials and for protecting the finished work.

1.08 SURVEYS AND LAYOUT

- A. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings or as directed by the Engineer. Elevations of existing ground and appurtenances are believed to be reasonably correct but are not guaranteed to be absolute and therefore are presented only as an approximation. Any error or apparent discrepancy in the data shown or omissions of data required for accurately accomplishing the stake out survey shall be referred immediately to the Engineer for interpretation or correction.
- B. All survey work for construction control purposes shall be made by the Contractor at his expense. The Contractor shall provide a Licensed Surveyor as Chief of Party, competently qualified survey party, all necessary instruments, stakes, and other material to perform the work.
- C. Contractor shall establish all baselines for the location of the principal component parts of the work together with a suitable number of bench marks adjacent to the work. Based upon the information provided by the Contract Drawings, the Contractor shall develop and make all detail surveys necessary for construction, including stakes for all working points, lines and elevations.
- D. Contractor shall have the responsibility to carefully preserve the bench marks, reference points and stakes, and in the case of destruction thereof by the Contractor or resulting from his negligence, the Contractor shall be charged with the expense and damage resulting therefrom and shall be responsible for any mistakes that may be caused by the unnecessary loss or disturbance of such bench marks, reference points and stakes.
- E. Existing or new control points, property markers and monuments that will be or are destroyed during the normal causes of construction shall be reestablished by the Contractor and all reference ties recorded therefore shall be furnished to the Engineer. All computations necessary to establish the exact position of the work shall be made and preserved by the Contractor.
- F. The Engineer may check all or any portion of the work and the Contractor shall afford all necessary assistance to the Engineer in carrying out such checks. Any necessary corrections to the work shall be immediately made by the Contractor. Such checking by the Engineer shall not relieve the Contractor of any responsibilities for the accuracy or completeness of his work.

- G. At completion of the work, the Contractor shall furnish Record Drawings indicating the final layout of all constructed piping and manholes and finished grades constructed or changed as part of this work.

1.09 FIRE PROTECTION

- A. Contractor shall take all necessary precautions to prevent fires at or adjacent to the work and shall provide adequate facilities for extinguishing fires which do occur. Burning shall not be permitted on site.
- B. When fire or explosion hazards are created in the vicinity of the work as a result of the locations of fuel tanks or similar hazardous utilities or devices, the Contractor shall immediately alert the local Fire Marshal, the Engineer, and the Owner of such tank or device. The Contractor shall exercise all safety precautions and shall comply with all instructions issued by the Fire Marshal and shall cooperate with the Owner of the tank or device to prevent the occurrence of fire or explosion.

1.10 CHEMICALS

- A. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, or reactant of other classification, must show approval of either the EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with all applicable rules and regulations.

1.11 FIRST AID FACILITIES AND ACCIDENTS

A. First Aid Facilities

- 1. The Contractor shall provide at the site such equipment and facilities as are necessary to supply first aid to any of his personnel who may be injured in connection with the work.

B. Accidents

- 1. The Contractor shall promptly report, in writing, to the Engineer and Owner all accidents whatsoever out of, or in connection with, the performance of the work, whether on or adjacent to the site, which cause death, personal injury or property damage, giving full details and statements of witnesses.
- 2. If death, serious injuries, or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Owner and the Engineer.
- 3. If any claim is made by anyone against the Contractor or a Subcontractor on account of any accidents, the Contractor shall promptly report the facts, in writing, to the Engineer and Owner, giving full details of the claim.

1.12 ULTIMATE DISPOSITION OF CLAIMS BY ONE CONTRACTOR ARISING FROM ALLEGED DAMAGE BY ANOTHER CONTRACTOR

- A. During the progress of the Work, other Contractors may be engaged in performing other work or may be awarded other Contracts for additional work on this project. In that event, the Contractor shall coordinate the work to be done hereunder with the work of such other Contractors and the Contractor shall fully cooperate with such other Contractors and carefully fit its own work to that provided under other Contracts as may be directed by the Engineer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other Contractor.

- B. If the Engineer shall determine that the Contractor is failing to coordinate his work with the work of the other Contractors as the Engineer directed, then the Owner shall have the right to withhold any payments otherwise due hereunder until the Contractor completely complies with the Engineer's directions.
- C. If the Contractor notifies the Engineer in writing that another Contractor is failing to coordinate his work with the work of this Contract as directed, the Engineer will promptly investigate the charge. If the Engineer finds it to be true, he will promptly issue such directions to the other Contractor with respect thereto as the situation may require. The Owner, the Engineer, nor any of their agents shall not, however, be liable for any damages suffered by the Contractor by reason of the other Contractor's failure to promptly comply with the directions so issued by the Engineer, or by reason of another Contractor's default in performance, it being understood that the Owner does not guarantee the responsibility or continued efficiency of any Contractor.
- D. The Contractor shall indemnify and hold the Owner and the Engineer harmless from any and all claims of judgments for damages and from costs and expenses to which the Owner may be subjected or which it may suffer or incur by reason of the Contractor's failure to promptly comply with the Engineer's directions.
- E. Should the Contractor sustain any damage through any act or omission of any other Contractor having a Contract with the Owner for the performance of work upon the site or of work which may be necessary to be performed for the proper execution of the work to be performed hereunder, or through any act or omission of a Subcontractor of such Contract, the Contractor shall have no claim against the Owner or the Engineer for such damage, but shall have a right to recover such damage from the other Contractor under the provision similar to the following provisions which have been or will be inserted in the Contracts with such other Contractors.
- F. Should any other Contractor having or who shall hereafter have a Contract with the Owner for the performance of work upon the site sustain any damage through any act or omission of the Contractor hereunder or through any act or omission of any Subcontractor of the Contractor, the Contractor agrees to reimburse such other Contractor for all such damages and to defend at his own expense any suit based upon such claim and if any judgment or claims against the Owner shall be allowed, the Contractor shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith and shall indemnify and hold the Owner harmless from all such claims.
- G. The Owner's right to indemnification hereunder shall in no way be diminished, waived or discharged, by its recourse to assessment of liquidated damages as provided in the Contract, or by the exercise of any other remedy provided for by Contract Documents or by law.

1.13 BLASTING AND EXPLOSIVES

- A. Refer to section 02225 of these specifications for blasting requirements.

1.14 LIMITS OF WORK AREA

- A. The Contractor shall confine his construction operations within the Contract limits shown on the Drawings and/or property lines and/or fence lines. Storage of equipment and materials, or erection and use of sheds outside of the Contract limits, if such areas are the property of the Owner, shall be used only with the Owner's approval. Such storage or temporary structures, even within the Contract's limits, shall not be placed on properties designated as easements or rights-of-way unless specifically permitted elsewhere in the Contract Documents.
- B. The Contractor shall secure, insure, maintain, rent/lease, and restore staging area.

- C. The Contractor shall provide Engineer and Owner copy of agreement with landowner of staging areas.

1.15 WEATHER CONDITIONS

- A. No work shall be done when the weather is unsuitable. The Contractor shall take necessary precautions (in the event of impending storms) to protect all work, materials, or equipment from damage or deterioration due to floods, driving rain, or wind, and snow storms. The Owner reserves the right, through the opinion of the Engineer, to order that additional protection measures over and beyond those proposed by the Contractor, be taken to safeguard all components of the Project. The Contractor shall not claim any compensation for such precautionary measures so ordered, nor claim any compensation from the Owner for damage to the work from weather elements.

1.16 PERIODIC CLEANUP: BASIC SITE RESTORATION

- A. During construction, the Contractor shall regularly remove from the site of the work all accumulated debris and surplus materials of any kind which result from his operations. Unused equipment and tools shall be stored at the Contractor's staging area for the Project.
- B. As the work involves installation of sewers, drains, manholes, underground structures, or other disturbance of existing features in or across streets, rights-of-way, easements, or private property, the Contractor shall (as the work progresses) promptly backfill, compact, grade, and otherwise restore the disturbed area to the basic condition which will permit resumption of pedestrian or vehicular traffic and any other critical activity or functions consistent with the original use of the land. The requirements for temporary paving of streets, walks, and driveways are specified elsewhere. Unsightly mounds of earth, large stones, boulders, and debris shall be removed so that the site presents a neat appearance.
- C. The Contractor shall perform the cleanup work on a regular basis and as frequently as ordered by the Engineer. Basic site restoration in a particular area shall be accomplished immediately following the installation or completion of the required facilities in that area. Furthermore, such work shall also be accomplished, when ordered by the Engineer, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.
- D. Upon failure of the Contractor to perform periodic cleanup and basic restoration of the site to the Engineer's satisfaction, the Owner may, upon five (5) days prior written notice to the Contractor, without prejudice to any other rights or remedies of the Owner, cause such work for which the Contractor is responsible to be accomplished to the extent deemed necessary by the Engineer, and all costs resulting therefrom shall be charged to the Contractor and deducted from the amounts of money that may be due him.

1.17 USE OF FACILITIES BEFORE COMPLETION

- A. The Owner reserves the right to enter the site and use any portion of the constructed facilities before final completion of the whole work to be done under this Contract. However, only those portions of the facilities which have been completed to the Engineer's satisfaction, as evidenced by his issuing a Certificate of Substantial Completion covering that part of the work, shall be placed in service.
- B. It shall be the Owner's responsibility to prevent premature connections to or use of any portion of the installed facilities by private or public parties, persons or groups of persons, before the Engineer issues his Certificate of Substantial Completion covering that portion of the work to be placed in service.

- C. Consistent with the approved progress schedule, the Contractor shall cooperate with the Owner, his agents, and the Engineer to accelerate completion of those facilities, or portions thereof, which have been designated for early use by the Owner.

1.18 CONSTRUCTION VIDEO

- A. The Contractor shall video the entire project site including all concrete and asphalt pavements, curb and gutter, fencing to remain, structures to be demolished, and existing structures that are to remain or be modified. The original video image shall be turned over to the Engineer prior to beginning construction activities. The video shall be provided as an Audio Video Interleave File (.avi) and shall be provided on DVD+R/DVD-ROM compatible media only. The video shall clearly identify existing site and structural conditions prior to construction.

PART 2 – PRODUCT (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01025 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, equipment, service, other necessary supplies and perform all work including all excavation and backfilling (without additional compensation, except where specifically set out in these specifications) at the contract unit prices bid for the work described in Part 2 of this Section.

1.02 PROGRESS AND PAYMENTS SCHEDULES

- A. Within fifteen (15) days after the date of formal execution of the Agreement (Contract), the Contractor shall prepare and submit to the Engineer, for approval, a construction schedule of the Critical Path Method (CPM) type which depicts the Contractor's plan for completing the contract requirements and show work placement in dollars versus contract time. The Contractor's construction schedule must be approved by the Engineer before any payments shall be made on this contract.
- B. Within fifteen (15) days after the date of formal execution of the Agreement (Contract), the Contractor shall prepare and submit to the Engineer, for approval, a periodic estimate which depicts the Contractor's cost for completing the contract requirements and show by major unit of the project work, the Contractor's dollar value for the material and the labor (two separate amounts) to be used as a basis for the periodic payments. The Contractor's periodic estimate must be approved by the Engineer before any payments shall be made on this contract.
- C. The Engineer's decision as to sufficiency and completeness of the Contractor's construction schedule and periodic estimate shall be final.
- D. The Contractor must make current, to the satisfaction of the Engineer, the construction schedule and periodic estimate each time the Contractor requests a payment on this contract.
- E. The Contractor's construction schedule and periodic estimate must be maintained at the construction site available for inspection and shall be revised to incorporate approved change orders as they occur.
- F. When the Contractor requests a payment on this contract, it must be on the approved periodic estimate and be current. Further, the current periodic estimate and construction schedule (both updated and revised) shall be submitted for review and approval by the Engineer before monthly payments shall be made by the Owner. The Contractor shall submit as stored materials for pay purposes.
- G. Payment for pipeline items shall be limited to seventy percent (70%) of the bid price prior to testing and acceptance by the Engineer, then shall be limited to eighty-five percent (85%) after passing testing included in the line item, and one hundred percent (100%) after rough clean up and grading (final restoration paid separately).
- H. Payment for structures (manholes, junction boxes, curb box inlets, etc) shall be limited to eighty-five percent (85%) when set and backfilled, with the remaining fifteen percent (15%) being paid after passing testing (if applicable).
- I. Refer to Section 00800, Articles 14.02.A.6-8 for retainage requirements.

1.04 CLAIMS FOR EXTRA WORK

- A. If the Contractor claims that any instructions by Drawings or otherwise involve extra cost, the Contractor shall give the Engineer written notice of said claim within seven (7) days after the receipt of such instructions, and in any event before proceeding to execute the work, stating clearly and in detail the basis of its claim or claims. No such claim shall be valid unless so made.
- B. Claims for additional compensation for extra work, due to alleged errors in spot elevations, contour lines, or bench marks, shall not be recognized unless accompanied by certified survey data, made prior to the time the original ground was disturbed, clearly showing that errors exist which resulted, or would result, in handling more material, or performing more work than would reasonably be estimated from the Drawings and topographical maps issued.
- C. Any discrepancies which may be discovered between actual conditions and those represented by the topographical maps and Drawings shall at once be reported to the Engineer, and work shall not proceed, except at the Contractor's risk, until written instructions have been received by the Contractor from the Engineer.
- D. If, on the basis of the available evidence, the Engineer determines that an adjustment of the Contract Price or time is justifiable, the procedure shall then be as provided herein for "Changes in the Work".
- E. By execution of this Contract, the Contractor warrants that it has visited the site of the proposed work and fully acquainted himself with the conditions there existing relating to construction and labor, and that it fully understands the facilities, difficulties, and restrictions attending the execution of the work under this Contract. The Contractor further warrants that it has thoroughly examined and is familiar with the Drawings, Specifications and all other documents comprising the Contract. The Contractor further warrants that by execution of this Contract its failure when it was bidding on this Contract to receive or examine any form, instrument or document, or to visit the site and acquaint himself with conditions there existing, in no way relieves the Contractor from any obligation under the Contract, and the Contractor agrees that the Owner shall be justified in rejecting any claim based on facts regarding which it should have been on notice as a result thereof.

1.05 DETERMINATION OF THE VALUE OF EXTRA (ADDITIONAL) OR OMITTED WORK

- A. The value of extra (additional) or omitted work shall be determined in one or more of the following ways:
 - 1. On the basis of the actual cost of all the items of labor (including on-the-job supervision), materials, and use of equipment, plus a maximum 15 percent for added work or a minimum 15 percent for deleted work which shall cover the Contractor's general supervision, overhead and profit.
 - a. Labor may include on-site supervision, on-site project management, in addition to field personal associated with the work.
 - b. In case of subcontracts, the 15 percent (maximum for added work and minimum for deleted work) is interpreted to mean the subcontractor's supervision, overhead and profit, and an additional 5 percent (maximum for added work and minimum for deleted work) may then be added to such costs to cover the General Contractor's supervision, overhead and profit.
 - c. The cost of labor shall include required insurance, taxes and fringe benefits.
 - d. Equipment costs shall be based on current rental rates in Lexington, KY.
 - 2. By estimate and acceptance in a lump sum.

3. By unit prices named in the Contract or subsequently agreed upon.
- B. Provided, however, that the cost or estimated cost of all extra (additional) work shall be determined in advance of authorization by the Engineer and approved by the Owner.
- C. All extra (additional) work shall be executed under the conditions of the original Contract. Any claim for extension of time shall be adjusted according to the proportionate increase or decrease in the final total cost of the work unless negotiated on another basis.
- D. Except for over-runs in contract unit price items, no extra (additional) work shall be done except upon a written Change Order from the Engineer, and no claim on the part of the Contractor for pay for extra (additional) work shall be recognized unless so ordered in writing by the Engineer.

PART 2 - PRODUCTS

2.01 MOBILIZATION

Payment for the Contractor's mobilization shall be made at the Contract lump sum price and shall include all costs incurred for moving equipment onto the project area, staging, security fencing, and any pertinent costs related thereto, for the duration of the contract term. Mobilization unit price shall not exceed two percent (2%) of the total Bid Amount.

2.02 BONDS AND INSURANCE

Payment for bonds and insurance shall be made at the Contract lump sum price, and shall include the costs of all bonds provided under the Contract, and the premiums for insurance required under the Contract, for the duration of the contract term. Unit price shall be based on actual invoices and payment shall be made upon receipt of invoices attached to a monthly progress payment request.

2.03 GENERAL REQUIREMENTS

Payment for general requirements shall be made at the Contract lump sum price and shall include field supervision and support staff, office supervision and support staff, costs associated with maintaining the field operation, and other items required by the general requirements and conditions of the Contract. Payment for General Requirements shall be made on an equal distribution across the Contract term on a monthly basis.

2.04 DEMOBILIZATION

Payment for the Contractor's demobilization upon completion of the project shall be made at the Contract lump sum price and shall include all costs incurred for removing equipment and materials from the project area and any pertinent costs related thereto, for the duration of the Contract term. Demobilization unit price shall not exceed one percent (1%) of the total Bid Amount.

2.05 EROSION AND SEDIMENT CONTROL AND CONFORMANCE WITH SWPPP

Payment is for furnishing, installing, maintaining and removing erosion and sediment control devices. This is to be paid at the contract lump sum price, complete in place, which shall include compensation for materials, placing, cleaning, and maintaining the sediment and erosion control devices throughout the construction period and removal of the of the sediment and erosion

control devices once vegetation is established. Payment shall be distributed as follows: 25% when all ESC measures are in place and operating correctly; 50% equally distributed across the Contract term; and 25% for the removal of the ESC measures and final stabilization/restoration.

2.06 CLEARING AND GRUBBING

Payment for Clearing and Grubbing is at the Contract unit price lump. This is to be paid at the contract unit price, complete in place, which shall include compensation for clearing and grubbing all existing trees and foliage (regardless of size, number and diameter of vegetation) as needed for proper installation of all proposed sanitary sewer improvements described in the Contract Documents, including but not limited to any clearing needed for access to any part of the project. Compensation shall include all equipment, delivery, hauling, fuel, tools, etc. for demolition, cutting, clearing, grubbing, disposal, removal, backfilling, cleanup, temporary restoration, and all other items necessary for a complete clearing and grubbing within the temporary construction easement for the project.

2.07 PREBLAST SURVEY (N/A)

2.08 PVC (SDR 35) GRAVITY SEWER LATERAL

Payment is for furnishing and installing gravity sewer laterals at the contract unit price per linear foot, based on the line size as indicated on the Bid Schedule. This is to be paid at the contract unit price, complete in place, which shall include compensation for pipe, reducers, spool pieces, fittings (excluding items included in cleanout pay item), materials, hauling, excavation (excluding rock excavation), shoring, sheeting, removal of existing lateral, bedding, backfilling, cleanup, restoration, testing, and all other items necessary for a complete installation.

2.09 GRAVITY SEWER PIPE

Payment is for furnishing and installing Gravity Sewer Pipe at the contract unit price per linear foot, based on the line size and burial depth as indicated on the Bid Schedule. Depth of burial is measured from existing ground surface to invert of sewer pipe and paid for accordingly. The quantity of sewer to be paid for shall be the actual length of installed in trench and into boot of manhole. Fittings and tees are paid for separately under a different pay item and not included in the length of pipe. Gravity sewer pipe is to be paid at the contract unit price, complete in place, which shall include compensation for pipe, materials, hauling, clearing and grubbing, excavation (excluding rock excavation), shoring, sheeting, removal of existing pipe, bedding, backfilling, cleanup, restoration (excluding permanent seeding), testing, and all other items necessary for a complete installation.

2.10 TEE FITTINGS FOR GRAVITY SEWER LATERAL CONNECTION (NON-DUCTILE IRON)

Payment is for furnishing and installing Tee Fittings for Gravity Sewers (non-ductile iron) at the contract unit price per each, based on the line size as indicated on the Bid Schedule. This is to be paid at the contract unit price, complete in place, which shall include compensation for materials, hauling, excavation (excluding rock excavation), shoring, sheeting, bedding, backfilling, cleanup, testing, and all other items necessary for a complete installation.

2.11 BACK TRAP VALVES (N/A)

2.12 STEEL ENCASEMENT PIPE, OPEN CUT (N/A)

2.13 TUNNEL INSTALLATION (A-D)

Payment is for furnishing and installing a tunnel at the contract unit price per lump sum, based on the line size as indicated on the Tunneling Method Table listed in the Project Specific Notes (PSN). This is to be paid at the contract unit price, complete in place, which shall include: compensation for tunneling (as selected method), grade control monitoring/surveying, tunnel lining, grout (if required and incidental to the contract), carrier pipe(s), casing spacers, materials, hauling, excavation (excluding rock excavation) of shafts/pits, shoring, sheeting, stabilization of other utilities, dewatering, backfilling, temporary electricity and water, couplings, concrete brick and mortar end seals, grout ports, testing, cleanup, costs for bonds and insurance, and all other items necessary for a complete tunnel installation as shown on the Construction Plans, Specifications and Tunneling Method Table.

The Contractor shall supply a Schedule of Values Submittal for each Tunnel installation, including the following:

- Mobilization / Demobilization – LS (4% of total - maximum)
- Furnish and Install Tunnel and Lining – LF (58% of total - maximum)
- Shafts/Pits/Support Work – LS (10% of total)
- Furnish and Install Carrier Pipe(s) – LF (25% of total - maximum)
- Testing of Carrier Pipe(s) – LS (3% of total)

2.14 CONNECTION TO EXISTING SEWER

Payment is for furnishing and installing a Connection to Existing Sewer at the contract unit price each, based on the line size as indicated on the Bid Schedule. This is to be paid at the contract unit price, complete in place, which shall include compensation for coupling, one full length of pipe, materials, hauling, tapping, excavation (excluding rock excavation), shoring, sheeting, bedding, forming and placing (constructing) concrete cradle (for pipes 12" and larger), backfilling, cleanup, testing, and all other items necessary for a complete installation.

2.15 MANHOLE ABANDONMENT

Payment is for Manhole Abandonment at the contract unit price each. This is to be paid at the contract unit price, complete in place, which shall include compensation for excavation (excluding rock excavation), demolition, disposal, concrete, crushed stone fill, backfilling, cleanup, restoration, and all other items necessary for a complete installation.

2.16 INSTALL CLEANOUT (N/A)

2.17 MANHOLE

Payment is for furnishing and installing a Manhole, based on the size and depth as indicated on the Bid Schedule. This is to be paid at the contract unit price each, complete in place, which shall include compensation for the manhole casting, Xypex or Conshieid admixture, boots, gaskets, crushed stone, SS frame anchors, frame and cover, grout, materials, removal of existing manhole, hauling, excavation (excluding rock excavation), bedding, backfilling, testing, cleanup, and all other items necessary for a complete installation on new or existing sewer lines.

2.18 DOGHOUSE MANHOLE (N/A)

2.19 MANHOLE BARREL EXTENSION (N/A)

2.20 MANHOLE DROP CONNECTION

Payment is for furnishing and installing a Manhole Drop Connection, based on the size as indicated on the Bid Schedule. This is to be paid at the contract unit price each, complete in place, which shall include compensation for concrete casting, piping/ fittings cast into manhole concrete, Xypex or Conshield admixture, materials, assembly, installation, testing, and all other items necessary for a complete installation on new or existing sewer lines.

2.21 MANHOLE ACCESSORIES FOR LOCATION WITHIN 100-YEAR FLOODPLAIN

Payment is for furnishing and installing a manhole diaphragm, a concrete anti-flotation collar cast into the manhole, and the additional cost to provide a watertight cover instead of standard cover for frame. This is to be paid at the contract unit price each, complete in place, which shall include compensation for diaphragm, concrete collar cast into the manhole, upcharge for watertight cover, materials, installation, and all other items necessary for a complete installation.

2.22 RECONNECT EXISTING GRAVITY SEWER OR SERVICE LATERAL TO NEW MANHOLE

Payment is for furnishing and installing a new manhole connection to an existing gravity sewer or service lateral. This is to be paid at the contract unit price each, complete in place, which shall include compensation for gasket, Fernco Strongback coupling, full length of pipe, grout, materials, furnishing, excavation (excluding rock excavation), bedding, backfilling, cleanup, coring, and all other items necessary for a complete installation.

2.23 CONNECT FORCE MAIN TO NEW MANHOLE (N/A)

2.24 CUT AND CAP EXISTING SEWER

Payment is for cutting and capping existing sewer, based on the size as indicated on the Bid Schedule. This is to be paid at the contract unit price each, complete in place, which shall include compensation for concrete, cutting pipe, materials, equipment, excavation (excluding rock excavation), backfilling, cleanup, restoration, and all other items necessary for a complete capping.

2.25 PIPE ABANDONMENT, SAFELOAD (N/A)

2.26 PIPE ABANODONMENT, PLUG

Payment is for abandoning an existing sewer using a plug, based on the size as indicated on the Bid Schedule. This is to be paid at the contract unit price each, complete in place, which shall include compensation for concrete, cutting pipe, materials, equipment, excavation (excluding rock excavation), backfilling, cleanup, restoration, and all other items necessary for a complete installation.

2.27 PLUG MANHOLE INLET (N/A)

2.28 SEWAGE COMBINATION AIR RELEASE / VACUUM VALVE AND VAULT (N/A)

2.29 CREEK CROSSING AND BANK/BED RESTORATION

Payment is for furnishing, installing and maintaining each creek crossing and restoring the stream bank and bed. This is to be paid at the lump sum contract price, complete in place, which shall include compensation for excavation (excluding rock excavation), concrete, materials, bedding, backfilling, cleanup, restoration, seeding, plantings, and all other items necessary for a complete installation on new or existing sewer lines.

2.30 VIDEO INSPECTION OF NEW SEWER PIPE

Payment for video inspection shall be made at the contract price per linear foot, including dewatering of pipe, bypass pumping, maintenance of traffic, hydraulic jet cleaning, disposal of debris, furnishing all labor, materials, tools, equipment, and incidentals, and doing all the work involved to perform sewer video inspections, including delivery of DVDs and written logs of the sewer videos to the Owner.

2.31 TREE REMOVAL (GREATER THAN 12-INCH DIAMETER)

Payment for tree removal shall be paid for at the Contract unit price each, which shall include equipment, excavation, removal of trees, hauling, backfilling, and all appurtenances necessary for complete removal. Measurement of the tree diameter made at 36-inches above grade at base of tree.

2.32 BITUMINOUS CONCRETE: TRENCH CONSTRUCTION, STREET (N/A)

2.33 BITUMINOUS CONCRETE: FULL WIDTH PAVING, STREET (N/A)

2.34 BITUMINOUS CONCRETE: PRIVATE PARKING LOTS/DRIVEWAYS

Payment for bituminous concrete relating to construction in private parking lots and driveways shall be paid for at the Contract unit price per square yard, which shall include placement of aggregate, compaction, bituminous concrete, removal of existing surface, placement of bituminous concrete, proper grading, taper of new pavement into existing pavement, and all appurtenances necessary for a complete installation.

2.35 PORTLAND CEMENT CONCRETE PAVING: PRIVATE PARKING LOTS/DRIVEWAYS/APRONS (N/A)

2.36 ASPHALT PAVEMENT PATCH (N/A)

2.37 ROADWAY STRIPING (N/A)

2.38 MISCELLANEOUS ROADWAY MARKINGS (N/A)

2.39 STORM SEWER REMOVAL AND REPLACEMENT

Payment is for removal and replacement (furnishing and installing) storm sewers at the contract unit price per linear foot, based on the line size as indicated on the Bid Schedule. This is to be paid at the contract unit price, complete in place, which shall include compensation for pipe, materials, connections, hauling, excavation (excluding rock excavation), bedding, backfilling,

cleanup, maintenance of traffic, removal of existing storm sewer, and all other items necessary for a complete installation.

2.40 PRECAST CONCRETE HEADWALL

Payment is for furnishing and installing each precast concrete headwall at the contract unit price each. This is to be paid at the contract unit price, complete in place, which shall include compensation for casting, materials, hauling, excavation (excluding rock excavation), bedding, backfilling, removal of existing headwall, disposal of waste material, cleanup, maintenance of traffic, removal of existing headwall, and all other items necessary for a complete installation.

2.41 REMOVE AND REPLACE CURB BOX INLET (N/A)

2.42 SEEDING, TEMPORARY, EXTRA AS DIRECTED BY ENGINEER

Payment for temporary seeding shall be paid for at the Contract unit price per square yard, which shall include seed, fertilizer, lime, mulch/straw/netting, placement, watering and maintenance throughout the duration of the contract, and all appurtenances necessary for a complete installation.

2.43 SITE RESTORATION, METHOD A (N/A)

2.44 SITE RESTORATION, METHOD B

Payment for site restoration, method B (as defined in the General Notes), shall be paid for at the Contract unit price per square yard, which shall include seed, fertilizer, lime, mulch/straw/netting, placement, watering and maintenance throughout the duration of the contract, and all appurtenances necessary for a complete installation

2.45 SITE RESTORATION, METHOD C (N/A)

2.46 SOD

Payment for sod shall be paid for at the Contract unit price per square yard, which shall include sod, fertilizer, lime, placement, watering and maintenance throughout the duration of the contract, and all appurtenances necessary for a complete installation.

2.47 MONOLITHIC CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT (N/A)

2.48 CONCRETE CURB REMOVAL AND REPLACEMENT (N/A)

2.49 BITUMINOUS CURB REMOVAL AND REPLACEMENT (N/A)

2.50 DENSE GRADED AGGREGATE – DGA, EXTRA AS DIRECTED BY ENGINEER

Payment for dense graded aggregate shall be paid for at the Contract unit price per ton, which shall include placement of aggregate, compaction and all appurtenances necessary for a complete installation.

2.51 NO. 9 CRUSHED STONE, EXTRA AS DIRECTED BY ENGINEER

Payment for No. 9 crushed stone shall be paid for at the Contract unit price per ton, which shall include placement of aggregate, compaction and all appurtenances necessary for a complete installation.

2.52 NO. 57 CRUSHED STONE, EXTRA AS DIRECTED BY ENGINEER

Payment for No. 57 crushed stone shall be paid for at the Contract unit price per ton, which shall include placement of aggregate, compaction and all appurtenances necessary for a complete installation.

2.53 NO. 2 CRUSHED STONE, EXTRA AS DIRECTED BY ENGINEER

Payment for No. 2 crushed stone shall be paid for at the Contract unit price per ton, which shall include placement of aggregate, compaction and all appurtenances necessary for a complete installation.

2.54 FLOWABLE (CONTROLLED DENSITY) FILL

Payment for flowable fill shall be paid for at the Contract unit price per cubic yard measured in-place, which shall include placement of flowable fill, maintenance of traffic, and all appurtenances necessary for a complete installation.

2.55 CONCRETE SIDEWALK (N/A)

Payment for chain link fence removal and replacement shall be paid for at the Contract unit price per linear foot, which shall include posts, anchoring, concrete, fencing, gates, and all appurtenances necessary for a complete installation. Chain link fence shall be replaced from post to post unless specifically noted otherwise on the plans.

2.56 SIDEWALK RAMPS, INCLUDING DETECTABLE WARNINGS (N/A)

2.57 CHAIN LINK FENCE (N/A)

2.58 PRIVACY FENCE (WOODEN)

Payment for wooden privacy fence removal and replacement shall be paid for at the Contract unit price per linear foot, which shall include posts, anchoring, concrete, fencing, gates, and all appurtenances necessary for a complete installation. Wooden privacy fence shall be replaced from post to post unless specifically noted otherwise on the plans.

2.59 SAFETY FENCE

Payment for safety fence shall be paid for at the Contract unit price per linear foot as shown on the Drawings, which shall include materials, labor, equipment, removal once work is complete, and all appurtenances necessary for a complete installation. Safety fence used on daily basis is not included in this pay item and is an incidental cost to the Work.

2.60 BYPASS PUMPING AND SETUP

Payment is for operation and setup of bypass pumping required for installation of all items shown in Contract Documents. This is to be paid for at the Contract lump sum as indicated on the Bid Schedule. Work shall be complete in place, which shall include compensation for all mobilizations, set ups, testings (per section 01520), takedowns, relocations, and demobilization for the pumps, hoses, line plugs, generator, rental fees, fuel, monitoring, piping, duty and backup pumps, check valve, adapters, hose, labor, maintenance, and all appurtenances necessary for the continued setup and operation of the bypass pumping system throughout the project. Provision of redundant pumping capability per Section 01520 is incidental to the cost of bypass pumping and shall be included in this pay item.

2.61 ROAD RAMPS (AS DIRECTED BY ENGINEER) (N/A)

2.62 SSO SITE CLEANUP (N/A)

2.63 MAINTENANCE OF TRAFFIC (N/A)

2.64 COMBINATION VACUUM / HYDRAULIC JET / HYDRO EXCAVATOR, EXTRA AS DIRECTED BY ENGINEER (N/A)

2.65 BACKHOE / EXTEND-A-HOE, EXTRA AS DIRECTED BY ENGINEER

Payment for a backhoe/extend-a-hoe shall be paid for at the Contract unit price per hour, which shall include the equipment, delivery, rental costs, fuel, operator, and all appurtenances necessary.

2.66 HOE RAM, EXTRA AS DIRECTED BY ENGINEER

Payment for a hoe ram shall be paid for at the Contract unit price per hour, which shall include the equipment, delivery, rental costs, fuel, operator, and all appurtenances necessary.

2.67 DUMP TRUCK, EXTRA AS DIRECTED BY ENGINEER

Payment for a dump truck shall be paid for at the Contract unit price per hour, which shall include the equipment, delivery, rental costs, fuel, operator, and all appurtenances necessary.

2.68 TRACK HOE, EXTRA AS DIRECTED BY ENGINEER

Payment for a track hoe shall be paid for at the Contract unit price per hour, which shall include the equipment, delivery, rental costs, fuel, operator, and all appurtenances necessary.

2.69 SKID-STEER LOADER, EXTRA AS DIRECTED BY ENGINEER

Payment for a skid steer loader shall be paid for at the Contract unit price per hour, which shall include the equipment, delivery, rental costs, fuel, operator, and all appurtenances necessary.

2.70 ROLLER / COMPACTOR, EXTRA AS DIRECTED BY ENGINEER

Payment for a roller/compactor shall be paid for at the Contract unit price per hour, which shall include the equipment, delivery, rental costs, fuel, operator, and all appurtenances necessary.

2.71 TRAFFIC MAINTENANCE – TYPE 1 (FLAGGER) , EXTRA AS DIRECTED BY ENGINEER

Payment for a flagger shall be paid for at the Contract unit price per hour, which shall include the hourly rate of a flagger and necessary equipment.

2.72 ELECTRONIC ARROW BOARD, EXTRA AS DIRECTED BY ENGINEER (N/A)

2.73 ELECTRONIC MESSAGE BOARD, EXTRA AS DIRECTED BY ENGINEER (N/A)

2.74 ROCK REMOVAL

Payment for rock removal shall be paid for at the Contract unit price per cubic yard based on measured dimensions in trench, which shall include equipment, excavation, hauling, and all appurtenances necessary for complete removal. If blasting is involved then all permits, insurance and preblast surveys shall be included.

2.75 CLASS "A" CONCRETE

Payment for Class "A" Concrete used in the construction of cut-off trench walls shall be paid for at the Contract unit price per cubic yard based on measured dimensions in trench, which shall include equipment, excavation, hauling, formwork, finishes, and all appurtenances necessary for complete installation of wall.

2.76 OBSTRUCTION STANDBY TIME

Obstruction Standby Time is defined in and limited to tunnel construction specified in Sections 02441 and 02442 only.

This allowance only shall be utilized upon request by the Contractor and acceptance by the Engineer.

The Contractor shall include a unit price for obstruction standby time in the bid to be used for time while obstruction removal shaft is excavated to determine why forward motion is stopped. Obstruction removal time shall include all costs of specialist labor only (such as the operator and the superintendent), materials, equipment, production loss and other non-labor related costs associated with the work stoppage caused by an encountered Obstruction.

Obstruction removal time is to be calculated by the workday: a maximum of 10 hours per day for weekdays only, while efforts are made to identify and remove obstruction. The method selected by the contractor shall be submitted to Engineer for approval within three (3) workdays and reviewed and approved by the Engineer within an additional three (3) workdays, maximum, unless extraordinary conditions are encountered. Contractor shall make continuous, expeditious effort toward identification and removal of obstruction.

The Obstruction removal time measurement shall commence after three (3) hours of complete stoppage of tunnel excavation forward progress despite the Contractor's diligent efforts to continue. Obstruction removal time shall end when one of the following occurs:

- a) Obstruction removal shaft is completed, and obstruction is found to meet definition of obstruction defined in technical specifications, then Contractor is entitled to obstruction removal time rate until obstruction is removed and forward progress can be achieved, or

- b) Obstruction removal shaft is completed and exposed MTBM and obstruction does not meet definition specified in technical specifications, then calculation of obstruction removal time ends with no cost to the Owner.

2.77 OBSTRUCTION REMOVAL AND SHAFT

Obstruction Removal and Shaft are defined in and limited to tunnel construction specified in Sections 02441 and 02442 only.

Costs associated with construction of obstruction removal shaft to determine reason for stoppage of forward progress of tunneling activities and provide obstruction removal or tunneling equipment repair. Grouting of void space due to removal of an obstruction shall be incidental to the price.

Measurement: by the vertical foot (vf) of shaft excavation measured from the ground surface to one (1) foot below the bottom of the cutting face of the tunnel boring machine (TBM) or microtunnel boring machine (MTBM).

Payment: At unit price for each vertical foot of removal shaft excavated in order to remove an obstruction.

This pay item shall only be utilized upon request by the Contractor and acceptance by the Engineer.

The unit price includes all Work to construct an Obstruction Removal Shaft including, but not limited to, excavation, pavement cut, shoring, backfill, concrete, grouting, soil modification, dewatering, disposal of groundwater, disposal of excess or unsuitable excavated material, storage of reusable excavated material, bulkheads, monitoring, compaction, erosion control, paving, and surface restoration as required for installation and use of the obstruction removal shaft to identify and remove obstruction and repair tunneling equipment.

If an Obstruction meeting the definition for Obstruction provided in the technical specifications is identified and accepted by Owner, Contractor shall be paid for Obstruction Removal and Shaft and for removal or repair of the tunnel boring machine or microtunnel boring machine required to continue installation. If following excavation it is determined that there is not an impediment meeting the definition of an Obstruction defined in the technical specifications, there is no payment to Contractor.

Contractor shall provide access to Owner and/or Engineer and consultants of either to observe exposed TBM/MTBM face to determine size and orientation of object that stopped forward motion. All testing, measurement, quantifiable investigation required to determine compliance with Obstruction definition shall be provided by third party at Owner's expense.

2.78 MISCELLANEOUS SITE IMPROVEMENTS

An allocation has been established for Miscellaneous Site Improvements or other work not included in the Contract Documents but deemed necessary for the project during construction. Miscellaneous Site Improvements will be as directed by the Engineer in a Field Order which will document costs associated with the directed Miscellaneous Site Improvement(s). Costs shall include all labor, equipment, materials, and other incidental costs required to perform the directed work. Funds from the Miscellaneous Site Improvements allocation not encumbered by a Field Order will be credited to the final contract amount in a Final Adjusting Change Order.

PART 3 - EXECUTION

3.01 PAY ITEMS

- A. The pay items listed hereinbefore refer to the items listed in the Bid Schedule and are the only pay items for this contract.
- B. Any and all other items of work listed in the specifications or shown on the Contract Drawings for this contract shall be considered incidental to and included in the associated pay items.

END OF SECTION

SECTION 01040 - COORDINATION

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall allow the Owner or his agents, and other project Contractors or their agents, to enter upon the work for the purpose of constructing, operating, maintaining, removing, repairing, altering, or replacing such pipes, sewers, conduits, manholes, wires, poles, or other structures and appliances which may be required to be installed at or in the work. The Contractor shall cooperate with all aforesaid parties and shall allow reasonable provisions for the prosecution of any other work by the Owner, or others, to be done in connection with his work, or in connection with normal use of the facilities.
- B. Each Contractor shall cooperate fully with the Owner, the Engineer, and all other Contractors employed on the Work, to effect proper coordination and progress to complete the project on schedule and in proper sequence. Insofar as possible, decisions of all kinds required from the Engineer shall be anticipated by the Contractor to provide ample time for inspection, or the preparation of instructions.
- C. Each Contractor shall assume full responsibility for the correlation of all parts of his work with that of other Contractors. Each Contractor's superintendent shall correlate all work with other Contractors in the laying out of work. Each Contractor shall lay out his own work in accordance with the Drawings, Specifications, and instructions of latest issue and with due regard to the work of other Contractors.
- D. Monthly general progress coordination meetings will be held at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as special pre-installation meetings. Representation at each meeting by every part currently involved in coordination or planning for the work of the entire project is requested. Meetings shall be conducted in a manner that will resolve coordination problems. Results of the meetings shall be recorded and copies distributed to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.02 COORDINATION OF CRAFTS, TRADES, AND SUBCONTRACTORS

- A. The Contractor shall coordinate the work of all crafts, trades and subcontractors engaged on the Work, and he shall have final responsibility as regards the schedule, workmanship and completeness of each and all parts of the work.
- B. Each Subcontractor is expected to be familiar with the General requirements and all sections of the detailed Specifications for all other trades and to study all Drawings applicable to his work to the end that complete coordination between trades will be effected. Consult the Engineer if conflicts exist on the Drawings.
- C. Contractor's Superintendent, or his designee who is employed by Contractor, must be on site at all times when work is being performed, except for periods which will not exceed 1 hour.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 PRECONSTRUCTION MEETING

- A. A preconstruction meeting will be held after Award of Contract, but prior to starting work at the site. Contractor's Project Manager and Site Superintendent are required to attend, as are representatives of all major subcontractors. Progress schedule update shall be submitted in advance of each meeting.

1.02 PROGRESS MEETINGS

- A. Progress meetings will be held monthly at the Division of Water Quality offices during the performance of the Work. Additional progress meetings may be called as progress of work dictates. Prior to each progress meeting, Contractor shall submit a progress report summarizing the work completed over the past month and providing a look ahead at the work to be done over the next month.
- B. Minimum Agenda for meeting shall include:
1. Review and approve minutes of previous meetings.
 2. Review progress of Work since last meeting.
 3. Review proposed 30 day construction schedule.
 4. Note and identify problems which impede planned progress.
 5. Develop corrective measures and procedures to regain planned schedule.
 6. Revise construction schedule as indicated and plan progress during next work period.
 7. Maintaining of quality and work standards.
 8. Complete other current business.
 9. Schedule next progress meeting.

1.03 SPECIAL MEETINGS

- A. Owner or Engineer may schedule special meetings at the site or at Division of Water Quality offices to resolve construction issues. Contractor and when appropriate, subcontractors, shall attend upon request. No additional compensation shall be paid for meeting attendance.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

END OF SECTION

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Progress Schedule

1. Within thirty (30) days after execution of the Agreement, but at least 20 days prior to submitting the first application for a progress payment, the Contractor shall prepare and submit three (3) copies of his proposed progress schedule to the Engineer for review and approval.
2. If so required, the schedule shall be revised until it is approved by the Engineer.
3. The schedule shall be updated monthly, depicting progress to the last day of the month and three (3) copies submitted to the Engineer not later than the fifth day of the month with the application for progress payment.
4. The schedule shall be prepared in the form of a horizontal bar chart showing in detail the proposed sequence of the work and identifying construction activities for each structure and for each portion of work.
5. The schedule shall be time scaled, identifying the first day of each week. The Schedule shall be provided with estimated dates for Early Start, Early Finish, Late Start and Late Finish as applicable. The work shall be scheduled to complete the Project within the Contract time. The Late Finish date shall equal the Contract Completion Date.
6. The schedule shall show duration (number of days) and float for each activity. Float shall be defined as the measure of leeway in starting or completing a scheduled activity without adversely affecting the project completion date established by the Contract Documents.
7. The updated schedule shall show all changes since the previous submittal.
8. All revisions to the schedule must have the prior approval of the Engineer.

B. Equipment and Material Orders Schedule

1. Contractor shall prepare and submit three (3) copies of his schedule of principal items of equipment and materials to be purchased to the Engineer for review and approval.
2. If so required, the schedule shall be revised until it is approved by the Engineer.
3. The schedule shall be updated monthly and three (3) copies submitted to the Engineer not later than the fifth day of every month with the application for progress payment.
4. The updated schedule shall be based on the Progress Schedule developed under the requirements of Paragraph 1.01(A) of this Section.
5. The schedule shall be in tabular form with appropriate spaces to insert the following information for principal items of equipment and materials:
 - a. Dates on which Shop Drawings are requested and received from the manufacturer.
 - b. Dates on which certification is received from the manufacturer and transmitted to the Engineer.

- c. Dates on which Shop Drawings are submitted to the Engineer and returned by the Engineer for revision.
- d. Dates on which Shop Drawings are revised by manufacturer and resubmitted to the Engineer.
- e. Date on which Shop Drawings are returned by Engineer annotated either "Furnish as Submitted" or "Furnish as Corrected".
- f. Date on which accepted Shop Drawings are transmitted to manufacturer.
- g. Date of manufacturer's scheduled delivery.
- h. Date on which delivery is actually made.

C. Working Drawings

- 1. Within thirty (30) days after the Notice to Proceed, each prime Contractor shall prepare and submit three (3) copies of his preliminary schedule of Working Drawing submittals to the Engineer for review and approval. If so required, the schedule shall be revised until it is approved by the Engineer.
- 2. Working Drawings include, but are not limited to, Shop Drawings, layout drawings in plan and elevation, installation drawings, etc. Contractor shall be responsible for securing all of the information, details, dimensions, Drawings, etc., necessary to prepare the Working Drawings required and necessary under this Contract and to fulfill all other requirements of his Contract. Contractor shall secure such information, details, Drawings, etc., from all possible sources including the Drawings, Working Drawings prepared by subcontractors, Engineers, suppliers, etc.
- 3. In the event that the Engineer is required to provide additional engineering services as a result of a substitution of materials or equipment by the Contractor, the additional services will be provided in accordance with Section 01010 - Summary of Work, and will be covered in supplementary or revised Drawings which will be issued to the Contractor. All changes indicated that are necessary to accommodate the equipment and appurtenances shall be incorporated into the Working Drawings submitted to the Engineer.
- 4. Shop Drawings
 - a. Contractor shall submit for review by the Engineer Shop Drawings for all fabricated work and for all manufactured items required to be furnished by the Contract Documents.
 - b. Structural and all other layout Drawings prepared specifically for the Project shall have a plan scale of not less than 1/4-inch = 1 foot.
 - c. The submitted documents shall provide information indicating that the materials are in conformance with the Technical Specifications and Contract Documents.
 - d. Where manufacturer's publications in the form of catalogs, brochures, illustrations or other data sheets are submitted in lieu of prepared Shop Drawings, such submittals shall specifically indicate the item for which approval is requested. Identification of items shall be made in ink, and submittals showing only general information are not acceptable.
- 5. Contractor Responsibilities
 - a. All submittals from subcontractors, manufacturers or suppliers shall be sent directly to the Contractor for checking. Contractor shall thoroughly check all Drawings for accuracy and conformance to the intent of the Contract Documents. Drawings found

to be inaccurate or otherwise in error shall be returned to the subcontractors, manufacturers, or suppliers by the Contractor for correction before submitting them to the Engineer.

- b. All submittals shall be bound, dated, properly labeled and consecutively numbered. Information on the label shall indicate Specification Section, Drawing number, subcontractors', manufacturer's or supplier's name and the name or type of item the submittal covers. Each part of a submittal shall be marked and tabulated.
- c. Working Drawings shall be submitted as a single complete package including all associated drawings relating to a complete assembly of the various parts necessary for a complete unit or system.
- d. Shop Drawings shall be submitted as a single complete package for any operating system and shall include all items of equipment and any mechanical units involved or necessary for the functioning of such system.
- e. ALL SUBMITTALS SHALL BE THOROUGHLY CHECKED BY THE CONTRACTOR FOR ACCURACY AND CONFORMANCE TO THE INTENT OF THE CONTRACT DOCUMENTS BEFORE BEING SUBMITTED TO THE ENGINEER AND SHALL BEAR THE CONTRACTOR'S STAMP OF APPROVAL CERTIFYING THAT THEY HAVE BEEN SO CHECKED. SUBMITTALS WITHOUT THE CONTRACTOR'S STAMP OF APPROVAL WILL NOT BE REVIEWED BY THE ENGINEER AND WILL BE RETURNED TO THE CONTRACTOR. Any comments added to the drawings by the Contractor shall be done in green ink so as to denote any Contractor notes.
- f. If the submittals contain any departures from the Contract Documents, specific mention thereof shall be made in the Contractor's letter of transmittal. Otherwise, the review of such submittals shall not constitute approval of the departure.
- g. No materials shall be ordered, fabricated or shipped or any work performed until the Engineer returns to the Contractor the submittals, herein required, annotated either "Furnish as Submitted" or "Furnish as Corrected".
- h. Where errors, deviations, and/or omissions are discovered at a later date in any of the submittals, the Engineer's prior review of the submittals does not relieve the Contractor of the responsibility for correcting all errors, deviations, and/or omissions.

6. Procedure for Review

- a. Submittals shall be transmitted in sufficient time to allow the Engineer at least thirty (30) working days for review and processing.
- b. Contractor shall transmit two (2) prints of each submittal to the Engineer for review for all Drawings greater than 11-inches by 17-inches in size, as well as six (6) copies of all other material. If electronic submittals are used, the Contractor shall transmit two (2) hardcopies of each submittal to the Engineer once the submittal has been reviewed.
- c. Submittal shall be accompanied by a letter of transmittal, in duplicate, containing date, project title, Contractor's name, number and titles of submittals, notification of departures and any other pertinent data to facilitate review.
- d. Submittals will be annotated by the Engineer in one of the following ways:
 - "Furnish as Submitted" - no exceptions are taken.
 - "Furnish as Corrected" - minor corrections are noted and shall be made.

"Revise and Resubmit" - major corrections are noted and a resubmittal is required.

"Rejected" - Based on the information submitted, the submission is not in conformance with the Contract Documents. The deviations from the Contract Documents are too numerous to list and a completely revised submission of the proposed equipment or a submission of other equipment is required.

- e. If a submittal is satisfactory to the Engineer, the Engineer will annotate the submittal "Furnish as Submitted" or "Furnish as Corrected", retain four (4) copies and return remaining copies to the Contractor.
- f. If a resubmittal is required, the Engineer will annotate the submittal "Revise and Resubmit" and transmit five (5) copies to the Contractor for appropriate action.
- g. Contractor shall revise and resubmit submittals as required by the Engineer until submittals are acceptable to the Engineer. It is understood by the Contractor that Owner may charge the Contractor the Engineer's charges for review in the event a submittal is not approved (either "Furnish as Submitted" or "Furnish as Corrected") by the third submittal for a system or piece of equipment. These charges shall be for all costs associated with engineering review, meetings with the Contractor or manufacturer, etc., commencing with the fourth submittal of a system or type of equipment submitted for a particular Specification Section.
- h. Acceptance of a Working Drawing by the Engineer will constitute acceptance of the subject matter for which the Drawing was submitted and not for any other structure, material, equipment or appurtenances indicated or shown.

7. Engineer's Review

- a. Engineer's review of the Contractor's submittals shall in no way relieve the Contractor of any of his responsibilities under the Contract. An acceptance of a submittal shall be interpreted to mean that the Engineer has no specific objections to the submitted material, subject to conformance with the Contract Drawings and Specifications. The Engineer will denote any notes in red ink so as to record his comments.
- b. Engineer's review will be confined to general arrangement and compliance with the Contract Drawings and Specifications only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, tolerances, interferences, coordination of trades, etc.

8. Record Working Drawings

- a. Prior to final payment, the Contractor shall furnish the Engineer one complete set of all accepted Working Drawings, including Shop Drawings, for equipment, piping, electrical work, heating system, ventilating system, air conditioning system, instrumentation system, plumbing system, structural, interconnection wiring diagrams, etc.
- b. Manufacturer's publications, submitted in lieu of prepared Shop Drawings, will not be required in reproducible form. However, three (3) sets of such material shall be furnished by the Contractor to the Engineer.
- c. Working Drawings furnished shall be corrected to include any departures from previously accepted Drawings.

D. Construction Photographs

1. The General Contractor shall take photographs at the locations and at such stages of the construction as directed by the Engineer. Digital format shall be used. Provide all pictures for a given period on a CD or DVD.
2. Provide the equivalent of 36 different exposures per month for the duration of the Contract time. When directed by the Engineer, frequency of photographs may be increased to weekly sessions, provided that the equivalent number of exposures is not exceeded. Engineer may waive requirements for photographs during inactive construction periods in favor of increased photographs during active construction sequences.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01320 - PROGRESS SCHEDULES

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

A. Scheduling Responsibilities:

1. In order to provide a definitive basis for determining job progress, a construction schedule of a type approved by the Owner will be used to monitor the project.
2. Each week the Contractor shall be responsible for preparing the schedule and updating it based on a tentative two week basis. It shall at all times remain the Contractor's responsibility to schedule and direct his forces in a manner that will allow for the completion of the work within the contractual period.

B. Construction Hours: see Section 01010 – Summary of Work – for construction working hours requirements.

C. Progress of the Work:

1. The work shall be started within ten (10) days following the Notice to Proceed and shall be executed with such progress as may be required to prevent delay to other Contractors or to the general completion of the project. The work shall be executed at such times and in or on such parts of the project, and with such forces, material and equipment, to assure completion of the work in the time established by the Contract.
2. The Contractor agrees that whenever it becomes apparent from the current monthly schedule update that delays have resulted and, hence, that the Contract completion date will not be met or when so directed by the Owner, he will take some or all of the following actions at no additional cost to the Owner:
 - a. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of work.
 - b. Increase the number of working hours per shift, shifts per working day or days per week, the amount of construction equipment, or any combination of the foregoing to substantially eliminate the backlog of work.
 - c. Reschedule activities to achieve maximum practical concurrency of accomplishment of activities, and comply with the revised schedule.
 - d. The Contractor shall submit to the Owner or the Owner's representative for review a written statement of the steps he intends to take to remove or arrest the delay to the critical path in the accepted schedule.

1.02 CONSTRUCTION SCHEDULE

- A. Within ten (10) calendar days of the Notice to Proceed, the Contractor shall submit to the Engineer five (5) copies of his proposed schedule. The schedule will be the subject of a schedule review meeting with the Contractor, the Engineer and the Owner or the Owner's representative within one (1) week of its submission. The Contractor will revise and resubmit the schedule until it is acceptable and accepted by the Owner or the Owner's representative.

1.03 CONTRACT COMPLETION TIME

A. Causes for Extensions:

The Contract completion time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any Contract completion date, he shall furnish such justification and supporting evidence as the Owner or the Owner's representative may deem necessary for a determination as to whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Owner, with the assistance of the Engineer, will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof.

B. Requests for Time Extension:

Each request for change in any Contract completion date shall be initially submitted to the Owner within the time frame stated in the General Conditions. All information known to the Contractor at that time concerning the nature and extent of the delay shall be transmitted to the Owner at that time. Within the time frame stated in the General Conditions but before the date of final payment under this Contract, all information as required above concerning the delay must be submitted to the Owner. No time extension will be granted for requests which are not submitted within the foregoing time limits.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Testing Laboratory Services

1. Laboratory testing and checking required by the Specifications, including the cost of transporting all samples and test specimens, shall be provided and paid for by the Owner unless otherwise indicated in the Specifications.
2. Materials to be tested include, but are not necessarily limited to the following: cement, concrete aggregate, concrete, and reinforcing steel.
3. Tests required by the Owner shall not relieve the Contractor from the responsibility of supplying test results and certificates from manufacturers or suppliers to demonstrate conformance with the Specifications.
4. In place testing of compacted materials will be conducted as specified or recommended by Engineer.
5. Procedure
 - a. The Contractor shall plan and conduct his operations to permit taking of field samples and test specimens, as required, and to allow adequate time for laboratory tests.
 - b. The collection, field preparation and storage of field samples and test specimens shall be as directed by the Engineer with the cooperation of the Contractor.
6. Significance of Tests
 - a. Test results shall be binding on both the Contractor and the Owner, and shall be considered irrefutable evidence of compliance or noncompliance with the Specification requirements, unless supplementary testing shall prove, to the satisfaction of the Owner, that the initial samples were not representative of actual conditions.
7. Supplementary and Other Testing
 - a. Nothing shall restrict the Contractor from conducting tests he may require. Should the Contractor at any time request the Owner to consider such test results, the test reports shall be certified by an independent testing laboratory acceptable to the Owner. Testing of this nature shall be conducted at the Contractor's expense.

1.02 IMPERFECT WORK OR MATERIALS

- A. Any defective or imperfect work or materials furnished by the Contractor which is discovered before the final acceptance of the work, as established by the Certificate of Substantial Completion, or during the subsequent guarantee period, shall be removed immediately even though it may have been overlooked by the Engineer and estimated for payment. Any materials condemned or rejected by the Engineer shall be tagged as such and shall be immediately removed from the site. Satisfactory work or materials shall be substituted for that rejected.

- B. The Engineer may order tests of imperfect or damaged work or materials to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the Contractor; and the nature, tester, extent and supervision of the tests will be as determined by the Engineer. If the results of the tests indicate that the required functional capability of the work or material was not impaired, consistent with the final general appearance of same, the work or materials may be deemed acceptable. If the results of such tests reveal that the required functional capability of the questionable work or materials has been impaired, then such work or materials shall be deemed imperfect and shall be replaced. The Contractor may elect to replace the imperfect work or material in lieu of performing the tests.

1.03 INSPECTION AND TESTS

- A. The Contractor shall allow the Engineer ample time and opportunity for testing materials to be used in the work. He shall advise the Engineer promptly upon placing orders for material so that arrangements may be made, if desired, for inspection before shipment from the place of manufacture. The Contractor shall at all times furnish the Engineer and his representatives, facilities including labor, and allow proper time for inspecting and testing materials and workmanship. The Contractor must anticipate possible delays that may be caused in the execution of his work due to the necessity of materials being inspected and accepted for use. The Contractor shall furnish, at his own expense, all samples of materials required by the Engineer for testing, and shall make his own arrangements for providing water, electric power, or fuel for the various inspections and tests of structures and material.
- B. Where other tests or analyses are specifically required in other Sections of these Specifications, the cost thereof shall be borne by the party (Owner or Contractor) so designated in such Sections. The Owner will bear the cost of all tests, inspections, or investigations undertaken by the order of the Engineer for the purpose of determining conformance with the Contract Documents if such tests, inspection, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby. Whenever nonconformance is determined by the Engineer as a result of such tests, inspections, or investigations, the Contractor shall bear the full cost thereof or shall reimburse the Owner for said cost. In this connection, the cost of any additional tests and investigations, which are ordered by the Engineer to ascertain subsequent conformance with the Contract Documents, shall be borne by the Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01510 - TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The General Contractor shall provide temporary sanitary facilities for the construction operations of this Contract. The temporary services shall be provided for use throughout the construction period.
- B. Temporary Sanitary Service

Sanitary conveniences, in sufficient numbers, for the use of all persons employed on the work and properly screened from public observation, shall be provided and maintained at suitable locations by the General Contractor, all as prescribed by State Labor Regulations and local ordinances. The contents of same shall be removed and disposed of in a manner consistent with local and state regulations, as the occasion requires. Sanitary facilities shall be removed from the site when no longer required.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01520 - MAINTENANCE OF UTILITY OPERATIONS DURING CONSTRUCTION

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. The sanitary sewer system shall be maintained in continuous operation during the entire construction period of all Contracts as hereinafter specified. The intent of this section is to outline the minimum requirements necessary to provide continuous transference of wastewater throughout the construction period.
- B. Work under each Contract shall be scheduled and conducted by each Contractor so as to not reduce the quality of near-by water streams or cause odor or other nuisance except as explicitly permitted hereinafter. In performing the work shown and specified, the Contractor shall plan and schedule his work to meet the plant and collection system operating requirements, and the constraints and construction requirements as outlined in this Section. No discharge of raw or inadequately treated wastewater shall be allowed. The Contractor shall pay all civil penalties, costs, and assessments associated with any discharge of raw or inadequately treated wastewater associated with the Contractor's work.
- C. The General Contractor shall be responsible for coordinating the general construction and for ensuring that permanent or temporary power is available for all existing, proposed, and temporary facilities that are required to be on line at any given time.
- D. The Contractor has the option of providing additional temporary facilities that can eliminate a constraint, provided it is done without cost to the Owner and provided that all requirements of these Specifications are fulfilled and approved by the Engineer.

1.02 TEMPORARY BYPASS PUMPING

- A. Requirements for this section shall apply to all pumping required for Contractor to perform tie-ins, shutdowns, etc. for construction of the work. Temporary bypass pumping shall be performed in accordance with this section unless noted otherwise herein. Temporary pumping system design calculations and equipment information shall be submitted for review by Engineer per Section 01300. Calculations shall be stamped by a professional engineer registered in the Commonwealth of Kentucky.
- B. Contractor shall furnish, install, maintain, and operate temporary bypass pumping facilities as required to complete the Work. Contractor shall be responsible for all construction necessary to accommodate pumps and piping including but not limited to structure modifications, pump base construction, pipe supports, etc.
- C. The Contractor shall perform a test run of the bypass pumping set-up before being allowed to continue with the full-scale bypass pumping.
- D. Contractor shall design the temporary bypass pumping facilities to convey flows from the upstream manholes where existing manhole or sewer tie-ins, replacement, or modifications will be conducted in a manner that will prevent backup of the existing system.
- E. All tie-ins, replacement, or modifications shall be performed during low flow conditions.
- F. All tie-ins, replacement, or modifications Work shall be accomplished as quickly as possible. If Work required extends beyond 8-hours or weather causes higher flows in the existing system during the Work, the new Work shall be stopped and the existing system shall be placed back into service. The new Work shall be properly protected from damage. Any damage to the new Work or damage to surrounding areas caused by the new Work shall be

repaired or replaced at the Owner's decision by the Contractor at the Contractor's sole expense.

- G. Contractor shall provide all power, fuel, maintenance materials, parts, and other expendables in order to maintain temporary pumping through the duration of the Work.
- H. Contractor shall provide one primary pump capable of conveying all dry weather flows as provided in plans. Contractor shall provide one standby pump, which, when run in conjunction with primary pump, is capable of conveying the 2-year/24-hour storm flows as provided in plans. Temporary control system shall start standby pump on high level and dial-out to local contact who will respond and be on-site within an hour to check and address problem. High-high level shall also alarm and dial-out indicating that standby pump is not maintaining level. Temporary pumping system shall be provided by company that has spare pumps ready to be delivered and installed locally if problems occur.
- I. Contractor shall provide standby power or 48-hour on-site fuel storage capacity for diesel engine type pumps to ensure continuous operation at all times.
- J. Contractor shall provide sound attenuation for temporary pumping facilities to limit noise levels to no more than 85 dBA at a distance of 21 feet from the noise source.
- K. Temporary pumping system shall remain fully operational until all modifications are complete and approved by Owner or Engineer.
- L. Following successful completion of the new Work, Contractor shall remove all temporary pumps, piping and appurtenances and restore area and/or structures to original condition prior to start of work.
- M. Contractor shall prepare Temporary Bypass Plan and submit to Owner and Engineer at pre-construction conference for review and approval.
- N. Contractor shall reconnect to existing gravity sewer at the end of each day, weather delay, or completion of Work so that bypass pumping does not occur when not on jobsite. Overnight bypass pumping will only be allowed when directed by Engineer and Owner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01530 - PROTECTION OF EXISTING FACILITIES

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. Contractor shall be responsible for the preservation and protection of property adjacent to the work site against damage or injury as a result of his operations under this Contract. Any damage or injury occurring on account of any act, omission or neglect on the part of the Contractor shall be restored in a proper and satisfactory manner or replaced by and at the expense of the Contractor to an equal or superior condition than previously existed.
- B. Contractor shall comply promptly with such safety regulations as may be prescribed by the Owner or the local authorities having jurisdiction and shall, when so directed, properly correct any unsafe conditions created by, or unsafe practices on the part of, his employees. In the event of the Contractor's failure to comply, the Owner may take the necessary measures to correct the conditions or practices complained of, and all costs thereof will be deducted from any monies due the Contractor. Failure of the Engineer to direct the correction of unsafe conditions or practices shall not relieve the Contractor of his responsibility hereunder.
- C. In the event of any claims for damage or alleged damage to property as a result of work under this Contract, the Contractor shall be responsible for all costs in connection with the settlement of or defense against such claims. Prior to commencement of work in the vicinity of property adjacent to the work site, the Contractor, at his own expense, shall take such surveys as may be necessary to establish the existing condition of the property. Before final payment can be made, the Contractor shall furnish satisfactory evidence that all claims for damage have been legally settled or sufficient funds to cover such claims have been placed in escrow, or that an adequate bond to cover such claims has been obtained.

1.02 PROTECTION OF WORK AND MATERIAL

- A. During the progress of the work and up to the date of final payment, the Contractor shall be solely responsible for the care and protection of all work and materials covered by the Contract.
- B. All work and materials shall be protected against damage, injury or loss from any cause whatsoever, and the Contractor shall make good any such damage or loss at his own expense. Protection measures shall be subject to the approval of the Engineer.

1.03 BARRICADES, WARNING SIGNS AND LIGHTS

- A. The General Contractor shall provide, erect and maintain as necessary, strong and suitable barricades, danger signs and warning lights along all roads accessible to the public, as required by the Manual on Uniform Traffic Control Devices or as required by the authority having jurisdiction, to insure safety to the public. All barricades and obstructions along public roads shall include reflective material, shall be illuminated at night, and all lights for this purpose shall be kept burning from sunset to sunrise.
- B. Each Contractor shall provide and maintain such other warning signs and barricades in areas of and around their respective work as may be required for the safety of all those employed in the work, the Owner's operating personnel, or those visiting the site.

1.04 EXISTING UTILITIES AND STRUCTURES

- A. The term existing utilities shall be deemed to refer to both publicly-owned and privately-owned utilities such as electric power and lighting, telephone, water, gas, storm drains, sanitary sewers and all appurtenant structures.
- B. Where existing utilities and structures are indicated on the Drawings, it shall be understood that all of the existing utilities and structures affecting the work may not be shown and that the locations of those shown are approximate only. It shall be the responsibility of the Contractor to ascertain the actual extent and exact location of existing utilities and structures. In every instance, the Contractor shall notify the proper authority having jurisdiction and obtain all necessary directions and approvals before performing any work in the vicinity of existing utilities.
- C. Prior to beginning any excavation work, the Contractor shall, through field investigations, determine any conflicts or interferences between existing utilities and new utilities to be constructed under this project. This determination shall be based on the actual locations, elevations, slopes, etc., of existing utilities as determined in the field investigations, and locations, elevation, slope, or other information of new utilities as shown on the Drawings. If an interference exists, the Contractor shall bring it to the attention of the Engineer as soon as possible. If the Engineer agrees that an interference exists, he shall develop a plan to address the interference as required, and obtain the Owner's approval. Additional costs to the Contractor for this change shall be processed through a Change Order as detailed elsewhere in these Contract Documents. In the event the Contractor fails to bring a potential conflict or interference to the attention of the Engineer prior to beginning excavation work, any actual conflict or interference which does arise during the Project shall be corrected by the Contractor, as directed by the Engineer, at no additional expense to the Owner.
- D. The work shall be carried out in a manner to prevent disruption of existing services and to avoid damage to the existing utilities. Temporary connections shall be provided, as required, to insure uninterrupted of existing services. Any damage resulting from the work of this Contract shall be promptly repaired by the Contractor at his own expense in a manner approved by the Engineer and further subject to the requirements of any authority having jurisdiction. Where it is required by the authority having jurisdiction that they perform their own repairs or have them done by others, the Contractor shall be responsible for all costs thereof.
- E. Where excavations by the Contractor require any utility lines or appurtenant structures to be temporarily supported and otherwise protected during the construction work, such support and protection shall be provided by the Contractor. All such work shall be performed in a manner satisfactory to the Engineer and the respective authority having jurisdiction over such work. In the event the Contractor fails to provide proper support or protection to any existing utility, the Engineer may, at his discretion, have the respective authority to provide such support or protection as may be necessary to insure the safety of such utility, and the costs of such measures shall be paid by the Contractor. This is not a pay item.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01540 - DEMOLITION AND REMOVAL OF EXISTING STRUCTURES AND EQUIPMENT

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. This Section covers the demolition, removal, and disposal of structures, pavement, curbs, sidewalk, and any existing equipment. The Contractor shall furnish all labor, materials and equipment to demolish and remove structures and equipment designated to be removed on Drawings.

1.02 TITLE TO EQUIPMENT AND MATERIALS

- A. Contractor shall have no right or title to any of the equipment, materials or other items to be removed from the existing structures unless authorized by Owner.

1.03 CONDITION OF STRUCTURES AND EQUIPMENT

- A. The Owner does not assume responsibility for the actual condition of structures and equipment to be demolished and removed.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 DEMOLITION AND REMOVALS

- A. The removal of all equipment and piping, and all materials from the demolition of structures shall, when released by the Owner and Engineer, be done by the Contractor and become the Contractor's property, unless otherwise noted, for disposition in any manner not contrary to the Contract requirements and shall be removed from the site to the Contractor's own place of disposal.
- B. Any equipment piping and appurtenances removed without proper authorization, which are necessary for the operation of the existing facilities shall be replaced to the satisfaction of the Engineer at no cost to the Owner.
- C. Excavation caused by demolitions shall be backfilled with fill free from rubbish and debris.
- D. All materials removed by demolition or excavation shall be lawfully and properly handled and disposed according to applicable local, state, and federal laws. Where materials shall be disposed at landfill, manifests and documentation shall be provided to Owner showing / documenting that materials have been properly handled and disposed.
- E. Manhole frames and covers that have been removed shall become the property of the Contractor and shall be disposed on in a legal manner.

END OF SECTION

SECTION 01550 - SITE ACCESS AND STORAGE

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Access Roads

1. The General Contractor shall construct and maintain such temporary access roads as required to perform the work of this Contract.
2. Access roads shall be located within the property lines of the Owner unless the Contractor independently secures easements for his use and convenience. Contractor shall submit written documentation to the Engineer for any Contractor secured easements across privately held property. Easement agreement shall specify terms and conditions of use and provisions for site restoration. A written release from the property owner certifying that all terms of the easement agreement have been complied by the Contractor shall be furnished to the Engineer prior to final payment.
3. Existing access roads used by the Contractor shall be suitably maintained by the Contractor at his expense during construction. Contractor shall not be permitted to restrict Owner access to existing facilities. Engineer may direct Contractor to perform maintenance of existing access roads when Engineer determines that such work is required to insure all weather access by the Owner.
4. The Contractor will maintain the primary roads to be free of mud and dirt. All mud and dirt carried from the access roads to the primary roads shall be washed and cleaned.
5. The Contractor shall obtain and pay all cost associated with any bonds required by the Kentucky Department of Transportation for the use of State maintained roads.

B. Parking Areas

1. Each Contractor shall construct and maintain suitable parking areas for his construction personnel on the project site where approved by the Engineer and the Owner.

C. Restoration

1. At the completion of the Work, the surfaces of land used for access roads and parking areas shall be restored by the Contractor to its original condition and to the satisfaction of the Engineer.

D. Traffic Regulations

1. Contractor shall obey all traffic laws and comply with all the requirements, rules and regulations of the Kentucky Transportation Cabinet, LFUCG, and other local authorities having jurisdiction to maintain adequate warning signs, lights, barriers, etc., for the protection of traffic on public roadways.

E. Storage of Equipment and Materials

1. Contractor shall store his equipment and materials at the job site in accordance with the requirements of the Contract Documents, and as hereinafter specified. All equipment and materials shall be stored in accordance with manufacturer's recommendations and as directed by the Owner or Engineer, and in conformity to applicable statutes, ordinances, regulations and rulings of the public authority having jurisdiction.

2. Contractor shall secure a site for staging area and material storage, including portable restroom facilities. Contractor shall not store materials or encroach upon private property without the written consent of the owners of such private property. Use of public lands must be with the written approval of the Owner.
3. Contractor shall not store unnecessary materials or equipment on the job site, and shall take care to prevent any structure from being loaded with a weight which will endanger its security or the safety of persons.
4. Materials shall not be placed within ten (10) feet of fire hydrants. Gutters, drainage channels and inlets shall be kept unobstructed at all times.
5. Contractor shall provide adequate temporary storage buildings/facilities, if required, to protect materials or equipment on the job site.
6. Contractor shall provide Engineer with copy of agreement with property owner of staging area. Contractor will be responsible for all restoration. Agreement between Contractor and property owner shall include language holding the Owner harmless from responsibility and liability.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01560 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.01 GENERAL

- A. Provide and maintain equipment and temporary construction, as necessary to provide controls over environmental and safety conditions at the construction site and adjacent areas. Remove physical evidence of temporary facilities at completion of Work.
- B. Prohibited Construction Activities:
1. Disposing of excess or unsuitable excavated material in wetlands or floodplains, even with the permission of the property owner.
 2. Locating stockpile storage areas in environmentally sensitive areas.
 3. Indiscriminate, arbitrary, or capricious operation of equipment in any stream corridors, any wetlands, any surface waters, or outside the construction limits.
 4. Pumping of sediment-laden water from trenches or other excavations directly into any surface waters, any stream corridors, any wetlands, or storm sewers; all such water will be properly filtered or settled to remove silt prior to release.
 5. Discharging pollutants such as chemicals, fuels, lubricants, bituminous materials, raw sewage and other harmful waste into or alongside of rivers, streams, impoundments, or into natural or manmade channels leading thereto.
 6. Permanent or unspecified alteration of the flow line of any stream.
 7. Damaging vegetation outside of the construction area.
 8. Disposal of trees, brush, and other debris in any stream corridors, any wetlands, any surface waters, or at unspecified locations.
 9. Open burning of project debris without a permit.
 10. Discharging injurious silica dust concentrations into the atmosphere resulting from breaking, cutting, chipping, drilling, buffing, grinding, polishing, shaping or surfacing closer than 200 feet to places of residences or commercial, professional, quasi-public or public places of human occupation.
 11. Storing construction equipment and vehicles and/or stockpiling construction materials on property, public or private, not previously authorized for such purposes as noted in Section 01550.
 12. Running well point or pump discharge lines through private property or public property and rights-of-way without an easement or the written permission of the property owner and the consent of the ENGINEER.
 13. Non-compliance with the Contractor's, OSHA's, or the Owner's safety requirements.
 14. Operations entailing the use of vibratory hammers or compactors outside the hours listed in Section 01010 - Summary of Work, or outside the hours allowed for construction by local ordinances or regulations.

1.02 SAFETY ADVISORY

- A. Scope: Sewer Installation
 - 1. Maintaining jobsite safety
 - 2. Maintaining traffic safety
- B. LFUCG-funded projects have a contractual and legal obligation for performance and breach of contract in regard to the safety of all exposed personnel. Reference the Occupational Safety Health Administration (OSHA) Multi Employer Citation Policy: Multi-employer Worksites, The Creating Employer, The Exposing Employer, The Correcting Employer, The Controlling Employer, Multiple Roles.
- C. The Contractor shall at all times conduct the work safely in order to assure a safe work site. The Contractor shall be responsible for the safety of the Contractor's employees, agents and subcontractors, Owner's personnel and all other personnel or persons at the work site. The Contractor shall be responsible for the adequacy and safety of all construction methods or procedures and the safe prosecution of the work.
- D. The Contractor shall be responsible at all times to conduct the work and keep the work site in compliance with federal, state, and local safety Laws and Regulations, including but not limited to Occupational Safety and Health (OSHA) requirements. This includes shaft drilling operations, concrete moving and placement, confined space entry requirements for trench construction, including use of a trench box or other shoring to support trench walls and proper means of exit from an excavation.
- E. The Contractor shall have an authorized and competent safety representative as defined above on the work site at frequent and regular intervals, or more often, as conditions require. Failure to have such a person at the site as specified herein constitutes an unsafe practice.
- F. The Contractor shall be responsible to suspend Work whenever a Work method or procedure or condition at work site is unsafe.
- G. The Contractor shall submit a written notification to the Owner of any accident or injury. Such notification shall include the Contractor's investigation and what measures are appropriate to avoid such accidents. Payment applications will not be authorized until such notice is provided.
- H. Failure of the Contractor to comply with any provision of this Specification section or the Owner's safety requirements or any federal, state or local safety Laws and Regulations constitute just cause for the Owner to order suspension of Work.
- I. None of the provisions of the section are intended to, nor shall be construed to, create any duty or responsibility on the Owner or Engineer to provide or enforce safety requirements of the Contractor. The duty, responsibility, and liability for safety shall remain with the Contractor.

1.03 AIR POLLUTION AND NOISE CONTROL

- A. Contractor's vehicles and equipment shall be such as to minimize noise to the greatest degree practicable. Noise levels shall conform to the latest OSHA standards and in no case will noise levels be permitted which interfere with the work of the Owner or others.
 - 1. Construction activities will be limited to hours specified in Section 01010 – Summary of Work.
 - 2. Construction equipment will be provided with intake silencers and mufflers, as required by safety standards.

3. All construction vehicles should be equipped with proper emissions control equipment.
4. Periodically check equipment and machinery for proper tuning to minimize exhaust emissions and noise.

1.04 DUST CONTROL

- A. Contractor shall be responsible for controlling objectionable dust caused by his operation of vehicles and equipment, clearing or for any reason whatever. Contractor shall apply water or use other methods subject to the Engineer's approval which will keep dust in the air to a minimum. Dust control measures shall be implemented multiple times throughout each working day if necessary.

1.05 PEST AND RODENT CONTROL

- A. Provide rodent and pest control as necessary to prevent infestation of construction or storage area.
 1. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.

1.06 WATER CONTROL

- A. Contractor shall comply with the Storm Water Pollution Prevention Plan (SWPPP) approved by LFUCG.
- B. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the site, or adjoining properties.
- C. Provide, operate and maintain equipment and facilities of adequate size to control surface water.
- D. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas and in conformance with all environmental requirements.

1.07 POLLUTION CONTROL

- A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.
- B. Provide equipment and personnel, perform emergency measures required to contain any spillages, and to remove contaminated soils or liquids.
 1. Excavate and dispose of any contaminated earth offsite, and replace with suitable compacted fill and topsoil.
- C. Take special measures to prevent harmful substances from entering public waters.
 1. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.
- D. Provide systems for control of atmospheric pollutants.

1. Prevent toxic concentrations of chemicals.
 2. Prevent harmful dispersal of pollutants into the atmosphere.
- E. All Contractor's equipment used during construction shall conform to all current federal, state and local laws and regulations.

1.08 EROSION AND SEDIMENT CONTROL

- A. See Section 02372 for erosion and sediment control requirements.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01580 – PROJECT IDENTIFICATION AND SIGNS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall provide signs near the site of the Work. The sign shall set forth the description of the Work and the names of the Owner, Engineer, and Contractor.

PART 2 - PRODUCTS

2.01 IDENTIFICATION SIGN

- A. Basic design shall be as shown in the sample on page 01580-2 below, and shall include at a minimum the names of the Project, the Owner, the Contractor, and the Engineer. This sign shall be 3' x 6' and provided and installed by the Contractor.
- B. "Working Hard" sign (as shown on page 01580-3) shall be provided by the Owner and mounted and installed by the Contractor. Contractor shall provide posts and backing.
- C. Colors shall be as selected by the Engineer.
- D. Number Required:

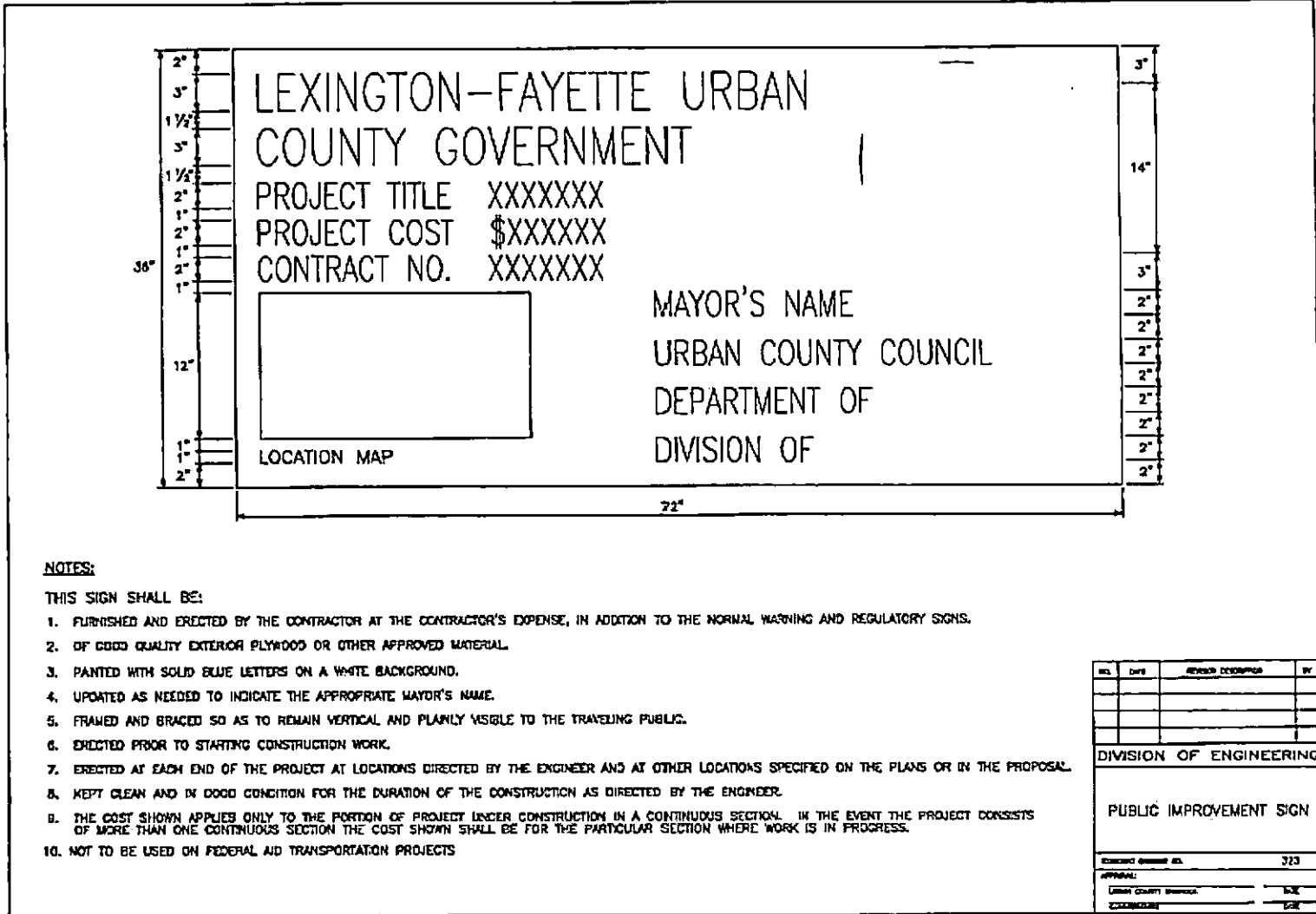
PART 3 - EXECUTION

3.01 INSTALLATIONS

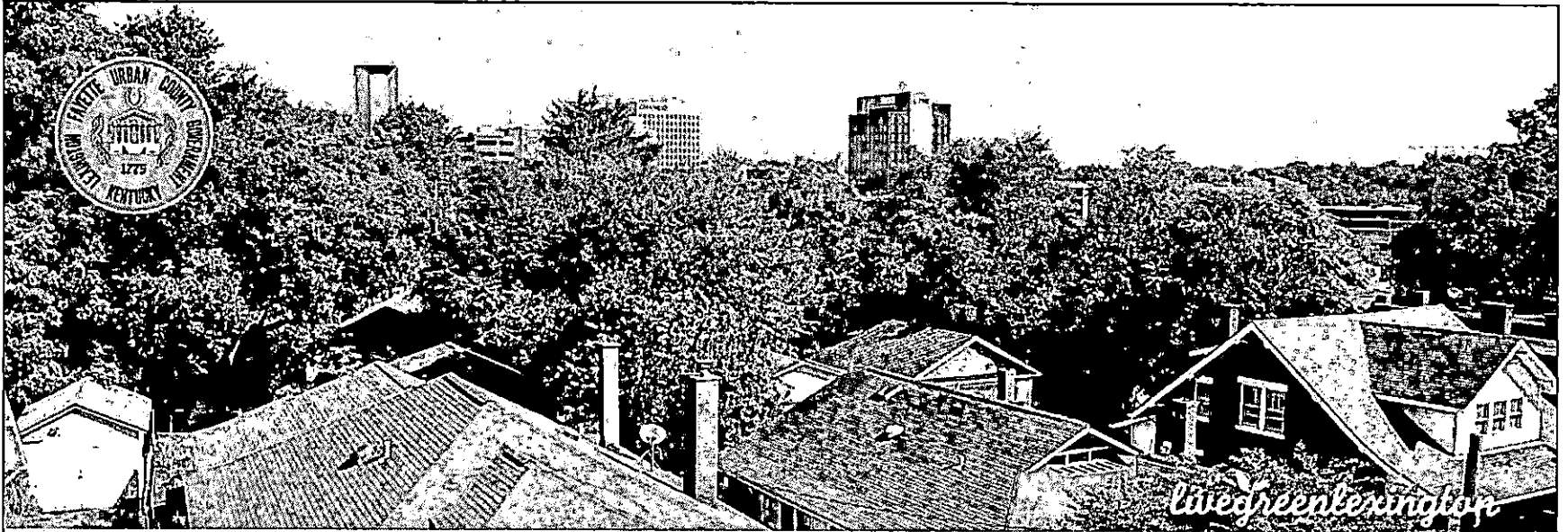
- A. Signs shall be installed at locations specified by the Engineer and installed in accordance with the detail below.

3.02 MAINTENANCE

- A. The signs shall be maintained in good condition until the completion of the Project and then removed by the Contractor.



END OF SECTION



WORKING HARD

TO IMPROVE YOUR NEIGHBORHOOD

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SECTION 01631 - PRODUCTS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. General: Substitution of materials and/or equipment is defined in the General Conditions and more fully hereinafter.
- B. Substitutions: The Contractor's requests for changes in the products, materials, equipment and methods of construction required by the Contract Documents are considered requests for "substitutions", and are subject to the requirements specified herein. The following are not considered as substitutions:
 - 1. Revisions to the Contract Documents, where requested by the Owner and Engineer are considered as "changes" not substitutions.
 - 2. Substitutions requested during the bidding period, which have been accepted prior to the Contract Date, are included in the Contract Documents and are not subject to the requirements for substitutions as herein specified.
 - 3. Specified Contractor options on products and construction methods included in the Contract Documents are choices available to the Contractor and are not subject to the requirements for substitutions as herein specified.
 - 4. Except as otherwise provided in the Contract Documents, the Contractor's determination of and compliance with governing regulations and orders as issued by governing authorities do not constitute "substitutions" and do not constitute a basis for change orders.

1.02 SUBMITTALS

- A. The information required to be furnished for evaluation of product substitution will be as follows:
 - 1. Performance capabilities, and materials and construction details will be evaluated based upon conformance with the Specifications. Products that do not conform with the Specification shall not be accepted.
 - 2. Manufacturer's production and service capabilities, and evidence of proven reliability will be acceptable if the following is furnished.
 - a. Written evidence that the manufacturer has not less than (3) years' experience in the design and manufacture of the substitute product.
 - b. Written evidence of at least one application, of a type and size similar to the proposed substitute product, in successful operation in a wastewater treatment plant or collection system for a period of at least one year.
 - c. In lieu of furnishing evidence of a manufacturer's Experience and successful operation of an application of the product to be substituted, the Contractor has the option of furnishing a cash deposit or bond which will guarantee replacement if the product the furnished does not satisfy the other requirements specified in this section. The amount of each deposit or bond will be subject to the approval.
 - 3. Specific reference to characteristics either superior or inferior to specified requirements will be evaluated based on their net effect on the project. Products with any

characteristics inferior to those specified will not be acceptable unless offset by characteristics that, in the opinion of the Engineer, will cause the overall effect of the product on the project to be at least equal to that of those specified.

1.03 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work.
- B. Compatibility of Options: Compatibility of products is a basic requirement of product selection. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected must be compatible with other products previously selected, even if the products previously selected were also Contractor options. The complete compatibility between the various choices available to the Contractor is not assured by the various requirements of the Contract Documents, but must be provided by the Contractor.
- C. The detailed estimate of operating and maintenance costs will be evaluated based on comparison with similar data on the specified products. Proposed substitute products which have an operating and maintenance cost that, in the opinion of the Engineer, exceeds that of the specified products will not be considered equal and will not be acceptable.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft. Control delivery schedules to minimize long-term storage at the site and to prevent overcrowding of construction spaces. In particular coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.
 - 1. Deliver products to the site in the manufacturer's sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
 - 2. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
 - 3. Store heavy materials away from the project construction in a manner that will not endanger the supporting construction.

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT COMPLIANCE

- A. General: Requirements for individual products are indicated in the Contract Documents; compliance with these requirements is in itself a Contract Requirement. These requirements may be specified in any one of several different specifying methods, or in any combination of these methods. These methods include the following:
 - 1. Proprietary
 - 2. Descriptive
 - 3. Performance
 - 4. Compliance with Reference Standards

Compliance with codes, compliance with graphic details and similar provisions of the Contract Documents also have a bearing on the review and approval outcome.

- B. Procedures for Selecting Products: Contractor's options in selecting products are limited by requirements of the Contract Documents and governing regulations. They are not controlled by industry traditions or procedures experienced by the Contractor on previous construction projects.

2.02 SUBSTITUTIONS

- A. Conditions: Contractor's request for substitution will be received and considered when extensive revisions to the Contract Documents are not required, when the proposed changes are in keeping with the general intent of the Contract Documents, when the request is timely, fully documented and properly submitted, and when one or more of the following conditions is satisfied, all as judged by the Engineer; otherwise the requests will be returned without action except to record non-compliance with these requirements.
 1. The Engineer will consider a request for substitution where the request is directly related to an "or equal" clause or similar language in the Contract Documents.
 2. The Engineer will consider a request for substitution where the specified product or method cannot be provided within the Contract Time. However, the request will not be considered if the product or method cannot be provided as a result of the Contractor's failure to pursue the work promptly or to coordinate the various activities properly.
 3. The Engineer will consider a request for substitution where the specified product or method cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 4. The Engineer will consider a request for a substitution where a substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include such considerations as additional compensation to the Engineer for redesign and evaluation services, the increased cost of other work by the Owner or separate contractors, and similar considerations.
 5. The Engineer will consider a request for substitution when the specified product or method cannot be provided in a manner which is compatible with other materials of the work, and where the Contractor certifies that the substitution will overcome the incompatibility.
 6. The Engineer will consider a request for substitution when the specified product or method cannot be properly coordinated with other materials in the work, and where the Contractor certifies that the proposed substitution can be properly coordinated.
 7. The Engineer will consider a request for substitution when the specified product or method cannot receive a warranty as required by the Contract Documents and where the Contractor certifies that the proposed substitution receive the required warranty.
 8. The Contractor shall reimburse the Owner any costs for review by the Engineer of proposed product substitutions which require major design changes, as determined by the Owner, to related or adjacent work made necessary by the proposed substitutions.
- B. Work-Related Submittals: Contractor's submittal of and the Engineer's acceptance of shop drawings, product data or samples which relate to work not complying with requirements of the Contract Documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

2.03 GENERAL PRODUCT REQUIREMENTS

- A. General: Provide products that comply with the requirements of the Contract Documents and that are undamaged and, unless otherwise indicated, unused at the time of installation. Provide products that are complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
1. Standard Products: Where they are available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 2. Continued Availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced products for which the manufacturer has published assurances that the products and its parts are likely to be available to the Owner at a later date.

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

- A. General: Except as otherwise indicated in individual sections of these Specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at Time of Acceptance.

END OF SECTION

SECTION 01731 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the work or to make its parts fit together properly.
- C. The Contractor shall not damage or endanger any portion of the Work or the Work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation.
- D. Any cutting of existing structures or facilities shall be approved in advance by Owner or Engineer. Approval shall not impact Contractor's full liability for any damage caused.

1.02 QUALITY ASSURANCE

- A. Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.

1.03 WARRANTY

- A. Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials, to the extent practicable.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the functional performance of existing materials.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

3.02 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.

- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

3.03 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

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. Engineer shall immediately notify Contractor, in writing, stating reasons.
2. Contractor: Complete work, and send second written certification to 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. Engineer 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. Engineer 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 USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 02100

CLEARING, GRUBBING, AND SITE PREPARATION

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. Includes all labor, material, and equipment required for the complete execution of the proposed construction work as shown on the Drawings and specified herein.
- B. Principal items of work include:
 - 1. Notifying all authorities owning utility lines running to or on the property. Protecting and maintaining all utility lines to remain and capping those that are not required in accordance with instructions of the Utility Companies, and all other authorities having jurisdiction.
 - 2. Clearing the site within the Temporary Construction Easement, including removal of grass, brush, shrubs, trees, loose debris and other encumbrances except for trees marked to remain.
 - 3. Boxing and protecting all trees, shrubs, lawns and the like within areas to be preserved. Relocating trees and shrubs, so indicated on the Drawings, to designated areas.
 - 4. Repairing all injury to trees, shrubs, and other plants caused by site preparation operations shall be repaired immediately. Work shall be done by qualified personnel in accordance with standard horticultural practice and as approved by the Engineer.
 - 5. Removing topsoil to its full depth from designated areas and stockpiling on site where approved by the Engineer for future use.
 - 6. Disposing from the site all debris resulting from work under this Section.

1.02 STREET AND ROAD BLOCKAGE

- A. Closing of streets and roads during progress of the work shall be in compliance with the requirements of the Owner and other authorities having jurisdiction. Access shall be provided to all facilities remaining in operation.

1.03 PROTECTION OF PERSONS AND PROPERTY

- A. All work shall be performed in such a manner to protect all personnel, workmen, pedestrians and adjacent property and structures from possible injury and damage.
- B. All conduits, wires, cables and appurtenances above or below ground shall be protected from damage.

- C. Provide warning and barrier fence where shown on the Drawings and as specified herein.

PART 2 -- EXECUTION

2.01 CLEARING OF SITE

- A. Before removal of topsoil, and start of trenching for utility installation, the areas within the Temporary Construction Easement shall be cleared and grubbed.
- B. Clearing shall consist of cutting, removal, and satisfactory disposal of all trees, fallen timber, brush, bushes, rubbish, sanitary landfill material, fencing, and other perishable and objectionable material within the areas to be excavated or other designated areas.
- C. Excavation resulting from the removal of trees, roots and the like shall be filled with suitable material, as approved by the Engineer, and thoroughly compacted to ensure stability.
- D. Unless otherwise shown or specified, the Contractor shall clear and grub a strip at least 15 ft. wide along all permanent fence lines installed under this Contract.
- E. In temporary construction easement locations, only those trees and shrubs shall be removed which are in actual interference with excavation or grading work under this Contract, and removal shall be subject to approval by the Engineer. However, the Engineer reserves the right to order additional trees and shrubs removed at no additional cost to the Owner, if such, in their opinion, are too close to the work to be maintained or have become damaged due to the Contractor's operations.
- F. All clearing and grubbing is incidental to this pay item unless specifically called out in the plans.

2.02 STRIPPING AND STOCKPILING EXISTING TOPSOIL

- A. Existing topsoil and sod on the site within areas designated on the Drawings shall be stripped to whatever depth it may occur and stored in locations directed by the Engineer.
- B. The topsoil shall be free of stones, roots, brush, rubbish, or other unsuitable materials before stockpiling the topsoil.
- C. Care shall be taken not to contaminate the stockpiled topsoil with any unsuitable materials.

2.03 GRUBBING

- A. Grubbing shall consist of the removal and disposal of all stumps, roots, logs, sticks and other perishable materials to a minimum depth of 6-inches below ground surfaces.
- B. Large stumps located in areas to be excavated may be removed during grading operations, subject to the approval of the Engineer.

2.04 DISPOSAL OF MATERIAL

- A. All debris resulting from the clearing and grubbing work shall be disposed of by the Contractor as part of the work of this Contract. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed by the Engineer for reuse in this Project or removal by others.
- B. Burning of any debris resulting from the clearing and grubbing work will not be permitted at the site.

2.05 WARNING AND BARRIER FENCE

- A. The fence shall be made of a visible, lightweight, flexible, high strength polyethylene material. The fence shall be MIRASAFE as manufactured by Mirafi, Inc., or equal.
- B. Physical Properties

Fence:

Color:	International Orange
Roll Size:	4' x 164'
Roll weight:	34 lbs.
Mesh opening:	1-1/2" x 3"

Posts:

ASTM Designation:	ASTM 702
Length:	5 feet long (T-Type)
Weight:	1.25 #/Foot (min)
Area of Anchor Plate:	14 Sq. In.

- C. Drive posts 12 to 18 inches into ground every 10' to 12'. Wrap fence material around first terminal post allowing overlap of one material opening. Use metal tie wire or plastic tie wrap to fasten material to itself at top, middle and bottom. At final post, cut with utility knife or scissors at a point halfway across an opening. Wrap around and tie at final post in the same way as the first post.
- D. Use tie wire or tie wrap at intermediate posts and splices as well. Thread ties around a vertical member of the fence material and the post, and bind tightly against the post. For the most secure fastening, tie at top, middle and bottom. Overlap splices a minimum of four fence openings, tie as above, fastening both edges of the fence material splice overlap.

- END OF SECTION -

SECTION 02222

EXCAVATION

PART 1 - GENERAL

1.01 SCOPE

- A. The work described by this Section consists of furnishing all labor, materials, equipment and supplies as required to construct launching and exit shafts associated with tunnel construction.
- B. Work shall be done in strict accordance with the Contract Documents, and in accordance with all Federal, State and local laws, regulations, and requirements.
- C. All available and known geotechnical reports, logs, borings, and laboratory testing performed within close proximity of the project corridor have been made available as "technical data" and are not part of the Contract Documents. This is provided as information only and solely for the convenience of Bidders. The Owner and/or the Engineer do not warrant or guarantee the accuracy or correctness of this material with respect to actual subsurface conditions. Subsurface conditions are considered unclassified and no expectation of quantity, specific location of ground conditions, or geotechnical baselines are provided or assumed herein.
- D. For all shafts defined under this Section, Contractor shall excavate and support of excavation using techniques and methods selected by the Contractor that are appropriate for prevailing ground conditions. Contractor shall review all available geotechnical reports and data and perform any additional subsurface investigations they deem necessary at their own expense for the planning and the selection of shaft construction techniques and methods in order to enable proper construction as shown on the Drawings and other requirements of the Contract Documents.
- E. Shaft installation techniques and methods of construction shall include all equipment, materials, and selection of associated support of excavation best suited for ground conditions, as required to maintain face stability, reduce wear, advance heading within line and grade tolerances, transport spoils, and accomplish productivity assumed in Bid.
- F. Where warranted in the experience of the Contractor or where identified on the Drawings, ground modification shall be provided as part of the appropriate preparation for tunneling activities to reduce risk of surface settlement and heaving, protect nearby structures and utilities, and successfully install the piping system within line and grade tolerances. Contractor shall design and include in their Bid the furnishing of all labor, equipment, materials, and supplies necessary for ground stabilization by jet grouting, compaction grouting, void filling, soil mixing, slurry walls or other ground modification technologies to meet project objectives specified herein.
- G. Dewatering shall be controlled such that the launching and exit shafts are free of water, but the surrounding groundwater table is not substantially lowered such that settlement along the tunnel drive or nearby existing structures and foundations does not occur.
- H. The Contractor shall furnish all labor, equipment, and material required to complete the work including but not limited to the following:

1. Initial support system and all related components.
 2. Spoil transportation, removal, and disposal.
 3. Safety and security.
 4. Hoisting and lifting.
 5. Control equipment and required power.
 6. Launching and exit shafts construction including, but not limited to, rehandling and disposal of unsuitable and excess materials, control of groundwater and surface water, utility adjustment/supports, tests, excavation, sheeting and shoring, shaft wall thrust blocking, backfilling, cleanup, and restoration of surface features, and all other work necessary for construction as specified and/or shown on the Drawings.
- I. Follow all OSHA regulations regarding tunnel construction including but not limited to OSHA 29 CFR Part 1926. Obtain all permits required associated with OSHA regulations and requirements for confined space entry.
 - J. Conform with all requirements of the Kentucky Transportation Cabinet (KYTC) for work within their rights-of-way.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02225 – Excavation, Backfilling and Compaction for Sewers
- B. Section 02441 – Tunneling by Slurry Microtunnel Boring Machine
- C. Section 02442 – Tunneling by Tunnel Boring Machine
- D. Section 02444 – Tunneling by Pipe Jacking with Shield Method
- E. Section 02445 – Utility Hand Tunneling
- F. Section 02446 – Tunneling by Guided Bore and Jack Method
- G. Tunneling Method Table in Project Specific Notes (PSN)

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 1. Applicable codes, ordinances, statutes and governing rules and regulations of governing municipalities and counties, the Commonwealth of Kentucky, and the Federal Government.
 2. American Association of State Highway and Transportation Officials (AASHTO).

3. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.
4. Occupational Safety and Health Administration (OSHA) Regulations and Standards for Underground Construction 29 CFR Part 1926, subpart S and other applicable OSHA parts.
5. Applicable ASTM and AWWA Standards for materials and methods.
6. Kentucky Transportation Cabinet (KYTC) Permit Guidance Manual
7. All applicable guidelines and restrictions of the United States Army Corps of Engineers (USACE) and Department of Environmental Protection (DEP).

1.04 DEFINITIONS

- A. Unless otherwise stated or context otherwise requires, the definitions and provisions contained in this section shall govern the construction, meaning, and application of words and phrases utilized in this specification. For purposes of this specification, the following terms are defined as follows:
1. Exit Shaft or Retrieval Shaft: Shaft utilized for retrieval of tunneling equipment.
 2. Ground Modification: soil stabilization by jet grouting, compaction grouting, void filling, soil mixing, slurry walls, or other ground stabilization technologies to meet project objectives specified herein.
 3. Support of Excavation: The support system selected, designed and installed by Contractor to support launching shafts, exit shafts, and rescue shafts.
 4. Launching Shaft or Entrance Shaft: Shaft utilized at the start of the tunneling operation.
 5. Rescue Shaft: Shaft utilized to access tunneling equipment for repair or removal of obstruction.
 6. Spoil: Excavated soil and bedrock material that has been generated by the shaft construction process.

1.05 DESIGN CRITERIA

- A. The Contractor is responsible for the design, installation, maintenance and safety of the shaft's excavation and its support of excavation. All design calculations provided by the Contractor as part of the required submittals shall be sealed by a Licensed Professional Engineer registered in the Commonwealth of Kentucky.

1.06 SUBMITTALS

- A. Conform to Section 01300 – Submittals.
- B. Detailed shaft construction methodology sufficient to convey the following:
1. Proposed method of shaft excavation and support of excavation system

2. Drawings and design details for launching and exit shafts, indicating number required, proposed spacing, criteria for installing, and method of operation.
 3. Number and duration of shifts planned to be worked each day in accordance with restrictions on work hours.
 4. Sequence of work/operations.
 5. Procedures for handling, control and disposal of surface water, and groundwater inflow.
 6. Method of spoil transportation, surface storage, and disposal location. A description indicating the locations of material disposal sites and releases from property owners.
 7. Survey methods and proposed procedures for alignment and grade control.
 8. Identification of critical utility crossings and special precautions proposed.
- C. Ground Modification Plan: Contractor shall design and submit proposed ground modification strategies for review and acceptance including soils stabilization methods and surface settlement prevention plan for areas adjacent to shafts.
- D. Ventilation Plan. Provide shaft ventilation plan. Ventilation plan to include a written description, calculations, drawings, fan curves, and manufacturer's catalogue cut sheets. Ventilation plan shall be designed by a competent person with at least five (5) years of recent on-the-job experience on similar projects, involving shafts of similar size constructed by similar methods. Provide qualifications of Designer.
- E. Settlement Monitoring Plan and Site Assessment:
1. Submit a settlement monitoring plan for review prior to construction. The plan shall be in accordance with Article 3.03.
- F. Daily Reports. A shift log shall be maintained on a daily basis by Contractor. Submit reports no later than 24 hours after the end of the shift to the Engineer. Daily reports shall include at a minimum the following:
1. Details of shaft excavation progress.
 2. Hours worked per shift, equipment and materials used, and the duration of different activities performed.
 3. Groundwater control operations, groundwater inflow location and rates.
 4. Observation of any lost ground or other ground movement.
 5. Any unusual conditions or events.
 6. Reasons for operational shutdown whenever construction is halted.
 7. Air quality reports for dust, toxic and hazardous gases, and other atmospheric impurities in the working environment.

- G. Record Drawings: Maintain at construction site a complete set of field drawings for recording of as-built conditions. All marks and notes shall be dated and thorough.
- H. Permits: The Contractor shall be responsible for executing the requirements of permits obtained from the KYTC, United States Army Corps of Engineers, and any State and local authority where the project is located. The Contractor shall be responsible for any phase submittals required by the permits. All submittal information required by the project permits shall be channeled through the Engineer.

1.07 QUALIFICATIONS

- A. The Contractor or Subcontractor performing shaft construction must demonstrate in writing that he has requisite past project experience constructing shafts similar to those for this Project.
- B. The Contractor or Subcontractor shall have the following minimum experience related to shaft construction:
 - 1. A minimum of five (5) years of experience performing utility tunneling with shafts of similar size.
 - 2. Three (3) tunnel projects with shafts of similar size and depth completed within the last 10 years.

1.08 QUALITY ASSURANCE

- A. Work shall be supervised by at least one (1) person with five (5) years of recent previous experience in shaft and tunnel construction. Experience shall be in a minimum of five (5) previous tunneling projects of similar size and scope.
- B. All shaft excavation and support operations shall be performed under the supervision of experienced shift foremen with at least five (5) years of recent on-the-job supervision experience on similar projects involving shafts of similar size constructed using similar methods.
- C. Operators shall be experienced in shaft excavation and support with prior knowledge and ability to properly operate the systems being employed. All operators shall have minimum of five (5) years' experience on shaft construction of similar size.

1.09 PRE-INSTALLATION MEETING

- A. At least three weeks prior to commencing the work of this section, convene a Pre-Installation Meeting at the job site to be attended by:
 - 1. Contractor and any sub-contractor performing any related work.
 - 2. Project Owner.
 - 3. Engineer.
 - 4. Any other pertinent stakeholders.
- B. Meeting shall cover settlement monitoring, work hours, safety, staging and storage of materials, schedule, any changes to on-site staff from original Work Plan submittal,

permitting, and the development of record drawings, etc. to ensure successful implementation of all requirements of this specification during shaft construction.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall accept material on site and inspect for damage.
- B. The Contractor shall handle, support and store materials to prevent injury or damage.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Conduct operations to not interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.
- B. Conduct operations to not interfere with roadway traffic, except with prior approval by the Kentucky Transportation Cabinet (KYTC) (where applicable), Lexington-Fayette Urban County Government, and the Owner.
- C. Provide temporary facilities to prevent erosion of disturbed construction area in accordance with the approved Erosion & Sedimentation Control Plan and Contract Documents.
- D. Maintain existing stormwater flow patterns or submit measures to temporarily bypass in accordance with the Erosion & Sedimentation Control Plan and Contract Documents.

1.12 COORDINATION

- A. Coordinate work with local, State, and Federal authorities and utility owners to avoid interference with or damage to existing facilities in or adjacent to construction areas.

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 shall be in serviceable conditions.
- B. Structural Steel: ASTM A 36.
- C. Steel Sheet Piles: ASTM A 328.
- D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal three inches thick.
- E. Portable Steel Trench Box shall be OSHA approved.

PART 3 – EXECUTION

3.01 PROJECT SITE CONDITIONS

- A. Shaft construction shall not begin until the following have been completed:

1. Required submittals have been made and the Engineer has reviewed and accepted all submittals.
 2. Notify the Owner and Engineer at least 14 days before beginning any excavation.
 3. Installation of ground modification, if required.
 4. Groundwater control, if required.
 5. A Safety Officer has been designated and prepared a Health and Safety Plan in accordance with OSHA requirements for tunnel construction. The Safety Officer shall have held safety meetings and provided safety instruction for new employees as required by OSHA.
 6. Pre-Installation Meeting has been held and all comments have been addressed from the meeting.
 7. Settlement monitoring system is in place and pre-construction readings have been provided to the Engineer.
 8. Pre-construction survey documents have been submitted to the Engineer.
- B. Perform shaft construction to the extent indicated on the Drawings so as not to interfere with, interrupt or endanger surface activity thereon, and minimize subsidence of surface, structures, and utilities. Roadway, utilities, and/or structures damaged by shaft construction operations shall be repaired or replaced as necessary to restore them to their condition prior to beginning shaft construction in a timely manner, unless otherwise directed by the Engineer, at no additional cost to Owner.
- C. Furnish all necessary equipment, power, water, and utilities for shaft construction, removal and disposal of spoil, grouting, and other associated work required for the Contractor's methods of construction.
- D. Promptly clean up, remove, and dispose of all spoil.
- E. Furnish all maintenance of traffic and establish and maintain all safety procedures on any highways whose thoroughfare is interrupted due to the tunneling operation.
- F. Inspect the locations where shaft construction will be conducted, verify conditions under which the work will be performed, and provide all necessary details, whether shown or specified on the Drawings or not, for the orderly prosecution of the Work.

3.02 PREPARATION

- A. Existing utilities shown on Drawings are shown for general information only. Contractor shall verify locations, sizes, and configurations of existing utility systems within potential conflict of installation operations.
- B. Complete any required testing, inspection, surveying, etc., of any existing utilities required by the Contract Documents.

- C. Call Local Utility Line Locate Service (811) not less than five working days before performing Work.
- D. Request underground utilities to be located and marked within and surrounding the construction areas.
- E. Locate, identify, and protect utilities indicated to remain from damage.
- F. Protection
 - 1. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.
 - 2. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic. Repair or replace all items damaged during construction.
 - 3. Repair or replace structures raised more than 0.50-inch due to shaft construction operations including pavement and sidewalk.
- G. Ventilation
 - 1. Furnish and operate a temporary ventilation system and air monitoring system in accordance with the approved ventilation plan and conforming to the requirements of OSHA at all times that personnel are present in the shaft. Operate and maintain a ventilation system that provides a sufficient supply of fresh air and maintains an atmosphere free of toxic or flammable gases in all underground work areas.
 - 2. Before any personnel enters the shaft, the air quality must be tested and verified that the OSHA requirements pertaining to air quality are met or exceeded.
- H. Barricades
 - 1. Protect shafts and other open excavations with barricades and security fencing as indicated on the Drawings and with additional measures approved by the Engineer and Owner as required to prevent unauthorized personnel from accessing.
 - 2. During non-work hours, isolate with additional measures approved by the Engineer and Owner as required to prevent unauthorized personnel from accessing.
 - 3. Remove equipment daily from vehicular and pedestrian roads, sidewalk, and pathways not contained within the direct work area to permit access and use by public.

3.03 SETTLEMENT MONITORING

- A. The Contractor will be held solely responsible for damages to highway and street surfaces, railroads, pavements, structures, structural embankments, sidewalks, curbing, and public utilities resulting from subsidence, failure of support of excavation system, or ground losses and for the refilling of voids with grout. Where

such ground losses are so severe that they result in damage to surface pavement, existing utilities or structures, the Contractor shall be solely responsible for remedying such damage.

- B. As a minimum, surface monitoring points shall be established consisting of settlement markers to detect surface movement of roadways and pavements.
- C. Survey the site showing locations and elevations of existing ground, pavement, and other permanent features to establish a baseline for existing conditions adjacent to each shaft. All surveying performed for settlement monitoring shall be performed by a Professional Land Surveyor licensed in the Commonwealth of Kentucky at the Contractor's expense.
- D. Surface settlement marks:
 - 1. Surface settlement markers shall be located adjacent to each shaft as designed by the Contractor and approved by the Engineer.
- E. All markers/points shall be surveyed as follows:
 - 1. Prior to beginning any work.
 - 2. Every 24 hours by the licensed surveyor during shaft construction.
 - 3. At the completion of shaft construction.
 - 4. The same points shall also be surveyed 90 days after the work is completed and both shafts have been backfilled.
- F. Ground Surface Movement:
 - 1. Shaft construction shall be performed to prevent settlement and loss of ground.
 - 2. Unless more stringent requirements are set forth by third party agencies, settlement of the ground surface shall not exceed 0.25-inch.
 - 3. If the ground subsidence exceeds 0.25-inch, shaft construction operations shall stop, and remedial measures approved by the Engineer shall be implemented.
 - 4. If any movement or settlement occurs which causes or might cause damage to an existing structure over, along or adjacent to the work, immediately stop any or all work except that which assists in making the work secure and in preventing further movement, settlement, or damage. Resume shaft construction only after all necessary precautions have been taken to prevent further movement, settlement, or damage, and repair the damage at the Contractor's expense and to the satisfaction of the Engineer.
- G. Lateral Displacements: Unless more stringent requirements are set forth by third party agencies, lateral movement or deflection of shaft excavation support system shall be limited to 0.50-inch.

- H. Report any settlement or movement immediately to the Engineer and applicable agency and take immediate remedial action.

3.04 GROUNDWATER CONTROL

- A. Intercept and divert surface drainage, precipitation, and groundwater away from shaft excavations through use of dikes, curb walls, ditches, pipes, sumps, or other means within the conditions permitted by the approved Erosion & Sedimentation Control Plan and the Contract Documents.
- B. Develop substantially dry shaft subgrades for prosecution of subsequent tunneling operations.
- C. Shaft subgrades shall be kept continuously free from ground and surface waters during tunneling operations. Dewatering shall be controlled such that the launching and exit shafts are free of water, but the surrounding groundwater table is not substantially lowered.
- D. Keep removal of soil particles to a minimum.
- E. Water discharge from dewatering operations shall be directed into approved receiving basins or silt bags in accordance with all applicable regulatory requirements and the approved Erosion & Sedimentation Control Plan.
- F. Should settlement or displacement be detected, notify the Engineer and applicable agency immediately and act to maintain safe conditions and prevent damage.

3.05 GROUND MODIFICATION PRIOR TO SHAFT CONSTRUCTION

- A. Ground modification grout requirements are set forth in Section 02431 – Tunnel Grout.
- B. The use of jet grouting, compaction grouting, void filling, soil mixing, slurry walls, permeation grouting, compensation grouting, ground freezing, or other ground modification technologies shall be carefully considered by the Contractor to safely permit Contractor's selected shaft construction method in loose and flowable soils or in rock that is fractured with joints, bedding planes, shears, or fault zones beneath the groundwater table. Contractor shall determine if ground modification is needed to maintain a stabilized shaft excavation by Contractor's selected means of excavation and be fully responsible for the determination of the necessity, selection, design, and implementation of ground modification strategies.
- C. Ground modification strategies shall be designed to work in concert with Contractor's selected shaft excavation methods and implemented as needed to increase bearing capacity, provide settlement control, reduce permeability, and increase stand-up time at the face within the shaft, and shall be included in the Bid.
- D. Contractor shall furnish all labor, equipment, materials, and supplies necessary for ground modifications required to meet project objectives specified herein.

3.06 EQUIPMENT

- A. Contractor shall employ shaft excavation and support equipment capable of handling the various anticipated ground conditions and which minimize loss of ground and

allow for satisfactory support of the excavation.

- B. Fire Suppression: Contractor shall furnish, install, and maintain a fire suppression system in accordance with the General Conditions, and all local, State and Federal requirements.

3.07 SHAFT EXCAVATION AND INSTALLATION OF SUPPORT OF EXCAVATION

- A. Shaft excavation shall remain within the easements and rights-of-way indicated on the Drawings, and to the lines and grades shown on the Drawings.
- B. Contractor shall be responsible for developing procedures to support the ground in a safe manner, for maintaining stability of the ground, and for safety during excavation and support installation. Contractor's method shall ensure full bearing of the ground against the support of excavation without significant settlement or movement of the surrounding ground.
- C. Keep the excavation braced or otherwise supported where required to prevent falls, excessive raveling, or erosion. Maintain standby supports for immediate use when needed.

3.08 SPOIL TRANSPORT AND DISPOSAL

- A. Transport and dispose of all excavated materials properly away from the construction site. Shaft spoil and muck shall be disposed of at legal disposal facilities and proof of such disposal shall be provided to the Engineer.

3.09 VENTILATION

- A. Perform all shaft construction operations by methods and with equipment which will positively control dust, fumes, vapors, gases, fibers, fogs, mists, and other atmospheric impurities in accordance with OSHA safety requirements.

3.10 CONTROL OF ALIGNMENT

- A. Establish benchmarks and survey control points. Benchmarks and control points shall be established by a licensed surveyor registered in the Commonwealth of Kentucky at the Contractors expense.
- B. Verify benchmarks prior to start of construction and report any errors or discrepancies to the Engineer.
- C. When satisfied that all benchmarks are correct, use these benchmarks to furnish and maintain all reference lines and grades for shaft construction. Submit to the Engineer copies of field notes used to establish all lines and grades and allow the Engineer to check set up prior to beginning shaft construction. The Contractor remains fully responsible for the accuracy of the work and the correction of it, as required.
- D. Benchmark Movement. Contractor shall ensure that if settlement of the ground surface occurs during construction which affects the accuracy of the temporary benchmarks, Contractor shall detect and report such movement and reestablish temporary bench marks.

3.11 REPORTS

- A. Maintain and submit daily activity reports in accordance with Article 1.06.F

3.12 SITE AND WORK SAFETY

- A. Comply with applicable regulations of Federal Government, OSHA 29CFR 1926, and applicable criteria of ANSI A 10.16 "Safety Requirements for Tunnels, Shafts, and Caissons", as amended to date.
- B. Safety is the sole responsibility of the Contractor.

3.13 SITE RESTORATION

- A. Site restoration shall be in accordance with the Drawings and applicable sections of these Specifications.
- B. At the conclusion of all tunneling operations, remove excavation support systems for launching and exit shafts. If withdrawal should damage or disturb the roadway subgrade, leave supports in place and cut off five (5) feet below finished grade unless otherwise directed by Engineer.

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 Limestone
- C. Backfill Stone: No. 9 Crushed Limestone

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Trenching may be accomplished by means of a backhoe, trenching machine, hydro-excavation or by hand depending on the construction area. At the Contractor's option, trenching by a trenching machine or by backhoe is acceptable.
- 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 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 Sheet piling - Bracing and sheet piling 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. As backfill is placed, the sheet piling shall be withdrawn in increments not exceeding one (1) foot and the void left by the withdrawn sheet piling shall be filled and with #9 stone.
 - 3. The Engineer will not be responsible for determining requirements for bracing or sheet piling.

3.02 TRENCHING

- A. General:
 - 1. The Contractor shall perform all excavation of every description and of whatever

substances encountered, including clearing over the pipeline route. All excavations for the pipeline shall be open-cut except where noted for bore and jack.

B. Trench Width:

1. Trench widths shall be in accordance with LFUCG Standard Drawings.
2. **Contractor shall submit a shop drawing that includes a certification from the pipe manufacturer stating the recommended trench width for each pipe size and material being used.**

C. Trench Depth:

1. The trench shall be excavated to a minimum of six (6) inches below pipe grade as noted on LFUCG Standard Drawings.

3.03 BLASTING AND EXPLOSIVES

A. If rock removal by blasting methods is used, blasting must comply with Federal, State, and Local Regulations and National Codes on the purchase, transportation, storage, and use of explosive material. Codes include, but are not limited to the following:

1. Storage, security, and accountability: Bureau of Alcohol, Tobacco, and Firearms (BATF): 27 CFR Part 181.
2. Shipment: DOT, 49 CFR Parts 171-179, 390-397.
3. Safety and Health: OSHA 29 CFR Part 1926, Subpart U.
4. Transportation and Storage: NFPA 495, Chapters 3 through 6.
5. Kentucky Department of Mines and Minerals code for explosive disintegration of rock.

B. The Contractor must complete the following before explosives are brought to site:

1. Obtain all required permits from authorities having jurisdiction, with copies to Owner.
2. Obtain Blasting and Liability insurance in accordance with Kentucky Department of Highway requirements. A copy of the Declaration of Insurance shall be provided to the Owner.
3. Complete preblast survey with signed copy to Owner.

C. Preblast survey

1. A preblast survey is to be of such quality to determine whether blasting operations damaged structures. Preblast survey shall utilize video, still images and report forms to document each structure. Video with audible description of observations shall be used to observe general conditions of each structure and to note specific damage that exists to structure prior to blasting. Still images shall be utilized to supplement video as needed to document specific conditions of each structure. Report form shall document date of survey, and who was present during survey. Forms shall also be utilized to supplement video as to the conditions of structures. Existing damage such as cracked foundations, brick facade, and etc. shall have reference object such as a scale in image or video. Audio commentary of cracked foundations, brick facades, etc. shall denote width of cracks. The Contractor shall submit three copies of video, still images, and pdf copies of report forms on CD's.
2. A preblast survey is required for all structures and utilities within a 500 foot radius of the blasting area.
3. At least thirty (30) days before initiation of blasting, the Contractor shall notify, in writing, all residents or owners of dwellings or other structures located within 500 feet of the blasting area advising that they will have a preblast survey performed. Contractor to maintain records of notifications and responses to be submitted to the Engineer.

3.04 FORCE MAIN BEDDING

- A. Refer to LFUCG Standard Drawings.
- B. The trench shall be excavated to a depth to allow a minimum of 36 inches cover over the top of the pipe.

3.05 FORCE MAIN BACKFILLING (N/A)

3.06 GRAVITY SEWER PIPE BEDDING

- A. Refer to LFUCG Standard Drawings.

3.07 GRAVITY SEWER PIPE BACKFILLING

- A. Refer to LFUCG Standard Drawings.

3.08 INSTALLING IDENTIFICATION TAPE

- A. Marking tape is not required for gravity sewers.
- B. 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
- C. 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.

PART 2 - PRODUCTS (NOT USED)

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.
- 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.
- D. 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 below the base of the excavation during all stages of construction operations.
- E. No groundwater from the excavated area shall be discharged into the sanitary sewer system.
- F. Dewatering shall be in accordance with all state and local regulations/permits/plans.
- G. Trench shall be dewatered as required and never shall the trench accumulate groundwater to a depth that will cause pipe to float.

END OF SECTION

SECTION 02371 - STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

PART 1 - GENERAL

1.01 GENERAL

- A. The Contract Documents include a SWPPP that has been approved by LFUCG Division of Water Quality. This SWPPP shall be used for establishing quantities and a lump sum price for providing the Erosion and Sediment Control Measures.
- B. The Contractor may use this SWPPP to obtain the required permits, i.e. Land Disturbance Permit. If Contractor chooses to use this SWPPP, the Contractor takes sole responsibility for the content of the SWPPP and the implementation of the SWPPP during construction.
- C. Contractor may also choose to prepare its own SWPPP and submit to LFUCG Division of Water Quality for approval. No additional payment will be allowed for the Erosion and Sediment Control and conformance with SWPPP pay item.

CONSTRUCTION SITE STORMWATER POLLUTION PREVENTION PLAN

This Stormwater Pollution Prevention Plan (SWPPP) narrative and the attached plan sheets address requirements of the Kentucky Division of Water KYR10 General Permit and the Lexington-Fayette Urban County Government's Erosion and Sediment Control (ESC) Plan, which is required for an LFUCG Grading Permit.

Plan Preparer: Douglas K. Mynear, CPESC, PE, 859.233.2103, dmynear@engrsvices.com

Date: August 31, 2018 **LFUCG Checklist and KY DOW NOI Attached:** No

1. CONTACT INFORMATION AND SITE DESCRIPTION

Project Name and Location

Lansdowne South Trunk Sewer Replacement
Lexington, KY 40517

Site Owner Name and Contact Information

Lexington-Fayette Urban County Government Division of Water Quality
125 Lisle Industrial Avenue Lexington, KY 40511
859.425.2400
cthacher@lexingtonky.gov

Construction Site SWPPP/BMP Plan Manager and Contact Information

Name:
Company:
Address:
Phone:
Email:

Project Start and End Dates

Start:
End:

Description - Existing Site Conditions, Purpose, and Types of Soil Disturbing Activities

The existing site extends from Belleau Wood Park on the downstream end through residential neighborhoods upstream. Soils existing along the corridor are a mixture of silt loams and silty clays with good drainage. Permeability is moderate to moderately rapid. The project area starts downstream adjacent to West Hickman Creek and generally follows along the Wilson Downing tributary of West Hickman Creek proceeding upstream. No threatened or endangered species or historical sites were found on the property.

This project will consist of the replacement of existing 15-inch trunk sewer with larger capacity pipes. The new sewer will consist of approximately 2,400 feet of 24-inch sewer and 2,000 feet of 24-inch sewer. Soil disturbing activities will include: initial clearing and grubbing; installing

stabilized construction entrances, installing downgradient silt fence and other erosion and sediment controls; grading; excavation for the sewer trunk line; reconstruction of parking areas; and preparation for final seeding and landscaping.

Runoff Coefficient

Current Runoff Coefficient = 0.30 – 0.50; Final Runoff Coefficient= 0.30 – 0.50

Site Area and Disturbed Acreage

The site is approximately 4.05 acres, of which 4.05 acres will be disturbed by construction activities.

Sequence at Major Activities

Construction Activity	Schedule Considerations
Work crew orientation	Pre-project briefing to review permits, plans, schedule and staffing.
Construction access - initial construction routes, initial areas designated for vehicle parking.	This is the first land-disturbing activity. Downgradient silt fences will be installed below areas to be cleared, grubbed, graded, or cut/filled. Do-not-disturb areas will be marked off.
Sediment traps and barriers - basins, traps, sediment fences, outlet protection	ID locations and install temporary sediment traps as needed to intercept flow. Build basins prior to upgradient work where possible and seed/mulch/blanket slopes immediately. Relocate and reinstall silt fences as necessary prior to upgradient work. Maintain and remove sediment as necessary.
Runoff and run-on controls - diversion ditches or berms, perimeter dikes	Install controls as need to divert clean flows around or through site. Key practices will be installed after the installation of principal sediment traps and before land grading. Additional runoff control measures may be installed during grading.
Land clearing and grubbing- site preparation (cutting, filling, and grading, sediment traps, barriers, diversions, drains, surface roughing)	Clearing and grubbing will begin after installation of principal sediment and runoff control measures, and additional control measures will be installed as grubbing continues. Trees and buffer areas will be marked for preservation.
Sewer system construction - excavation, sewer installation and trench backfill	Backfilled trenches and surrounding disturbed areas will be graded and prepared for revegetation.

<p>Surface stabilization - temporary and permanent seeding, mulching, sodding, riprap</p>	<p>All disturbed areas will be graded and stabilized as soon as possible. Stabilization will begin within 14 days on areas of the site where construction has permanently or temporarily ceased. Temporary and permanent stabilization will comply with the Stormwater Manual. Erosion control blankets and turf reinforcement mats will be used on slopes in accordance with the Stormwater Manual.</p>
<p>Repaving of disturbed parking lots and driveways</p>	<p>Parking lots and driveways disturbed during the construction of the sanitary sewer will be reconstructed. All erosion control devices will remain in service during this phase of work.</p>
<p>Landscaping and final stabilization - topsoiling, trees and shrubs, permanent seeding, mulching, sodding</p>	<p>This is the last construction phase. All remaining disturbed areas will be stabilized, including borrow and spoil areas. Temporary control structures will be removed, and the area will be seeded and mulched.</p>

2. SITE DRAWINGS (ATTACHED)

Site Plan Showing Pre/Post Construction Topography, Construction, Drainage Features, and all BMPs Name of Receiving Waters

The sewer corridor follows along and drains to the Wilson Downing Tributary of West Hickman Creek. The Wilson Downing Tributary drains to West Hickman Creek near the downstream terminus of the project. Lawn and open areas along the sewer corridor will be graded to drain to the adjacent stream.

TMDLs and Pollutants of Concern in Receiving Waters

West Hickman Creek is listed on the 2016 Kentucky impaired waters (303d) list. No threatened and endangered species are present in West Hickman Creek downstream from the project discharge.

Potential Sources of Pollutants

Unspecified urban stormwater; fecal coliform; nutrient/eutrophication biological indicators; organic enrichment biological indicators; sediment/siltation.

3. EROSION PREVENTION AND SEDIMENT CONTROL MEASURES

Limits of Disturbance and Project Phasing

Without exception, no more than 2.00 acres will be disturbed at any one time. If additional acres of disturbed area exist on the site, no new disturbed areas will be created until previously disturbed areas are temporarily or permanently stabilized on an acre-for-acre basis. Land disturbance activities will be phased to minimize the amount of soil exposed and the length of exposure time. The overall objective will be to achieve final grades as quickly as possible, and to stabilize all areas with seed, mulch or blankets/mats within 14 days after final grade is achieved, or after grading work is suspended on that portion of the site.

Stabilization Practices

Temporary Stabilization - Top soil stockpiles and disturbed portions of the site where construction activity stops for 14 days or more will be stabilized with temporary seed or straw mulch no later than 14 days from the last construction activity in that area (portion) of the site. Seeding rates will be consistent with the Kentucky Erosion Prevention and Sediment Control Field Guide Lime and fertilizer will be applied only when necessary. After seeding, each area shall be mulched with at least 3,000 pounds per acre of blown or hand-scattered straw. The straw will be netted down or crimped into place by a disk harrow with the blades set straight. Slopes greater than 3:1 will be covered with blankets or mats consistent with the LFUCG Stormwater Manual. Areas of the site which are to be paved will be temporarily stabilized by applying geotextile and stone sub-base until bituminous pavement can be applied. Dust will be controlled by water sprayed from a tanker truck as needed during dry weather.

Permanent Stabilization - Disturbed portions of the site where construction activities are

completed will be stabilized with permanent seed no later than 14 days after completion of grading in that area. Seed and mulch will be applied consistent with the Kentucky Erosion Protection and Sediment Control Field Guide. Lime and fertilizer will be applied only if needed. After seeding, each area will be mulched with 4,000 pounds per acre of straw. The straw mulch will be netted down or crimped into place by a disk harrow with blades set straight. Slopes will be covered with erosion control blankets or turf reinforcement mats consistent with the LFUCG Stormwater Manual. Ditches will be triple-seeded and lined with erosion control blanket or turf reinforcement matting.

Structural Practices

Sediment Traps - will be sited and constructed as needed, according to the attached drawings and through field adaptations to changing grades and emergence of gullies that need to be controlled. Traps will consist of rock or rock bag berms across concentrated flow areas and be designed to intercept, detain, and settle out these flows. Traps installed as field adaptations will be logged on the erosion control plan sheets.

Inlet Protection Measures - will be used to detain, pond, and settle (or filter) out sheet and concentrated flows moving toward curb, drop, or other inlets. Inlet protection structures will consist of rock bags, #2 rock berms, trenched in silt fence on framing, or commercial devices.

Outlet Protection Measures - will be used where culverts discharge to ditches or channels, and consist of turf reinforcement matting over triple seeding, erosion control blanket over triple seeding, or channel lining, depending on the scour flows and consistent with the Kentucky Division of Water's BMP Technical Specifications Manual.

Ditch Check Dams - will be installed as needed to control ditch downcutting, trap sediment, and stabilize ditches. Check dam installation will be consistent with the Kentucky Erosion Protection and Sediment Control Field Guide and BMP Technical Specifications Manual.

Site Runoff Management

Sediment will be prevented from leaving the site to the maximum extent practicable. Silt fences will be constructed downgradient from construction areas to trap/retain sediment prior to entering drainage paths existing on the site. Runoff will be diverted onto undisturbed vegetated areas and revegetated areas where possible for infiltration.

Landscaped areas will be brought to grade and planted/seeded/mulched within 14 days. When construction is complete the entire site will drain to existing drainage features.

4. OTHER CONTROL MEASURES

Offsite Vehicle Tracking

A stabilized #2 and larger rock construction exit with geotextile underliner will be installed to help reduce vehicle tracking of sediments at all exits onto paved roads. The stabilized exit will be 100 ft. where possible, and at least 50 ft. in length. The paved street adjacent to the site entrance will be swept/cleaned daily if necessary to remove any excess mud, dirt, or rock tracked from the site. The rock exit will be grubbed lightly or otherwise maintained as needed to clear (shake down) dry mud. Dump trucks hauling material from the construction site will

be covered with a tarpaulin.

Waste Disposal

Waste Materials - All waste materials that may leach pollutants (caulk tubes, oil/grease containers, liquids of any kind, soluble materials, etc.) will be collected and stored in a covered metal dumpster rented from a local licensed solid waste management company in Lexington. The dumpster will meet all Lexington and state solid waste management regulations. Construction debris and other wastes that do not leach pollutants will be deposited in a covered or open-topped dumpster. The dumpster will be emptied when full, and the contents will be hauled to the Lexington Landfill. No construction waste materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer and the individual who manages the day-to-day site operations, will be responsible for seeing that these procedures are followed.

Hazardous Waste - All waste materials will be disposed of in the manner specified by local or state regulation or by the manufacturer. Site personnel will be instructed in these practices, the individual who manages day-to-day site operations, will be responsible for seeing that these practices are followed.

Sanitary Waste - Portable toilets will be used on site for sanitary wastes. All sanitary waste will be collected from the portable units as needed to prevent excessive odors and overflows by a licensed Lexington sanitary waste management contractor, as required by local regulation. Portable units will be placed away from storm drain inlets, ditches, creeks, and other water bodies.

Timing of Control Measures

As indicated in the Sequence of Major Activities, the stabilized construction exit, earthen diversion berm, and silt fences / sediment barriers will be constructed prior to clearing or grading of any other portions of the site.

Sediment traps will be constructed as needed in areas where gullying occurs.

Ditches will be built and triple seeded/mulched (or blanketed) after construction. Areas where construction activity temporarily ceases for more than 14 days will be stabilized with temporary seed and/or mulch within 14 days of the last disturbance. Once construction activity ceases permanently in an area, that area will be seeded and mulched within 14 days. Temporary controls in permanently stabilized areas, such as silt fences, sediment barriers, ditch checks, temporary sediment traps, etc., will be *removed*. Controls will remain in place until all vegetation is established and ditches are stable.

5. OTHER STATE AND LOCAL PLANS

Certification of Compliance with Federal, State, and Local Regulations

This Stormwater Pollution Prevention Plan (BMP Plan) reflects Kentucky Division of Water and LFUCG requirements for stormwater management and erosion and sediment control, as established in LFUCG ordinances. To ensure compliance, this plan was prepared in accordance

with the Kentucky BMP Planning and Technical Specifications Manual published by KY DOW and KY DOC and the LFUCG Stormwater Manual. Corps of Engineers 404 and KY Division of Water 401 Permits have already been approved for this project.

6. MAINTENANCE PROCEDURES

Stormwater, Erosion, and Sediment Control Maintenance Practices

Maintenance of all BMPs at the site will be handled by a person who has been trained on construction site BMPs at workshops sponsored by the KY DOW and the Kentucky Erosion Protection and Sediment Control (KEPSC) Program. Other workers on-site will be trained in BMP installation, maintenance, and good housekeeping. These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls:

Less than ½ of the site or 1.5 acres, whichever is less, will be cleared of vegetation at one time; areas at final grade will be seeded and mulched within 14 days. All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of being reported. This information will be logged on the SWPPP/BMP Plan.

Silt fences will be inspected for bypassing, overtopping, undercutting, depth of sediment, tears, and to ensure attachment to secure posts. Bypasses will be repaired immediately.

Built-up sediment will be removed from behind the silt fence before it has reached halfway up the height of the fence.

Diversion dikes and berms will be inspected, and any breaches promptly repaired. Areas that are eroding or scouring will be repaired and re-seeded/ mulched as needed.

Temporary and permanent seeding and mulching will be inspected for bare spots, washouts, and healthy growth. Bare or eroded areas will be repaired as needed.

7. INSPECTION PROCEDURES

Stormwater, Erosion, and Sediment Control Inspection Practices

Inspection of all BMPs at the site will be handled a person who has been trained on inspecting construction site BMPs at workshops sponsored by the KY DOW and the Kentucky Erosion Protection and Sediment Control (KEPSC) Program.

All erosion prevention and sediment control measures will be inspected at least once each week and following any rain of one-half inch or more. Inspections will be conducted by a person who has been trained by the KY DOW and KEPSC. This individual will train three people who will be responsible for assisting in the inspections and installing, maintaining, and repairing the controls on the site.

Inspection reports will be written, signed, dated, and kept on file for two years.

8. NON-STORMWATER DISCHARGES

It is expected that the following non-storm water discharges will occur from the site

during the construction period:

Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred).
Uncontaminated groundwater and rain water (from dewatering during excavation).

All non-storm water discharges will be directed to a filter bag, or filter fence enclosure in a flat vegetated infiltration area prior to discharge, to remove sediment and other contaminants.

The materials or substances listed below are expected to be present onsite during construction:

Concrete
Detergents
Tar

Fertilizers
Petroleum Based Products
Cleaning Solvents
Wood

Spill Prevention and Material Management Practices

The following material management practices will be used to reduce the risk of spills or other accidental exposure of materials and substances to exposure to the weather and/or runoff.

Good Housekeeping

The following good housekeeping practices will be followed onsite during the construction project. An effort will be made to store only enough product required to do the job

- Products and materials will be stored away from the surface drainage system;
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure;
- Products will be kept in their original containers with the original manufacturer's label;
- Substances will not be mixed with one another unless recommended by the manufacturer. Whenever possible, all of the product will be used up before disposing of the container;
- Manufacturers' recommendations for proper use and disposal will be followed;
- The site superintendent will inspect daily to ensure proper used and disposal of materials onsite. Dust will be controlled by water sprayed from a tanker truck as needed during dry weather.

Hazardous Products

These practices will be used to reduce the risks associated with any and all hazardous materials.

- Products will be kept in original containers unless they are not resealable;
- Original labels and material safety data sheets (MSDS) will be reviewed and retained;
- If surplus product must be disposed of, manufacturers' or state/local recommended methods for proper disposal will be followed.

Petroleum Products

All onsite vehicles will be fueled and maintained off-site, monitored for leaks, and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products stored onsite (oil, gas, etc.) will be stored in lightly sealed containers, which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers

If used, fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be covered with mulch or blankets or worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially

used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Concrete Truck Washout

Concrete truck mixers and chutes will not be washed on pavement, near storm drain inlets, or within 75 feet of any ditch, stream, wetland, lake, or sinkhole. Where possible, excess concrete and wash water will be discharged to areas prepared for pouring new concrete, flat areas to be paved that are away from ditches or drainage system features, or other locations that will not drain off site. Where this approach is not possible, a constructed wash basin lined with plastic sheeting will be installed away from ditches to receive the wash water. Washout locations are indicated on the attached drawings.

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturers' recommended methods for spill cleanup will be clearly posted. All personnel will be made aware of procedures and the location of the information and cleanup supplies;
- Materials and equipment necessary for spill cleanup will be kept in the material storage area. Equipment and materials will include but not limited to brooms, dust pans, mops, rags, gloves, kitty litter, sand, sawdust, and plastic and metal trash containers.

All spills will be cleaned up immediately after discovery.

- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance;
- Spills of toxic or hazardous material will be reported to the appropriate state/local agency. The spill prevention plan will be adjusted as needed to prevent spills from reoccurring and improve spill response and cleanup;
- The site superintendent responsible for the day-to-day site operations will be the spill prevention and cleanup coordinator. He will designate at least three other people onsite to receive spill prevention/cleanup training and assist in cleanups. Their names will be posted in the material storage area and in the office trailer outside.

9. CONTRACTOR AND SUBCONTRACTOR CERTIFICATIONS

SWPPP Files, Updates, and Amendments

This SWPP Plan and related documents (e.g., NOI, inspection reports, US ACE permits, etc.) will be kept on file at the construction site by the Site Manager. The SWPPP will be updated by the Owner and/or Site Manager to reflect any and all significant changes in site conditions, selection of BMPs, the presence of any unlisted potential pollutants on site, or changes in the Site Manager, contractor, subcontractors, or other key information. Updates and amendments will be made in

writing within 7 days and will be appended to the original BMP Plan and available for review.

Stormwater Pollution Prevention Plan 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 gathered and evaluated 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, 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.

Signed: _____

Date: _____

I certify under penalty of law that I understand the terms and conditions of the general KPDES permit that authorizes the storm water discharges associated with the construction site activity identified as part of this certification.

Subcontractor Certification

The subcontractors below certify under penalty of law that they understand the terms and conditions of the general KPDES permit that authorizes the storm water discharges associated with the construction site activity identified as part of this certification.

SECTION 02372 - EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, and equipment required for installing, maintaining, amending, and removing temporary soil erosion, sediment, and pollutant controls as shown in the Stormwater Pollution Prevention Plan (SWPPP) and as specified herein and as required by the LFUCG Land Disturbance Permit, Chapter 16-Article X, Division 5 of the LFUCG Code of Ordinances, and the KPDES General Permit for Stormwater Discharges Associated with Construction Activities (KYR10).
- B. The Contractor shall take all site management measures necessary to minimize erosion and contain sediment, construction materials (including excavation and backfill), and pollutants (such as chemicals, fuels, lubricants, bitumen, raw sewage, and other harmful waste) and prevent them from being discharged into or alongside any body of water or into natural or man-made channels leading thereto.
- C. 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.
- D. 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.
- E. 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.
- F. 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.
- G. Prior to construction, the Contractor shall obtain a LFUCG Land Disturbance Permit and shall obtain coverage under the KPDES General Permit for Stormwater Discharges Associated with Construction Activities (KYR10) (see Article 3.24 in this Section). The Contractor shall be responsible for placement of pollutant, erosion, and sedimentation controls as shown in the Stormwater Pollution Prevention Plan (SWPPP) prior to excavation, fill or grade work. If during the course of construction, the state and/or LFUCG determine additional controls are required, the Contractor shall furnish, install and maintain additional mulch, blankets, sediment barriers, and/or other controls as necessary to control pollution, erosion, and sedimentation to the satisfaction of the regulatory agency.
- H. The Contractor shall inspect and repair all erosion and sedimentation controls as follows:
 1. At least once every seven (7) calendar days, and
 2. Within 24 hours after any storm event of 0.5 inch or greater.
- I. Final stabilization practices on those portions of the project where construction activities have permanently ceased shall be initiated within fourteen (14) days of the date of cessation of

construction activities. Temporary stabilization practices on those portions of the project where construction activities have temporarily ceased shall be initiated within fourteen (14) days of the date of cessation of construction activities.

- J. **Erosion and Sediment Control prevention measures shall be installed prior to removal of vegetation and/or stripping of topsoil.** The Contractor is responsible for preparing and submitting the state Notice of Intent and attachments and obtaining state permit approval prior to the beginning of any construction activities.

1.02 PERMITS AND NOTIFICATION REQUIREMENTS

- A. The Contractor is responsible to prepare a Stormwater Pollution Prevention Plan (SWPPP) for inclusion with permit submittals. The Contractor may elect one of the following options to meet this requirement:
1. Utilize the SWPPP (which includes the Erosion and Sediment Control Plan) provided in the Construction Drawings and prepared by the Owner's Engineer and take sole responsibility for implementing the SWPPP, or
 2. Provide a SWPPP, including an Erosion and Sediment Control Plan, prepared by a professional engineer licensed in the Commonwealth of Kentucky, meeting all of the requirements of KYR10 and Chapter 16-Article X, Division 5 of the LFUCG Code of Ordinances.
- B. The Contractor shall submit a Notice of Intent specifically for Construction Activities (NOI-SWCA) before beginning any site disturbance, and shall implement erosion, sediment and pollution 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 prior to beginning of construction activity. **See Article 3.24 in this Section for detailed requirements.**
- C. A Land Disturbance Permit shall be obtained from the Lexington-Fayette Urban County Government. **See Article 3.25 in this Section for detailed requirements.**
- D. The Contractor shall comply with all additional requirements of LFUCG. 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. Section 02371 – Storm Water Pollution Prevention Plan (SWPPP)
- B. Section 02373 – Stream Crossings, Streambank Restoration, and Stream Buffer Restoration
- C. Applicable LFUCG Storm Water Manual Standard Drawings are included at the end of this Section 02372.

PART 2 – PRODUCTS

2.01 MULCH

- A. Mulch shall be used as a soil stabilization measure for any disturbed area inactive for 14 days or longer. Areas requiring stabilization during December through February shall receive only mulch held in place with bituminous material. Mulching shall be used whenever permanent or temporary seeding is used. The anchoring of mulch shall be in accordance with the Construction Drawings except all mulch placed in December through February shall be

anchored with bituminous materials regardless of the slope. Permanent mulches shall be used in conjunction with planting trees, shrubs, and other ground covers that do not provide adequate soil stabilization.

- B. Straw shall come from wheat, rye, or barley and may be spread by hand or machine. Straw shall be anchored. Straw shall be applied at two tons per acre or 90 pounds per 1,000 square feet. Straw shall be free from weeds and coarse matter.
- C. Wood chips do not require tacking. Wood chips shall be applied at 270 cubic yards per acre or 6 cubic yard per 1,000 square feet and approximately 2 inches deep. Wood chips shall be treated with 20 pounds of nitrogen per acre or shall be treated with 12 pounds slow-release nitrogen per ton to prevent nutrient deficiency in plants.
- D. Bark chips or shredded bark shall be applied at 70 cubic yards per acre or 1.5 to 2 cubic yards per 1,000 square feet and about one-half inch thick. Bark does not require additional nitrogen fertilizer.
- E. Manufacturer's recommendations shall be followed during application of manufactured wood fiber and recycled paper sold as mulch materials applied in a hydroseeder slurry with binders/tackifiers. Recycled paper (newsprint) or wood fiber shall be mixed at 50 pounds per 100 gallons of water and applied according to manufacturer's recommendations and model of hydroseeder in use.
- F. Liquid mulch binders/tackifiers shall be applied according to manufacturer's recommendations. Chemical soil stabilizers or soil binders/tackifiers/emulsions shall not be used alone.
- G. Netting and mats shall be used in critical areas such as waterways where concentrated flows are expected.
- H. Before the gravel or crushed stone is applied, it shall be washed. Aggregate cover shall only be used in relatively small areas and shall be incorporated into an overall landscaping plan.

2.02 TEMPORARY SEED

- A. Temporary seeding shall be used for soil stabilization when grades are not ready for permanent seeding, except during December through February. The seed shall be applied within 14 days after grading has stopped. Only rye grain or annual rye grass seed shall be used for temporary seeding.

2.03 PERMANENT SEED

- A. Permanent seeding shall be applied within 14 days after final grade has been reached, except during December through February. Permanent seeding shall also be applied on any areas that will not be disturbed again for a year even if final grades have not been reached. The use of mulch and erosion matting and netting with permanent seeding shall be in accordance with applicable sections of this Specification. "Seed mats" may be used for permanent seeding in accordance with manufacturers' recommendations.
- B. Permanent seeding shall be used on disturbed areas where permanent, long-lived vegetative cover is needed to stabilize the soil and on rough graded areas that will not be brought to final grade for one year or more.
- C. The area to be seeded shall be protected from excess runoff as necessary with diversions, grassed waterways, terraces, or sediment ponds.
- D. Contractor shall use the following Permanent Seed Mix, with the following exceptions:

- a. If a property owner landscaping agreement differs from this specification, the property owner landscaping agreement shall be followed on that property, or
- b. The area to be seeded is within 25 feet of a stream bank, in which case Contractor shall follow the seed mix provided in Section 02373, or
- c. The Construction Drawings identify a different seed mix.

The Permanent Seed Mix shall consist of the following mix spread at a rate of 12.5 pounds/1,000 square feet:

Common Name	%	lbs per 1,000 sq. ft.
Bluegrass	24%	3
Perennial ryegrass (turf)	16%	2
+ bluegrass	20%	2.5
Tall fescue (turf type)	32%	4
+ bluegrass	8%	1
TOTAL	100%	12.5

- E. Vegetative cover alone shall not be used to provide erosion control cover and prevent soil slippage on a soil that is not stable due to its structure, water movement, or excessive slope.
- F. Permanent seeding may be done at any time except December through February.
- G. Soil material shall be capable of supporting permanent vegetation and have at least 25 percent silt and clay to provide an adequate amount of moisture holding capacity. An excessive amount of sand will not consistently provide sufficient moisture for good growth regardless of other soil factors.
- H. Fertilizer shall be applied at a rate of 800 pounds per acre of 10-10-10 analysis or equivalent, unless soil test results indicate a different rate is appropriate. Lime shall be applied at a rate of 100 pounds per 1,000 square feet or two tons per acre of agricultural ground limestone, unless soil test results indicate differently.

2.04 SOD

- A. Sod shall be used for disturbed areas that require immediate vegetative cover, e.g., the area surrounding a drop inlet in a grassed waterway, the design flow perimeter of a grassed waterway that will convey flow before vegetation can be established, and the inlet of a culvert. Sod may be installed throughout the year. "Seed mats" and seed with geotextiles may be used in place of sod when done in accordance with manufacturers' recommendations.
- B. Contractor shall use tall fescue sod, unless another species is specified in the Construction Drawings or unless the property owner landscaping agreement differs from this specification.
- C. Sod shall not be used to provide erosion control and prevent soil slippage on a soil that is not stable due to its structure, water movement, or excessive slope.
- D. Sod shall be installed within 36 hours of digging and removal from the field. Sod should not be used on slopes steeper than 2H:1V. If it is to be mowed, installation should be on slopes no greater than 3H:1V.

- E. Soil material shall be capable of supporting permanent vegetation and shall consist of at least 25 percent silt and clay to provide an adequate amount of moisture holding capacity. An excessive amount of sand will not consistently provide sufficient moisture for the sod regardless of other soil factors.
- F. Fertilizer shall be applied at a rate of 1,000 pounds per acre of 10-10-10 analysis or equivalent, unless soil test results indicate a different rate is appropriate. Lime shall be applied at a rate of 100 pounds per 1,000 square feet or two tons per acre of agricultural ground limestone, unless soil test results indicate differently.
- G. The sod shall consist of strips of live, vigorously growing grasses. The sod shall be free of noxious and secondary noxious weeds and shall be obtained from good, solid, thick-growing stands. The sod shall be cut and transferred to the job in the largest continuous pieces that will hold together and are practical to handle.
- H. The sod shall be cut with smooth, clean edges and square ends to facilitate laying and fitting. The sod shall be cut to a uniform thickness of not less than three-fourth inch measured from the crown of the plants to the bottom of the sod strips for all grasses except bluegrass. Bluegrass sod shall be cut to a uniform thickness of not less than one and one-half inches.
- I. The sod shall be mowed to a height of not less than two inches and no more than four inches prior to cutting.
- J. The sod shall be kept moist and covered during hauling and preparation for placement on the sod bed.

2.05 ROAD/PARKING STABILIZATION

- A. Gravel or paved material shall be used to stabilize permanent roads or parking areas or roads or parking areas used repeatedly by construction traffic. Stabilization shall be accomplished within 14 days of grading or initiation of use for construction traffic. Unstabilized roads are not acceptable except in instances where the road will be used less than one month.
- B. Road/parking stabilization shall be used wherever roads or parking areas are constructed, whether permanent or temporary, for use by construction traffic.
- C. Stabilization shall be accomplished with a minimum depth of six inches of crushed stone. Stabilized construction roadbeds shall be at least 14 feet wide for one-way traffic and at least 20 feet wide for two-way traffic.
- D. Temporary roads shall follow the contour of the natural terrain to the extent possible. Slopes shall not exceed 10 percent.
- E. Temporary parking areas shall be located on naturally flat areas to minimize grading. Grades shall be sufficient to provide drainage but shall not exceed 4 percent.
- F. All cuts and fills shall be 2H:1V or flatter.
- G. Drainage ditches shall be provided as needed.
- H. Crushed stone shall be KYTC aggregate No. 2 (1.5 to 3 inches in diameter), or equivalent.

2.06 CONSTRUCTION ENTRANCE

- A. A stabilized construction entrance shall be constructed wherever vehicles are leaving a construction site to enter a public road or at any unpaved entrance/exit location where there

is a risk of transporting mud or sediment onto paved roads. A construction entrance shall be constructed at the beginning of the project before construction traffic begins to enter and exit the site.

- B. A stabilized construction entrance shall be constructed of crushed stone a minimum of 6 inches thick laid over geotextile (filter fabric).
- C. The width shall be at least 20 feet and as wide as the entire width of the access. At sites where traffic volume is high, the entrance shall be wide enough for two vehicles to pass safely. The length shall be at least 50 feet, and where practical, shall be extended to 100 feet. The entrance shall be flared where it meets the existing road to provide a turning radius.
- D. Stormwater and wash water runoff from a stabilized construction entrance shall drain to a sediment trap or sediment pond. If conditions on the site are such that the majority of the mud is not removed by the vehicles traveling over the gravel, then the tires of the vehicles shall be washed before entering a public road.
- E. Pipe placed under the entrance to handle runoff shall be protected with a mountable berm.
- F. Dust control shall be provided in accordance with the applicable sections of this Specification.
- G. Crushed stone shall be KYTC aggregate No. 2 (1.5 to 3 inches in diameter), or equivalent.
- H. Geotextile filter fabric shall be KYTC Type III.

2.07 DUST CONTROL

- A. Dust control measures shall be implemented on the site.
- B. Construction activities shall be phased to minimize the total area unstabilized at any given time, thereby reducing erosion due to air and water movement.
- C. Construction roads shall be watered as needed to minimize dust.
- D. Existing trees, shrubs, and ground cover shall be retained as long as possible during the construction. Initial land clearing should be conducted only in those areas to be regraded or where construction is to occur. Areas to be cleared only for new vegetation or landscaping shall be stabilized with seed and mulch immediately following clearing.
- E. Vegetative cover is the most effective means of dust and erosion control, when appropriate. See sections on Temporary Seed, Permanent Seed, Mulch, and Sod of this Specification.
- F. When areas have been regraded and brought to final grade, they shall be stabilized using temporary or permanent seed and mulch or other measures.
- G. Mulch with mulch binders may be used as an interim dust control measure in areas where vegetation may not be appropriate.
- H. See sections on Temporary Seed, Permanent Seed, Sod, Mulch, Road/Parking Stabilization, and Construction Entrance of this Specification.

2.08 NETS AND MATS

- A. Mulch netting, erosion control matting, or turf reinforcement matting (TRM) shall be used on sloping areas as indicated in the Construction Drawings. Mats or nets and permanent seeding may be used as an alternate to sod for culvert entrances and grassed waterways.

TRMs shall be used at the water line to control wave action in wet ponds. TRMs shall be used in accordance with manufacturer's recommendations. Erosion control matting may be used to stabilize channels and swales and on recently planted slopes to protect seedlings until they become established.

- B. Effective netting and matting shall require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.
- C. Nets and mats shall be suitable for their intended purpose and shall be as indicated in the Construction Drawings.

2.09 TEMPORARY DIVERSION DITCH

- A. Temporary diversion ditches shall be used to collect sediment-laden runoff from disturbed areas and direct it to a sediment pond where applicable. Temporary ditches are those expected to be in use for less than one year. Temporary diversion ditches do not require stabilization, unless otherwise indicated on the Construction Drawings.
- B. Temporary diversion ditches shall have stable outlets. The combination of conditions of site, slopes, and soils should be so that the ditch can be maintained throughout its planned life.
- C. Temporary diversion ditches shall not be constructed below high sediment-producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with or before the diversion.
- D. A typical diversion cross section consists of a channel and a supporting ridge. In the case of an excavated-type diversion, the natural ground serves as the diversion ridge. Diversion cross sections shall be adapted to the equipment that will be used for their construction and maintenance.
- E. The channel may be parabolic or trapezoidal in shape. V-shaped ditches shall not be constructed.
- F. Diversions shall be located so that water will empty onto an established area such as a stable watercourse, waterway, or structure.
- G. Any high sediment-producing area above a diversion shall be controlled by good land use management or by structural measures to prevent excessive sediment accumulation in the diversion channel.
- H. Temporary diversions above steep slopes or across graded rights-of-way shall have a berm with a minimum top width of 2 feet, side slopes of 2:1 or flatter and a minimum height of 18 inches measured from the channel bottom.
- I. Diversions installed to intercept flow on graded rights-of-way shall be spaced 200 to 300 feet apart.
- J. A level lip spreader shall be used at diversion outlets discharging onto areas already stabilized by vegetation.

2.10 LEVEL SPREADER

- A. Level spreaders shall be constructed at the outlets of temporary diversion ditches. Level spreaders shall also be constructed at outlets of permanent constructed waterways where they terminate on undisturbed areas.

- B. The length of the level spreader shall be constructed as shown on the Construction Drawings.

2.11 PERMANENT CONSTRUCTED WATERWAY

- A. Permanent constructed waterways shall be used to divert stormwater runoff from upland undisturbed areas around or away from areas to be disturbed during construction. A waterway expected to be in place for at least one year shall be considered permanent. Permanent waterways shall be lined with sod or permanent seeding and nets, mats, or TRMs.

2.12 PIPE SLOPE DRAIN

- A. Pipe slope drains shall be used whenever it is necessary to convey water down a steep slope, which is not stabilized or which is prone to erosion, unless paved ditch (flume) is installed.
- B. Contractor shall use a 10-inch diameter pipe or larger to convey runoff from areas up to one-third acre; 12-inch or larger pipe for up to half-acre drainage areas; and 18-inch pipe for areas up to one acre, unless otherwise specified in the Construction Drawings. Multiple pipes shall be required for large areas, spaced as shown on the Construction Drawings.
- C. The pipe shall be heavy duty flexible tubing designed for this purpose, e.g., non-perforated, corrugated plastic pipe, or specially designed flexible tubing.
- D. A standard flared end section or a standard T-section fitting secured with a watertight fitting shall be used for the inlet.
- E. Extension collars shall be 12-inch long sections of corrugated pipe. All fittings shall be watertight.

2.13 IMPACT STILLING BASIN

- A. Impact stilling basins shall be used at the outlet of culverts and storm sewers with calculated exit velocities greater than 15 feet per second when flowing full.

2.14 CHECK DAM

- A. Check dams shall be limited to use in small, open channels that drain 10 acres or less.
- B. Check dams shall not be used in streams.
- C. Check dams can be constructed of stones, coir logs, or wood fiber logs.
- D. Check dams shall be constructed prior to the establishment of vegetation.
- E. The maximum height of a check dam shall be three feet above the ground on which the rock is placed.
- F. The center of the portion of the check dam above the flat portion of the channel shall be at least 1 foot lower than the outer edges. The outer edges of the check dam shall extend up the side slopes of the channel to a point 3 feet in elevation above the center portion of the check dam or to the top of the side slopes.
- G. The maximum spacing between rock check dams in a ditch should be such that the toe of the

upstream dam is at the same elevation as the top of the next downstream dam.

- H. The spacing of coir and wood fiber check dams is one log every 100 feet for velocities of 5 fps, 50 feet for velocities between 5 and 7.5 fps, and 25 feet for velocities greater than 10 fps, unless otherwise shown in the Construction Documents.
- I. Stone check dams shall be constructed of KYTC Class II channel lining.
- J. Coir log or wood fiber log check dams shall be constructed of a single log with a diameter of at least 20 inches.

2.15 SEDIMENT TRAP

- A. Sediment traps shall be installed below all disturbed areas of less than 5 acres that do not drain to a sediment pond.
- B. Erosion control practices such as seeding, mulching, sodding, diversion dikes, etc., shall be used in conjunction with sediment traps to reduce the amount of sediment flowing into the trap. The amount of sediment entering a trap can be reduced by the use of stabilized diversion dikes and ditches.
- C. The trap shall not be located in a stream. It shall be located to trap sediment-laden runoff before it enters the stream.
- D. Trap depth shall be at least 2 feet at the inlet and 4 feet at the outlet. Effective trap width shall be at least 10 feet and trap length shall be at least 30 feet.
- E. The Construction Drawings shall indicate the final disposition of the sediment trap after the upstream drainage area is stabilized. The Construction Drawings shall indicate methods for the removal of excess water lying over the sediment, stabilization of the pond site, and the disposal of any excess material.

2.16 SEDIMENT POND

- A. A sediment pond shall be installed at the outlet of a disturbed area of 5 acres or more. The maximum drainage area for a single pond is 100 acres.
- B. Design and construction shall comply with all federal, state, and local laws, ordinances, rules, and regulations regarding dams.
- C. Erosion control practices such as seeding, mulching, sodding, diversion dikes, etc., shall be used in conjunction with sediment ponds to reduce the amount of sediment flowing into the pond.
- D. The pond shall not be located in a stream. It shall be located to trap sediment-laden runoff before it enters the stream.
- E. Contractor shall construct the sediment pond as shown on the Construction Drawings.
- F. Permanent ponds designed for stormwater detention or water quality treatment may serve as temporary sediment ponds if site conditions make the use of these structures desirable. At the time of conversion from a sediment pond to a permanent stormwater management pond, excess sediment shall be cleaned from the pond. If the pond is converted to a water quality basin, the sand in the sand filter outlet shall be replaced with clean sand unless it is shown to be clean.
- G. The Construction Drawings shall indicate the final disposition of the sediment pond after the

upstream drainage area is stabilized. The Construction Drawings shall indicate methods for the removal of excess water lying over the sediment, stabilization of the pond site, and the disposal of any excess material.

- H. Vegetation shall be established upon completion of construction of the embankment, emergency spillway and other areas disturbed by construction.

2.17 SILT FENCE

- A. Silt fence shall be installed down-slope of areas to be disturbed prior to clearing and grading. Silt fence shall be situated such that the total area draining to the fence is not greater than one-fourth acre per 100 feet of fence. Silt fence shall be used for storm drain drop inlet protection and around soil stockpiles.
- B. Under no circumstances shall silt fences be constructed in streams or in swales or ditch lines or any area of concentrated flow where discharge rates are likely to exceed 1 cubic foot per second (cfs).
- C. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, and polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to the following requirements:

<u>PHYSICAL PROPERTY</u>	<u>REQUIREMENTS</u>
Filtering Efficiency	80% (minimum)
Tensile Strength at 20%	50 lbs./linear inch (minimum)
Flow Rate	0.3 gal./ sq. ft/ min. (minimum)

- D. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0°F to 120°F.
- E. Posts for synthetic fabric silt fences shall be either 2-inch by 2-inch wood or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts shall have projections for fastening wire to them.
- F. Wire fence reinforcement for silt fences shall be a minimum of 36 inches in height, a minimum of 14 gauge and shall have a mesh spacing of no greater than 6 inches.

2.18 STORM DRAIN INLET PROTECTION

- A. Storm drain inlet protection may be utilized on drop inlets and curb inlets.
- B. Storm drain inlet protection shall only be used around drop inlets when the up-slope area draining to the inlet has no other or inadequate sediment control.
- C. The drainage area shall be no greater than 1 acre.
- D. The inlet protection device shall be constructed in a manner that will facilitate cleanout and disposal of trapped sediment and minimize interference with construction activities.
- E. Inlet protection devices shall be constructed in such a manner that any resultant ponding of stormwater will not cause flooding or excessive inconvenience or damage to adjacent areas, roadways, properties, or structures.
- F. Inlet protection devices are low flow filter devices, and as such shall be constructed in such a manner as to allow for higher flows to bypass into the storm drain system to prevent flooding of the roadway or downstream properties.

2.19 FILTER STRIP

- A. Filter strips shall be used on each side of permanent constructed channels.
- B. Filter strips shall only be used to remove sediment from overland flow. Filter strips are not effective in removing sediment from concentrated flows.
- C. If vegetative filters are proposed as a sediment control device and they do not already exist, they shall be planted and established prior to initiating land disturbing activities.
- D. The minimum filter strip width shall be 50 feet for streams, wetlands, and sinkholes. The minimum filter strip width shall be ten feet for constructed waterways.
- E. Where a post development floodplain or wet weather conveyance is being protected, filter strips shall be provided on each side. When a wetland or sinkhole is being protected, filter strips shall be provided around the perimeter.
- F. Contractor shall construct the filter strips as shown on the Construction Drawings.
- G. Existing grass or grass/legume mixtures used as filter strips shall be dense and well established, with no bare spots. When establishing new seeding, consideration shall be given to wildlife needs and soil conditions on the site. The following chart provides a list of alternative grass and grass/legume mixtures:

SEEDING MIXTURE AND SITE SUITABILITY CHART

Seeding Mixture	Rate lbs/acre	Soil Suitability
Alfalfa <i>Or</i> Red Clover <i>Plus</i> Timothy <i>Or</i> Orchardgrass <i>Or</i> Bromegrass	6 10 4 6 6	Well Drained
Ladino <i>Plus</i> Timothy <i>Or</i> Orchardgrass <i>Or</i> Bromegrass	.05 4 6 8	Wet or Well-Drained

Notes:

- 1. All seeding shall be in accordance with the seeding sections of this Specification.
- 2. Well drained sites include sites that are drained with tile as well as naturally well drained and droughty sites. Wet sites include sites that are excessively wet only a portion of the growing season.

2.20 STREAM CROSSING

- A. Stream crossings shall be used in cases where construction traffic, permanent traffic, or utilities must cross existing post development floodplains. If the drainage area exceeds 1 square mile and a structure is necessary, the structure must be designed by a professional engineer licensed in Kentucky, and shall be considered a permanent structure.
- B. Temporary stream crossings are applicable to flowing streams with drainage areas less than one square mile. Temporary stream crossings shall be planned to be in service for the shortest practical period of time and to be removed as soon as their function is completed.
- C. All such structures, whether temporary or permanent, are subject to the rules and regulations of the U.S. Army Corps of Engineers for in-stream modifications (404 Permitting) and the Kentucky Division of Water (401 Certification). No stream crossing shall be installed without first obtaining all applicable local, state, and federal permits.

Where culverts are to be installed, compacted soil or rock shall be used to form the crossing. The depth of soil or rock cover over the culvert shall be equal to one-half the diameter of the culvert or 12 inches, whichever is greater. The sides of the fill shall be protected from erosion using the mulching and seeding erosion control measures specified in this Specification.

- D. All stream crossings shall be constructed in such a manner as to avoid flooding or excessive inconvenience or damage to adjacent areas, roadways, properties, or structures.
- E. When using a culvert crossing, the top of a compacted earth fill shall be covered with six inches of KYTC No. 57 stone.
- F. KYTC No. 57 stone shall also be used for the stone pads forming the crossing approaches.

2.21 PUMP AROUND FLOW DIVERSION

- A. A pump-around flow diversion shall be used to divert flow around construction activities occurring in a stream when those activities are reasonably expected to cause the erosion of sediment or deposition of sediment in the stream.
- B. Check dams to form the diversion shall span the banks of the stream. Maintain 1-foot freeboard (minimum) on the upstream and downstream checks.
- C. Check dams may be constructed of sandbags or may be a water-filled bladder such as an Aqua-Barrier.
- D. The dewatering flow from the work area shall be treated in a sediment-trapping device prior to discharge to the stream.
- E. Sandbags shall be woven polypropylene bags with approximate dimensions of 18-1/2 inches by 28 inches. Contractor shall tie the ends of filled bags closed using either draw strings or wire ties.

2.22 CONSTRUCTION DEWATERING

- A. Sediment-laden water shall be pumped to a dewatering structure before it is discharged.

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 Associated with 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.
- D. 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 shall be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regrading and reseedling shall be accomplished with 14 days after disturbance.

3.02 MULCH

- A. Seed shall be applied prior to mulching except where seed is to be applied as part of a hydroseeder slurry containing mulch.
- B. Lime and fertilizer shall be incorporated and surface roughening accomplished as needed prior to mulching in accordance with applicable sections of this Specification.
- C. Mulch materials shall be spread uniformly by hand or mechanically so the soil surface is covered. During or immediately following application, the mulch shall be anchored or otherwise secured to the ground according to one of the following methods:
 - 1. Mechanical – Use a disk, crimper, or similar type tool set straight to punch or anchor the mulch material into the soil.
 - 2. Mulch Tackifiers/Nettings/Emulsions – Use according to the manufacturer's recommendations. This is a superior method in areas of water concentration to hold mulch in place.
 - 3. Wood Fiber – Wood fiber hydroseeder slurries may be used to tack straw mulch. This combination treatment is well suited to steep slopes and critical areas, and severe climate conditions.
- D. Mulch shall be anchored using a mulch anchoring tool, a liquid binder/tackifier, or mulch nettings. Nets and mats shall be installed to obtain firm, continuous contact between the material and the soil. Without such contact, the material is useless and erosion occurs.
- E. A mulch anchoring tool is a tractor-drawn implement that is typically used for anchoring straw and is designed to punch mulch approximately two inches into the soil surface. Machinery shall be operated on the contour and shall not be used on slopes steeper than 3H:1V.

- F. When using liquid mulch binders and tackifiers, application shall be heaviest around edges of areas and at crests of ridges and banks to prevent wind blow. Remainder of area shall have binders/tackifiers spread uniformly in accordance with manufacturer's recommendations.
- G. When using a mulch net, it shall be used in conjunction with an organic mulch and shall be installed immediately after the application and spreading of the mulch. Mulch net shall be installed over the mulch except when the mulch manufacturer recommends otherwise.
- H. Excelsior blankets and mats with mulch are considered protective mulches and may be used alone on erodible soils and during all times of year. Erosion control mats shall be installed in accordance with manufacturer's recommendations.
- I. Mulched areas shall be inspected at least weekly and after each rainfall of one-half inch or more. When mulch material is found to be loosened or removed, the mulch cover shall be replaced within 48 hours.

3.03 TEMPORARY SEED

- A. The site shall be graded as needed to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and anchoring.
- B. The needed erosion control practices, such as diversions, temporary waterways for diversion outlets, and sediment ponds, shall be installed prior to seeding.
- C. Prior to seeding, lime and fertilizer shall be worked into the soil with a disk harrow, springtooth harrow, or similar tools to a depth of two inches. On sloping areas, the final operation shall be on the contour.
- D. The seed shall be applied uniformly with a cyclone seeder, drill, cultipacker, seeder, or hydroseeder (slurry may include seed and fertilizer) preferably on a firm, moist seedbed. Seed shall be sown no deeper than one-fourth inch to one-half inch.
- E. The seedbed shall be firmed following seeding operations with a cultipacker, roller, or light drag.
- F. On sloping land, seeding operations shall be on the contour wherever possible.
- G. Mulch shall be applied, in the amounts described in the mulch section of this Specification, to protect the soil and provide a better environment for plant growth.
- H. New seed shall have adequate water for growth, through either natural means or irrigation, until plants are firmly established.
- I. Seeded areas shall be inspected at least weekly after planting and after each rainfall of one-half inch or more. Areas requiring additional seed and mulch shall be repaired within 48 hours.
- J. If vegetative cover is not established within 21 days, the area shall be reseeded.

3.04 PERMANENT SEED

- A. During site preparation, topsoil shall be stockpiled for use in establishing permanent vegetation.
- B. The site shall be graded as needed to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and anchoring.

- C. The needed erosion control practices, such as diversions, temporary waterways for diversion outlets, and sediment ponds, shall be installed prior to seeding.
- D. Prior to seeding, lime and fertilizer shall be worked into the soil with a disk harrow, springtooth harrow, or similar tools to a depth of four inches. On sloping areas, the final operation shall be on the contour.
- E. Where compacted soils occur, they shall be broken up sufficiently to create a favorable rooting depth of six to eight inches.
- F. The seed shall be applied uniformly with a cyclone seeder, drill, cultipacker, seeder, or hydroseeder (slurry may include seed and fertilizer) preferably on a firm, moist seedbed. Seed shall be sown no deeper than one-fourth inch to one-half inch.
- G. The seedbed shall be firmed following seeding operations with a cultipacker, roller, or light drag.
- H. On sloping land, seeding operations shall be on the contour wherever possible.
- I. Mulch shall be applied, in the amounts described in the mulch section of this Specification, to protect the soil and provide a better environment for plant growth.
- J. New seed shall have adequate water for growth, through either natural means or irrigation, until plants are firmly established.
- K. Seeded areas shall be inspected at least weekly after planting and after each rainfall of 0.5 inches or more. Areas requiring additional seed and mulch shall be repaired within 48 hours.
- L. If vegetative cover is not established (>70%) within 21 days, the area shall be reseeded. If 40 to 70 percent groundcover is established, seed and fertilize, using half of rates originally applied, and mulch. If less than 40 percent groundcover is established, follow original seedbed preparation methods, seeding and mulching specifications, and apply lime and fertilizer as needed according to soil tests.

3.05 SOD

- A. The area to be sodded shall be protected from excess runoff, as necessary, with appropriate BMPs.
- B. Prior to sodding, the soil surface shall be cleared of all trash, debris, and stones larger than one and one-half inches in diameter, and of all roots, brush, wire, and other objects that would interfere with the placing of the sod.
- C. Compacted soils shall be broken up sufficiently to create a favorable rooting depth of six to eight inches.
- D. Lime and fertilizer shall be worked into the soil with a disk harrow, springtooth harrow, or other suitable field equipment to a depth of four inches.
- E. After the lime and fertilizer have been applied and just prior to the laying of the sod, the soil in the area to be sodded shall be loosened to a depth of one inch. The soil shall be thoroughly dampened immediately after the sod is laid if it is not already in a moist condition.
- F. No sod shall be placed when the temperature is below 32°F. No frozen sod shall be placed nor shall any sod be placed on frozen soil.

- G. When sod is placed during the periods of June 15 to September 1 or October 15 to March 1, it shall be covered immediately with a uniform layer of straw mulch approximately one-half inch thick or so the green sod is barely visible through the mulch.
- H. Sod shall be carefully placed and pressed together so it will be continuous without any voids between the pieces. Joints between the ends of strips shall be staggered.
- I. On gutter and channel sodding, the sod should be carefully placed on rows or strips at right angles to the centerline of the channel (*i.e.*, at right angles to the direction of flow). The edge of the sod at the outer edges of all gutters shall be sufficiently deep so that surface water will flow over onto the top of the sod.
- J. On steep graded channels, each strip of sod shall be staked with at least two stakes not more than 18 inches apart.
- K. On slopes 3H:1V or steeper, or where drainage into a sod gutter or channel is one-half acre or larger, the sod shall be rolled or tamped and then chicken wire, jute, or other netting shall be pegged over the sod for protection in the critical areas. The netting and sod shall be staked with at least two stakes not more than 18 inches apart. The netting shall be stapled on the side of each stake within two inches of the top of the stake. The stake should then be driven flush with the top of the sod.
- L. When stakes are required, the stakes shall be wood and shall be approximately ½ inch by ¾ inch by 12 inches. They shall be driven flush with the top of the sod with the flat side against the slope and on an angle toward the slope.
- M. Sod shall be tamped or rolled after placing and then watered. Watering shall consist of a thorough soaking of the sod and of the sod bed to a depth of at least 4 inches. The sod should be maintained in a moist condition by watering for a period of 30 days.
- N. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week to maintain moist soil to a depth of 4 inches. Watering shall be done during the heat of the day to prevent wilting. After the first week, sod shall be watered as necessary to maintain adequate moisture content.
- O. The first mowing of sod shall not be attempted until the sod is firmly rooted. No more than one-third of the grass leaf shall be removed by the initial and subsequent cuttings. Grass height shall be maintained between 2 inches and 3 inches.
- P. Where sod does not establish properly, the sod should be replaced immediately. Areas requiring resodding should be prepared in the same manner as the original installation.

3.06 ROAD/PARKING STABILIZATION

- A. The roadbed or parking surface shall be cleared of all vegetation, roots, and other objectionable material.
- B. All roadside ditches, cuts, fills, and disturbed areas adjacent to parking areas and roads shall be stabilized with appropriate temporary or permanent vegetation according to the applicable sections of this Specification.
- C. Geotextile filter fabric may be applied beneath the stone for additional stability in accordance with fabric manufacturer's specifications.
- D. Both temporary and permanent roads and parking areas may require periodic top dressing with new gravel. Seeded areas adjacent to the roads and parking areas shall be checked regularly to ensure that a vigorous stand of vegetation is maintained. Roadside ditches and

other drainage structures shall be checked once each week to ensure that they do not have silt or other debris that reduces their effectiveness.

3.07 CONSTRUCTION ENTRANCE

- A. Vegetation, roots, and all other obstructions shall be cleared in preparation for grading. Prior to placing geotextile (filter fabric), the entrance shall be graded and compacted to 80% of standard proctor density.
- B. To reduce maintenance and loss of aggregate, the geotextile shall be placed over the existing ground before placing the stone for the entrance. Stone shall be placed to depth of 6 inches or greater for the entire width and length of the stabilized construction entrance.
- C. If wash racks are used, they shall be installed according to manufacturer's specifications.
- D. The stabilized construction entrance shall be inspected once each week and after there has been a high volume of traffic or a storm event greater than 0.2 inches.
- E. The entrance shall be maintained in a condition that will prevent tracking or flow of sediments onto public rights-of-way. This may require periodic top dressing with additional stone, as conditions demand, and repair and/or cleanout of any structures used to trap sediment.
- F. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately.

3.08 DUST CONTROL

- A. See Articles on Temporary Seed, Permanent Seed, Sod, Mulch, Road/Parking Stabilization, and Construction Entrance of this Specification Section.
- B. When construction is active on the site, dust control shall be implemented as needed.
- C. When using tillage as a dust control measure, Contractor shall begin plowing on windward side of area. Chisel-type plows spaced about 12 inches apart, spring-toothed harrow, and similar plows are examples of equipment that may produce the desired effect.
- D. The site shall be observed daily for evidence of windblown dust and reasonable steps shall be taken to reduce dust whenever possible. When construction on a site is inactive for a period, the site shall be inspected at least weekly for evidence of dust emissions or previously windblown sediments. Dust control measures shall be implemented or upgraded if the site inspection shows evidence of wind erosion.

3.09 NETS AND MATS

- A. Nets and mats shall be installed according to the manufacturer's recommendations. In the event that the manufacturer's recommendations conflict with any requirement of this Specification, the most conservative requirement, in terms of protection of public health and the environment, shall govern.

3.10 TEMPORARY DIVERSION DITCH

- A. All dead furrows, ditches or other depressions to be crossed shall be filled before construction begins or as part of construction, and the earth fill used to fill the depressions shall be compacted using the treads of the construction equipment. All old terraces,

fencerows, or other obstructions that will interfere with the successful operation of the diversion shall be removed.

- B. The base for the diversion ridge shall be prepared so that a good bond is obtained between the original ground and the fill material. Vegetation shall be removed and the base shall be thoroughly disked prior to placement of fill.
- C. The earth materials used to construct the earth fill portions of the diversions shall be obtained from the diversion channel or other approved source.
- D. The earth fill materials used to construct diversions shall be compacted by running the construction equipment over the fill in such a manner that the entire surface of the fill will be traversed by not less than one tread track of the equipment.
- E. When an excess of earth material results from cutting the channel cross section and grade, it shall be deposited adjacent to the supporting ridge unless otherwise directed.
- F. The completed diversion shall conform to the cross section and grade shown on the Construction Drawings.
- G. Temporary or permanent seeding and mulch shall be applied to the berm or ditch immediately following its construction. Contractor shall triple-seed areas below the flow line, and shall use erosion control blankets or turf reinforcement mats as needed.
- H. Bare and vegetated diversion channels shall be inspected regularly to check for points of scour or bank failure; rubbish or channel obstruction; rodent holes, breaching, or settling of the ridge; and excessive wear from pedestrian or construction traffic.
- I. Damaged channels or ridges shall be repaired at the time damage is detected. Sediment deposits shall be removed from diversion channels and adjoining vegetative filter strips regularly.
- J. Diversions shall be reseeded and fertilized as needed to establish vegetative cover.

3.11 LEVEL SPREADER

- A. The minimum acceptable width shall be 6 feet. The depth of the level spreader as measured from the lip shall be at least 6 inches and the depth shall be uniform across the entire length of the measure.
- B. The grade of the channel for the last 15 feet entering the level spreader shall be less than or equal to 1%.
- C. The level lip of the spreader shall be constructed on zero percent grade to insure uniform conversion of channel flow to sheet flow.
- D. Level spreaders shall be constructed on undisturbed soil.
- E. The entrance to the spreader shall be graded in a manner to insure that runoff enters directly onto the zero percent graded channel.
- F. Storm runoff converted to sheet flow shall discharge onto undisturbed areas stabilized with vegetation.
- G. All disturbed areas shall be stabilized immediately after construction is completed in accordance with the mulching and vegetation requirements of this Specification.

- H. The level spreader shall be inspected after each storm event and at least once each week. Any observed damage shall be repaired immediately.

3.12 PERMANENT CONSTRUCTED WATERWAY

- A. All ditches or other depressions to be crossed shall be filled before construction begins or as part of construction, and the earth fill used to fill the depressions shall be compacted using the treads of the construction equipment. All old terraces, fence rows, or other obstructions that will interfere with the successful operation of the channel shall be removed.
- B. The earth materials used to construct the earth fill portions of the channel shall be obtained from the excavated portion of the channel or other approved source.
- C. The earth fill materials used to construct the channel shall be compacted by running the construction equipment over the fill in such a manner that the entire surface of the fill will be traversed by at least one tread track of the equipment.
- D. The completed channel shall conform to the cross section and grade shown on the Construction Drawings.
- E. Channels shall be inspected regularly to check for points of scour or bank failure; rubbish or channel obstruction; rodent holes; breaching; and excessive wear from pedestrian or construction traffic.
- F. Channels shall be repaired at the time damage is detected. Sediment deposits shall be removed from adjoining vegetative filter strips when they are visible.
- G. Channels shall be reseeded and fertilized as needed to establish vegetative cover.
- H. The subgrade of paved channels shall be constructed to the required elevations. All soft sections and unsuitable material shall be removed and replaced with suitable material. The subgrade shall be thoroughly compacted and shaped to a smooth, uniform surface. The subgrade shall be moist when pouring concrete.
- I. Before permanent stabilization of the slope, the structure shall be inspected after each rainfall. Any damages to the paved channel or slope shall be repaired immediately.

3.13 PIPE SLOPE DRAIN

- A. The pipe slope drain shall be placed on undisturbed or well-compacted soil.
- B. Soil around and under the entrance section shall be hand-tamped in 4-inch to 8-inch lifts to the top of the dike to prevent piping failure around the inlet.
- C. Filter fabric shall be placed under the inlet and extended 5 feet in front of the inlet and be keyed in 6 inches on all sides to prevent erosion.
- D. Backfilling around and under the pipe with stable soil material hand compacted in lifts of 4 inches to 8 inches shall be done to ensure firm contact between the pipe and the soil at all points.
- E. The pipe slope drain shall be securely staked to the slope using grommets provided for this purpose at intervals of 10 feet or less.
- F. All slope drain sections shall be securely fastened together and have watertight fittings.
- G. The pipe shall be extended beyond the toe of the slope and discharged at a non-erosive velocity into a stabilized area or to a sediment trap or pond.

- H. The pipe slope drain shall have a minimum slope of 3 percent or steeper.
- I. The height at the centerline of the earth dike shall range from a minimum of 1.0 foot over the pipe to twice the diameter of the pipe measured from the invert of the pipe. It shall also be at least 6 inches higher than the adjoining ridge on either side. At no point along the dike will the elevation of the top of the dike be less than 6 inches higher than the top of the pipe.
- J. All areas disturbed by installation or removal of the pipe slope drain shall be immediately stabilized.
- K. The pipe slope drain shall be inspected after every rainfall and at least weekly. Any necessary repairs shall be made immediately.
- L. Contractor shall check to see that water is not bypassing the inlet and undercutting the inlet or pipe. If necessary, Contractor shall install headwall or sandbags.
- M. Contractor shall check for erosion at the outlet point and shall check the pipe for breaks or clogs. Contractor shall install additional outlet protection if needed and immediately repair the breaks and clean any clogs.
- N. Contractor shall not allow construction traffic to cross the pipe slope drain and shall not place any material on it.
- O. If a sediment trap has been provided, it shall be cleaned out when the sediment level reaches 1/3 the design volume.
- P. The pipe slope drain shall remain in place until the slope has been completely stabilized or up to 30 days after permanent slope stabilization.

3.14 IMPACT STILLING BASIN

- A. Construction specifications for impact stilling basins are provided in the Construction Drawings.

3.15 CHECK DAM

- A. Stone shall be placed by hand or mechanically as necessary to achieve complete coverage of the ditch and to ensure that the center of the dam is at least 1 foot lower than the outer edges. Stone shall also be placed to extend 3 feet in elevation above the center portion of the check dam or to the top of the channel side slopes.
- B. Coir and wood fiber logs shall be laid on the channel bottom.
- C. Check dams shall be removed when their useful life has been completed. In temporary ditches and swales, check dams shall be removed and the ditch filled in when it is no longer needed. In permanent channels, check dams shall be removed when a permanent lining can be installed. In the case of grass-lined ditches, check dams shall be removed when the grass has matured sufficiently to protect the ditch or swale. The area beneath the check dams shall be seeded and mulched or sodded (depending upon velocity) immediately after check dams are removed.
- D. If stone check dams are used in grass-lined channels that will be mowed, care shall be taken to remove all stone from the channel when the dam is removed. This shall include any stone that has washed downstream.
- E. Regular inspections shall be made to ensure that the check dam is in good working order and

the center of the dam is lower than the edges. Erosion caused by high flows around the edges of the dam shall be corrected immediately, and the dam shall be extended beyond the repaired area.

- F. Check dams shall be checked for sediment accumulation after each rainfall. Sediment shall be removed before or when it reaches one-third of the original height.
- G. Check dams shall remain in place and operational until the drainage area and channel are completely stabilized, or up to 30 days after the permanent site stabilization is achieved.

3.16 SEDIMENT TRAP

- A. The area to be excavated shall be cleared of all trees, stumps, roots, brush boulders, sod, and debris. All channel banks and sharp breaks shall be sloped to no steeper than 1:1. All topsoil containing excessive amounts of organic matter shall be removed.
- B. Seeding, fertilizing, and mulching of the material taken from the excavation shall comply with the applicable soil stabilization sections of this Specification.
- C. Construction specifications for sediment traps are provided in the Construction Drawings.
- D. Any material excavated from the trap shall be placed in one of the following ways so that it will not be washed back into the trap by rainfall:
 - 1. uniformly spread to a depth not exceeding 3 feet and graded to a continuous slope away from the trap
 - 2. uniformly placed or shaped reasonably well with side slopes assuming the natural angle of repose for the excavated material behind a berm width not less than 12 feet.
- E. Sediment shall be removed from the trap when the capacity is reduced to one third of the design volume. Contractor shall follow the methods for disposing of sediment removed from the trap as shown in the Construction Drawings.

3.17 SEDIMENT POND

- A. The foundation area shall be cleared of all trees, stumps, roots, brush boulders, sod, and debris. All channel banks and sharp breaks shall be sloped to no steeper than 1:1. All topsoil containing excessive amounts of organic matter shall be removed. The surface of the foundation area shall be thoroughly scarified before placement of the embankment material.
- B. A cutoff trench shall be backfilled with suitable material. The trench shall be kept free of standing water during backfill operations.
- C. The pipe conduit barrel shall be placed on a firm foundation. Selected backfill material shall be placed around the conduit in layers, and each layer shall be compacted to at least the same density as the adjacent embankment. All compaction within 2 feet of the pipe spillway shall be accomplished with hand-operated tamping equipment.
- D. All borrow areas outside the pond and in the drainage area shall be graded and left in such a manner that water will not be ponded.
- E. The material placed in the fill shall be free of all sod, roots, frozen soil, stones more than 6 inches in diameter, and other objectionable material. The placing and spreading of the fill material shall occur in approximately 6-inch horizontal layers or of such thickness that the required compaction can be obtained with the equipment used. Each layer shall be compacted in a way that will result in achieving 95 percent of the maximum standard dry

density.

- F. The distribution and gradation of materials throughout the fill shall be such that there will be no lenses, pockets, stakes, or layers of material differing substantially in texture or gradation from the surrounding material. Where it is necessary to use materials of varying texture and gradation, the more impervious material shall be placed in the upstream and center portions of the fill.
- G. The moisture content of fill material shall be such that the required degree of compaction can be obtained with the equipment used.
- H. Fill shall not be placed on frozen, slick, or saturated soil.
- I. The topsoil material saved in the site preparation shall be placed as a top dressing on the surface of the emergency spillways, embankments, and borrow areas. It shall be evenly spread.
- J. A protective cover of herbaceous vegetation shall be established on all exposed surfaces of the embankment, spillway, and borrow areas to the extent practical under prevailing soil and climatic conditions.
- K. Seedbed preparation, seeding, fertilizing, and mulching shall comply with the applicable sections of this Specification.
- L. Any material excavated from the pond shall be placed in one of the following ways so that its weight will not endanger the stability of the side slopes and where it will not be washed back into the pond by rainfall:
 - 1. uniformly spread to a depth not exceeding 3 feet and graded to a continuous slope away from the pond.
 - 2. uniformly placed or shaped reasonably well with side slopes assuming the natural angle of repose for the excavated material behind a berm width not less than 12 feet.
- M. Sediment shall be removed from the pond when the capacity is reduced to one third of the design volume. Contractor shall follow the methods for disposing of sediment removed from the pond as shown in the Construction Drawings.

3.18 SILT FENCE

- A. This Article provides construction specifications for silt fences using synthetic fabric. See the Construction Drawings for additional detail.
- B. Posts shall be spaced a maximum of 10 feet apart at the barrier location and driven securely into the ground (minimum of 12 inches). When necessary because of rapid runoff, post spacing shall not exceed 6 feet.
- C. A trench shall be excavated at least 6 inches wide and 6 inches deep along the line of posts and upslope from the barrier.
- D. A wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of 2 inches and shall not extend more than 36 inches above the original ground surface.
- E. The filter fabric shall be stapled or wired to the fence, and 12 inches of the fabric shall be extended into the trench. The fabric shall not extend more than 30 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.

- F. At joints, filter fabric shall be lapped with terminating posts with a minimum overlap of 3 feet.
- G. The trench shall be backfilled and soil compacted over the filter fabric.
- H. Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.
- I. Silt fences and filter barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately. Knocked down fences shall be repaired at the end of each day.
- J. Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected usable life and if the barrier is still necessary, the fabric shall be replaced promptly.
- K. Sediment deposits shall be removed after each storm event or when deposits reach approximately one-third the height of the barrier.
- L. Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform to the existing grade, prepared, and seeded.
- M. Silt fences shall be replaced every 6 months.

3.19 STORM DRAIN INLET PROTECTION

- A. For silt fence drop inlet protection, the following specifications apply:
 - 1. For stakes, Contractor shall use 2 x 4-inch wood (preferred) or equivalent metal with a minimum length of 3 feet.
 - 2. Stakes shall be evenly spaced around the perimeter of the inlet a maximum of 3 feet apart and securely driven into the ground, approximately 18 inches deep.
 - 3. To provide needed stability to the installation, Contractor shall frame with 2 x 4-inch wood strips around the crest of the overflow area at a maximum of 1.5 feet above the drop inlet crest and shall brace diagonally.
 - 4. Contractor shall place the bottom 12 inches of the fabric in a trench and backfill the trench with at least 4 inches of crushed stone or 12 inches of compacted soil.
 - 5. Contractor shall fasten fabric securely to the stakes and frame. Joints shall be overlapped to the next stake.
- B. For sod drop inlet protection, sod shall be placed to form a turf mat covering the soil for a distance of 4 feet from each side of the inlet structure. Soil preparation and sod placement shall be in accordance with the section entitled Sod.
- C. For gravel curb inlet protection, the following specifications apply:
 - 1. Wire mesh with ½-inch openings shall be placed over the curb inlet opening so that at least 12 inches of wire extends across the concrete gutter from the inlet opening.
 - 2. KYTC No. 2 Coarse Aggregate shall be piled against the wire so as to anchor it against the gutter and inlet cover and to cover the inlet opening completely.
 - 3. This type of device must never be used where overflow may endanger an exposed fill slope. Consideration shall also be given to the possible effects of ponding on traffic movement, nearby structures, working areas, and adjacent property.

- D. For block and gravel curb inlet protection, the following specifications apply:
1. Two concrete blocks shall be placed on their sides abutting the curb at either side of the inlet opening to act as spacer blocks.
 2. A 2-inch by 4-inch stud shall be cut and placed through the outer holes of each spacer block to help keep the front blocks in place.
 3. Concrete blocks shall be placed on their sides across the front of the inlet and abutting the spacer blocks.
 4. Wire mesh shall be placed over the outside of the concrete blocks to prevent stone from being washed through the holes in the blocks. Wire with ½-inch openings shall be used
 5. KYTC No. 2 Coarse Aggregate shall be piled against the wire to the top of the barrier.
- E. For stone-filled corrugated pipe curb inlet protection, the following specifications apply:
1. Two concrete "L" blocks shall be placed on their sides, with one leg fitting into the mouth of the curb opening.
 2. A 6-inch corrugated pipe shall be filled with stone and covered with a filter sock.
 3. The stone-filled pipe will be placed in front of the two concrete "L" blocks, and extend a minimum of the width of the curb inlet opening on either side. The total length of the stone filled pipe shall be three times the width of the curb inlet opening.
- F. The structure shall be inspected after each rain, and repairs made as needed.
- G. Sediment shall be removed and the device restored to its original dimensions when the sediment has accumulated to one-third the design depth of the filter. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode.
- H. If a stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the blocks, cleaned, and replaced.
- I. Structures shall be removed after the drainage area has been properly stabilized.

3.20 FILTER STRIP

- A. When planting filter strips, Contractor shall prepare seedbed, incorporate fertilizer, and apply mulch consistent with the seeding sections of this Specification. Filter strips using areas of existing vegetation shall be over seeded, as necessary, with the specified mixtures to obtain an equivalent density of vegetation. The over seeding shall be accomplished prior to any land disturbing activities.
- B. Filter strips shall be inspected regularly to ensure that a healthy vegetative growth is maintained. Any bare spots or spots where sediment deposition could lead to the destruction of vegetation shall be repaired.
- C. Filter strips shall be fertilized once each year in the fall.
- D. Irrigation shall be used as necessary to maintain the growth of the vegetation in the filter strip.
- E. Sediment shall be removed when it becomes visible in the filter.
- F. Construction traffic shall not be driven on or over filter strips.

3.21 STREAM CROSSING

- A. Clearing and excavation of the streambed and banks shall be kept to a minimum.
- B. The structure shall be removed as soon as it is no longer necessary for project construction.
- C. Upon removal of the structure, the stream shall immediately be reshaped to its original cross section and properly stabilized.
- D. The approaches to the structure shall consist of stone pads with a minimum thickness of 6 inches, a minimum width equal to the width of the structure, and a minimum approach length of 25 feet on each side.
- E. The structure shall be inspected after every rainfall and at least once a week and all damages repaired immediately.

3.22 PUMP-AROUND FLOW DIVERSION

- A. Operations shall be scheduled such that diversion installation, in-stream excavation, in-stream construction, stream restoration, and diversion removal are completed as quickly as possible. Contractor shall not construct in a stream when rainfall is expected during the time excavation will be occurring in the stream.
- B. Check dams shall be installed across the stream during low flow conditions.
- C. Stream flow shall be pumped around the check dams. Outlet protection shall be installed as required at the discharge point.
- D. Contractor shall dewater the work area and pump into a sediment trapping device.
- E. Contractor shall complete construction activities across the stream.
- F. Contractor shall restore the streambed and banks.
- G. Contractor shall remove sandbags and shut down pumping operation. (Salvage sandbags for future use if multiple stream crossings are required on the project.) Contractor shall remove all sandbags from the stream, including damaged and empty bags.
- H. Pumps shall be manned around-the-clock when the pump-around diversion is in the stream.
- I. This control provides short-term diversion of stream flow (typically 1 day to 3 days). Additional sandbags or pumps may be required to maintain 1-foot freeboard on the sandbag checks if flow conditions change.
- J. Contractor shall add sandbags as required to seal leaks in checks.

3.23 CONSTRUCTION DEWATERING

- A. Contractor shall follow the specifications for sediment traps and basins. The manufacturer's recommendations shall be followed for commercial products.
- B. The dewatering structure shall be inspected frequently to ensure it is functioning properly and not overtopping. Accumulated sediment shall be spread out on site and stabilized or disposed of offsite.

3.24 KPDES GENERAL PERMIT FOR STORM WATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

- A. The Contractor is responsible for electronically filing the appropriate state Notice of Intent (NOI-SWCA) letter at least seven (7) days prior to start of construction activity. 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.
- 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
- C. 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.
- D. 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.
- E. 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
- F. The Contractor is responsible for implementing the approved Stormwater Pollution Prevention Plan (SWPPP) prior to commencement of site disturbance. The SWPPP shall include erosion prevention measures and sediment and pollutant control measures which are installed and maintained to minimize discharges of sediments and other pollutants from a 2-year, 24-hour storm event. The SWPPP must be kept at the site and available for review by LFUCG and state officials.
- G. The Contractor is responsible for the description of procedures to maintain erosion and sediment control measures during the period of construction.
- H. The Contractor is responsible for identifying each Contractor and Subcontractor who will install each SWPPP erosion and sediment control measure.
- I. Each Contractor and Subcontractor shall sign a statement certifying the awareness of the requirements of the SWPPP related documents. Certification is attached at the end of this section.
- J. The Contractor shall not start land disturbing activities until written permit coverage is obtained from the Kentucky Division of Water.
- K. The inspection by qualified personnel, **provided by the Contractor**, of the site as follows:
1. at least once every seven (7) calendar days, and

2. within 24 hours after any storm event of 0.5 inch or greater
- L. The Contractor is responsible for completing and maintaining the required Self-Inspection Forms. A sample is included in this specification Section.
- M. Amendments to the approved SWPPP shall be made and implemented as necessary through the course of the construction project if inspections or investigations by the Contractor's inspector, site staff, or by local, state, or federal officials determine that the existing sediment control measures, erosion control measures, or other site management practices are ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the construction site. All plan amendments shall be noted on the copy of the SWPPP maintained at the project site.
- N. 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 Kentucky Division of Water, the LFUCG Division of Water Quality, and the LFUCG Division of Engineering.
- O. All subcontractors shall be required to comply with the requirements of the state permit and the Stormwater Pollution Prevention Plan (SWPPP).
- P. Where to submit:
1. Complete KPDES FORM NOI-SW at the following website:
<https://dep.gateway.ky.gov/eForms/default.aspx?FormID=7>
 2. Do not initiate work until receiving approval from the Kentucky Division of Water.
 3. A complete copy of the NOI submittal shall also be provided to the following for approval/coverage verification:

Division of Water Quality
125 Lisle Industrial Avenue, Suite 180
Lexington, KY 40511

Division of Engineering
Lexington-Fayette Urban County Government
101 E. Vine St.
4th Floor
Lexington, KY 40507

3.25 LFUCG Land Disturbance Permit

- A. The Contractor shall obtain a Land Disturbance Permit from the LFUCG Division of Engineering, after the LFUCG Division of Water Quality inspects the installation of the best management practices as required by 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
Attn: Land Disturbance Permit Section

- C. All excess earthen/rock materials hauled off the site to a location in Fayette County shall 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.

LFUCG LAND DISTURBANCE PERMIT APPLICATION AND ESC PLAN CHECKLIST

OWNER / DEVELOPER Name: _____ Date: _____ Zone: _____
 Address: _____ City: _____ State: _____ Zip: _____
 Contractor Name and Address: _____ Reg #: _____
 Contact Name, Phone/ FAX/Email: _____

ITEM DESCRIPTION	Y	N	N/A	PAGE #	NOTES
I. Permits:					
KY Construction Permit (KYR10 or Indvid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
USCOE 404 Permit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
KYDOW 401 Water Quality Cert.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
KY Stream Construction Permit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
FEMA LOMR or CLOMR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
II. BMPS:					
Site Preparation:					
Phasing plan for large projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Maximum disturbed area = 25 acres
Limits of disturbance clearly marked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		25 foot undisturbed buffer strip along streams
Construction Entrance/ Exit Pad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		No. 2 stone w/ filter fabric, min. 50 ft long (100' where practical)
Temporary Diversion (Berm or Ditch)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Offsite (clean) water routed around disturbed area
Stream Crossings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Not allowed without US Army Corps 404 permit
Concrete Washout Area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		One washout pit for every 40 lots
Soil Stabilization:					
Seeding/sodding schedule/timing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Applied within 14 days of reaching final grade or suspending work
Slope Protection:					
Silt Fence downslope of bare areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Silt Fence installed along contour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Erosion Control Blankets on slopes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Conforms with Fig. 11-1 in LFUCG Stormwater Manual
Drainage System Control:					
Inlets Protected	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Pipe Outfall Erosion Prevention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Channel Lining	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Sodding or seed w/ blankets/mats immediately after construction
Check Dams	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Max drainage area = 10 acres
Sediment Basins and Traps:					
Sediment Traps (drainage area < 5 ac)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Minimum volume = 2yr-24hr runoff volume
Sediment Basins (drainage area = > 5 ac)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Minimum volume = 2yr-24hr runoff volume
Good Housekeeping:					
Material storage addressed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Spill Prevention and Control addressed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Dust control addressed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Dewatering operations are filtered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Narrative:					
Schedule/sequence for BMP installation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
BMP Inspection Requirement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Every 7 days, or every 14 days and after 0.5" of rainfall
BMP Maintenance Requirement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Roadway Cleaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

LFUCG USE ONLY: Review Date: _____ Status: In Compliance: Y N Additional Info Needed: Y N

Reviewed By: _____ Department: _____

Comments / Items Missing or Incomplete:

Form Effective Date - January 13, 2011

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 gullying 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

CONTRACTOR AND SUBCONTRACTOR CERTIFICATIONS

SWPPP Files, Updates, and Amendments

This SWPPP Plan and related documents (e.g., NOI, inspection reports, US ACE permits, etc.) will be kept on file at the construction site by _____ (name and title). The SWPPP will be updated by the Owner and/or Site Manager to reflect any and all significant changes in site conditions, selection of BMPs, the presence of any unlisted potential pollutants on site, or changes in the Site Manager, contractor, subcontractors, or other key information. Updates and amendments will be made in writing within 7 days and will be appended to the original BMP Plan and available for review.

Stormwater Pollution Prevention Plan 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 gathered and evaluated 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, 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.

Signed: _____

Date: _____

Title: _____

I certify under penalty of law that I understand the terms and conditions of the general KPDES permit that authorizes the storm water discharges associated with the construction site activity identified as part of this certification.

Subcontractor Certification

The subcontractors below certify under penalty of law that they understand the terms and conditions of the general KPDES permit that authorizes the storm water discharges associated with the construction site activity identified as part of this certification.

Signed: _____

Date: _____

Title: _____

Signed: _____

Date: _____

Title: _____

Signed: _____

Date: _____

Title: _____

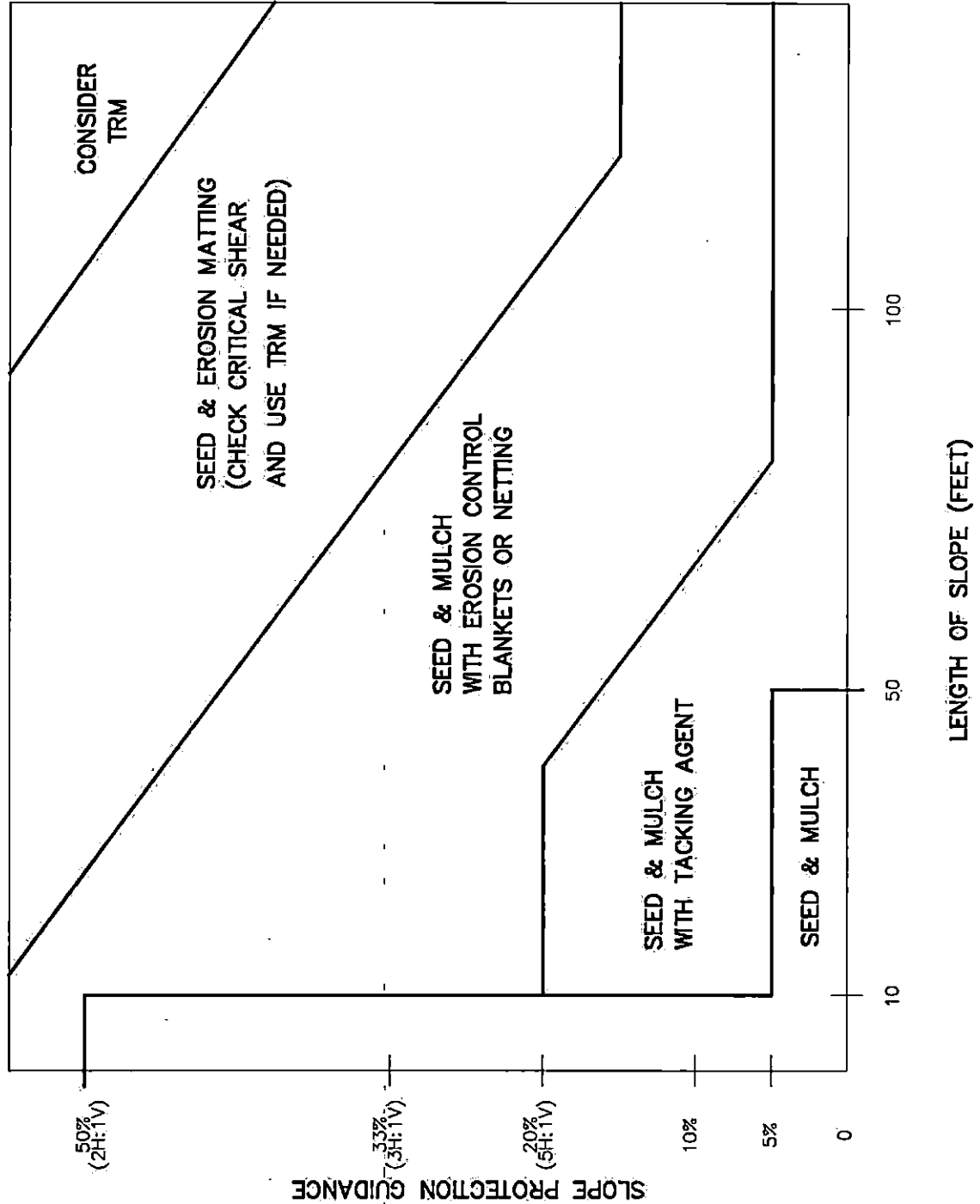


STORMWATER MANUAL

FIGURE 11-1 SLOPE PROTECTION GUIDANCE

(OCTOBER 1, 2016)

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



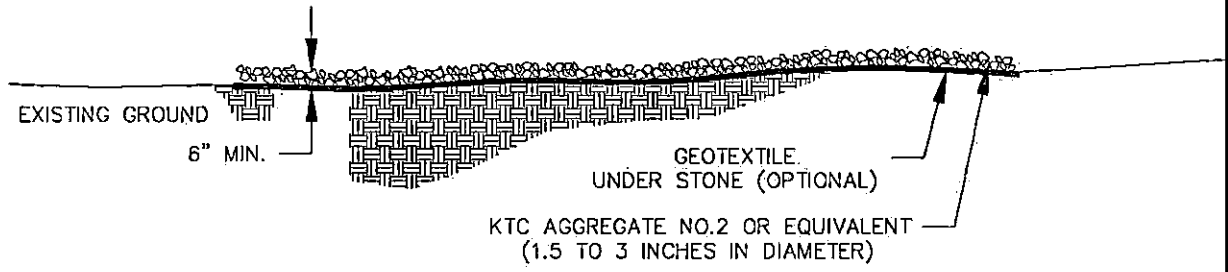


STORMWATER MANUAL

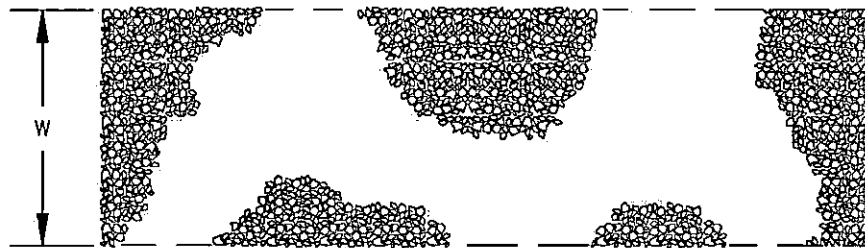
FIGURE 11-2 ROAD/PARKING STABILIZATION

(OCTOBER 1, 2016)

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



CROSS SECTION



PLAN VIEW

W = 14' MIN. FOR ONE WAY TRAFFIC
20' MIN. FOR TWO WAY TRAFFIC

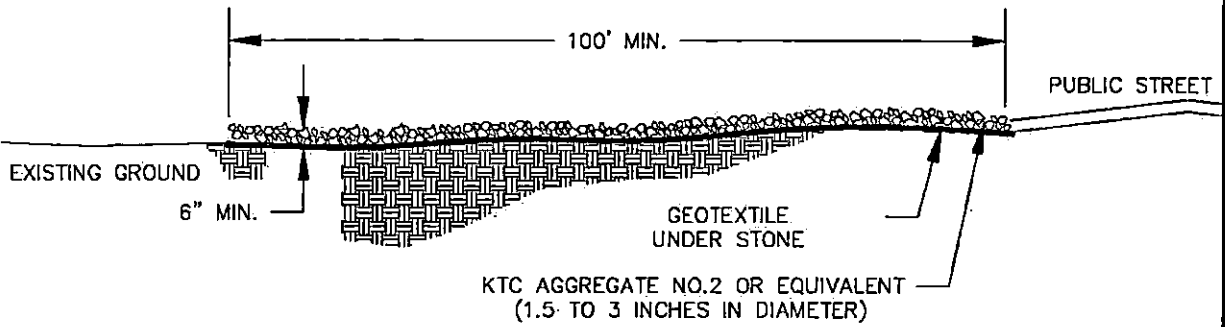


STORMWATER MANUAL

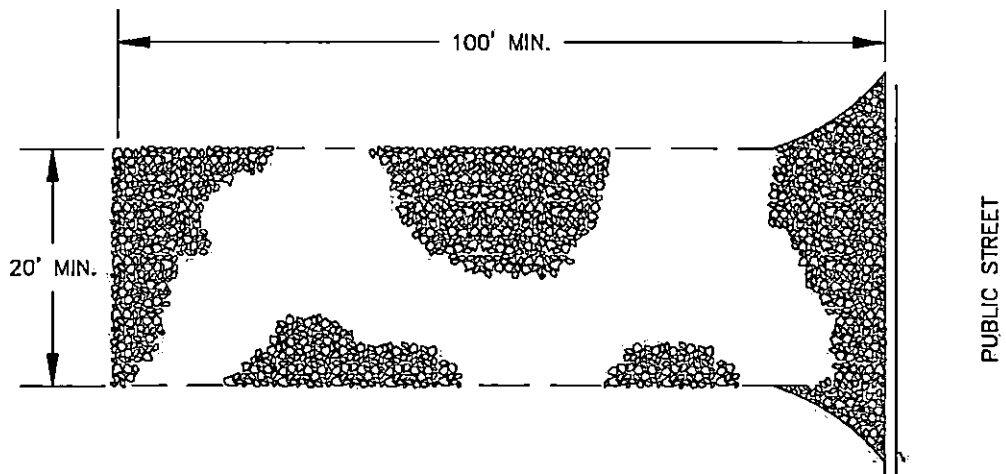
FIGURE 11-3 CONSTRUCTION ENTRANCE

(OCTOBER 1, 2016)

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



CROSS SECTION



PLAN VIEW



STORMWATER MANUAL

FIGURE 11-4 CONSTRUCTION ENTRANCE NOTES AND SPECIFICATIONS (OCTOBER 1, 2016)

SPECIFICATIONS FOR GEOTEXTILE FABRIC

GRAB TENSILE STRENGTH	220 LBS. (MIN.) (ASTM D1682)
ELONGATION FAILURE	60% (MIN.) (ASTM D1682)
MULLEN BURST STRENGTH	430 LBS. (MIN.) (ASTM D3768)
PUNCTURE STRENGTH	125 LBS. (MIN.) (ASTM D751) (MODIFIED)
EQUIVALENT OPENING	SIZE 40-80 (US STD SIEVE) (CW-02215)

NOTES

1. A STABILIZED ENTRANCE PAD OF CRUSHED STONE SHALL BE LOCATED WHERE TRAFFIC WILL ENTER OR LEAVE THE CONSTRUCTION SITE ONTO A PUBLIC STREET.
2. SOIL STABILIZATION FABRIC SHALL BE USED AS A BASE FOR THE CONSTRUCTION ENTRANCE.
3. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC STREETS OR EXISTING PAVEMENT. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS WARRANT AND REPAIR OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT.
4. ANY SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC STREETS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.
5. WHEN APPROPRIATE, WHEELS MUST BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTERING A PUBLIC STREET. WHEN WASHING IS REQUIRED, IT SHALL BE DONE IN AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT BASIN.

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



STORMWATER MANUAL

FIGURE 11-5
STAPLE PATTERN FOR STRAW
OR EXCELSIOR MATS
(OCTOBER 1, 2016)

SLOPES UP TO 1.5H:1V

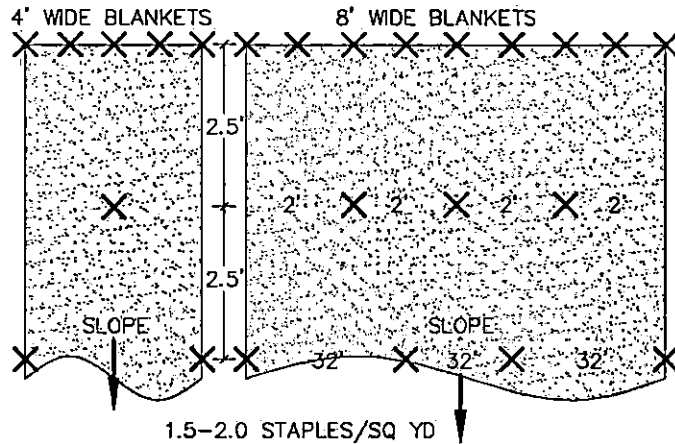
- INSTALL BLANKET VERTICALLY OR HORIZONTALLY
- USE 12" STAPLE SPACING ON STARTER ROW.

COHESIVE SOILS:

- NO OVERLAP REQUIRED ON SIDE SEAMS
- USE 6" STAPLE LENGTH

NON-COHESIVE SOILS:

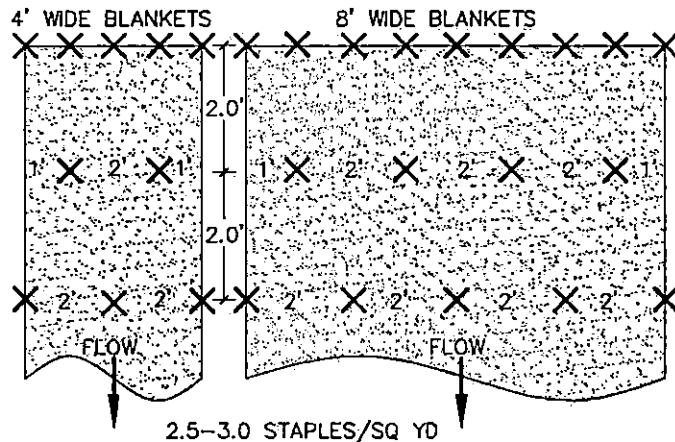
- USE 6" SIDE SEAM OVERLAP
- USE 8" STAPLE LENGTH
- USE 6" ANCHOR TRENCH AT TOP OF SLOPE



CHANNELS IN COHESIVE SOILS

- USE 6" SIDE SEAM OVERLAP
- USE 6" STAPLE LENGTH
- USE 6" TRANSVERSE ANCHOR TRENCH AT 100-FT. INTERVALS

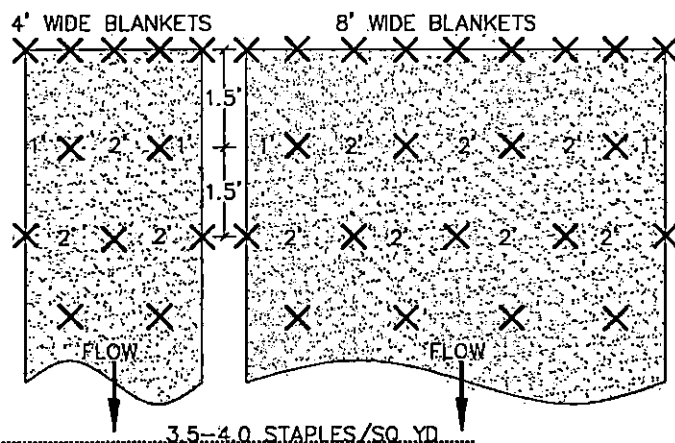
- USE 12" STAPLE SPACING ON STARTER ROW.
- UPSTREAM BLANKET SHOULD OVERLAP DOWNSTREAM BLANKET A DISTANCE OF 12" IN A "SHINGLE" FASHION AND BURY THE FINISHED TOE AT LEAST 6".



CHANNELS IN NON-COHESIVE SOILS

- USE 6" SIDE SEAM OVERLAP
- USE 8" STAPLE LENGTH
- USE 6" TRANSVERSE ANCHOR TRENCH AT 50-FT. INTERVALS

- USE 12" STAPLE SPACING ON STARTER ROW.
- UPSTREAM BLANKET SHOULD OVERLAP DOWNSTREAM BLANKET A DISTANCE OF 12" IN A "SHINGLE" FASHION AND BURY THE FINISHED TOE AT LEAST 6".



NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.

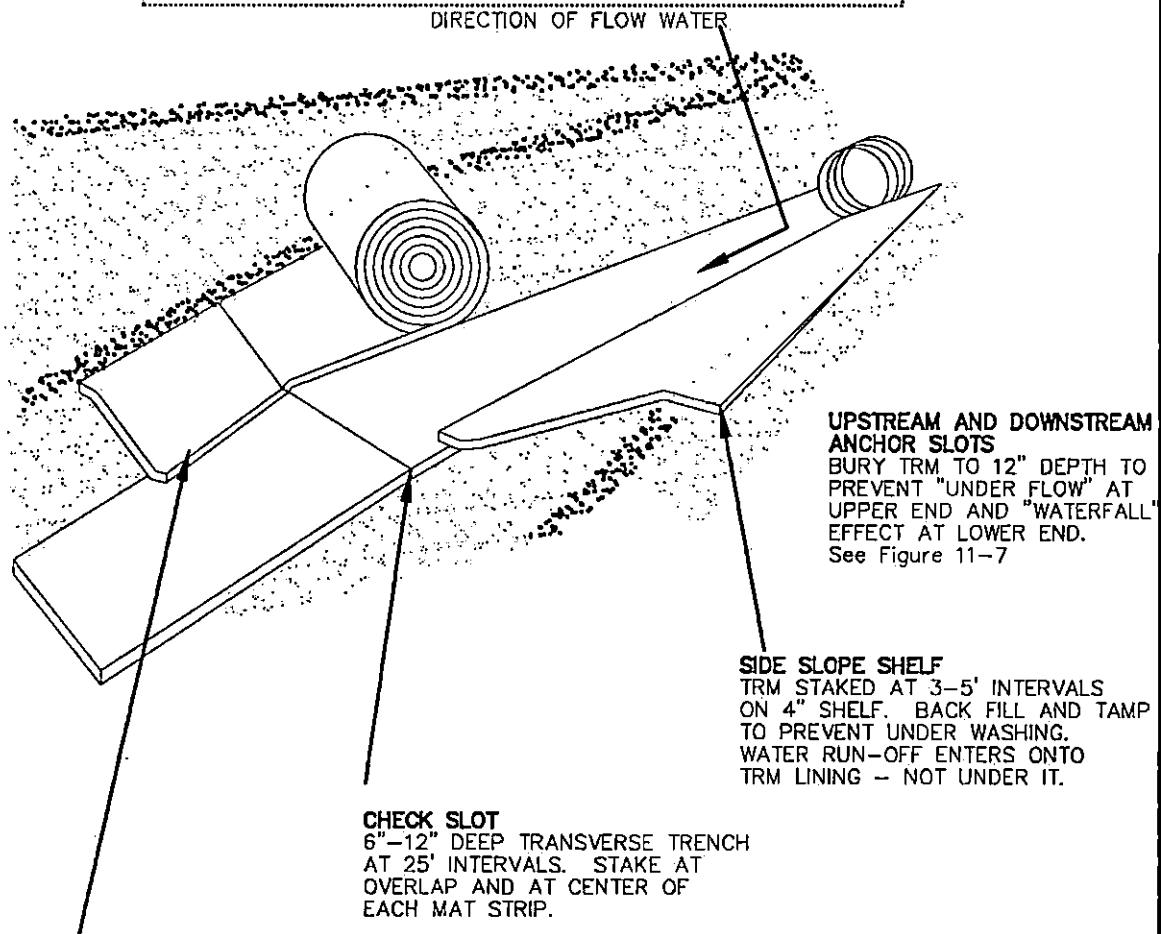


STORMWATER MANUAL

FIGURE 11-6 PLACEMENT OF TRM IN CHANNEL

(OCTOBER 1, 2016)

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



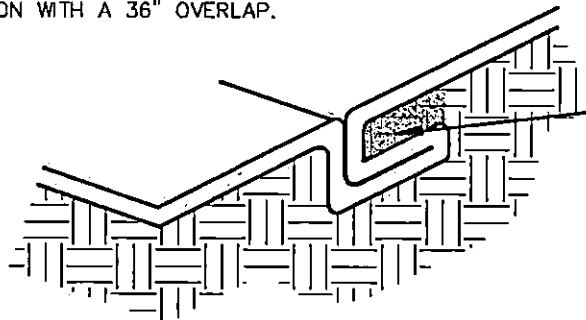
UPSTREAM AND DOWNSTREAM ANCHOR SLOTS
BURY TRM TO 12" DEPTH TO PREVENT "UNDER FLOW" AT UPPER END AND "WATERFALL" EFFECT AT LOWER END.
See Figure 11-7

SIDE SLOPE SHELF
TRM STAKED AT 3-5' INTERVALS ON 4" SHELF. BACK FILL AND TAMP TO PREVENT UNDER WASHING. WATER RUN-OFF ENTERS ONTO TRM LINING - NOT UNDER IT.

CHECK SLOT
6"-12" DEEP TRANSVERSE TRENCH AT 25' INTERVALS. STAKE AT OVERLAP AND AT CENTER OF EACH MAT STRIP.

OVERLAP IN A SHINGLE FASHION
4" OVERLAP STAKED AT 3-5' INTERVALS

WHEN ROLL TERMINATES, IT IS STAKED OVER THE ROLL WHICH EXTENDS DOWNSTREAM IN A SHINGLE FASHION WITH A 36" OVERLAP.



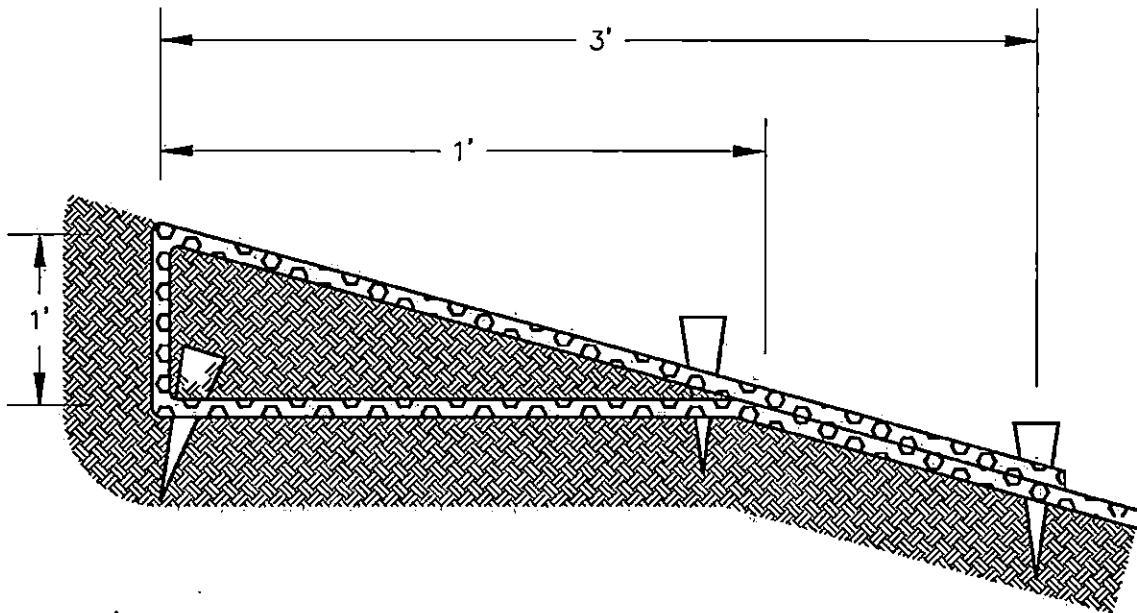
CHECK SLOT DETAIL
STAKE AND BACK FILL IN CHECK SLOT BEFORE CONTINUING TO PLACE UPSLOPE



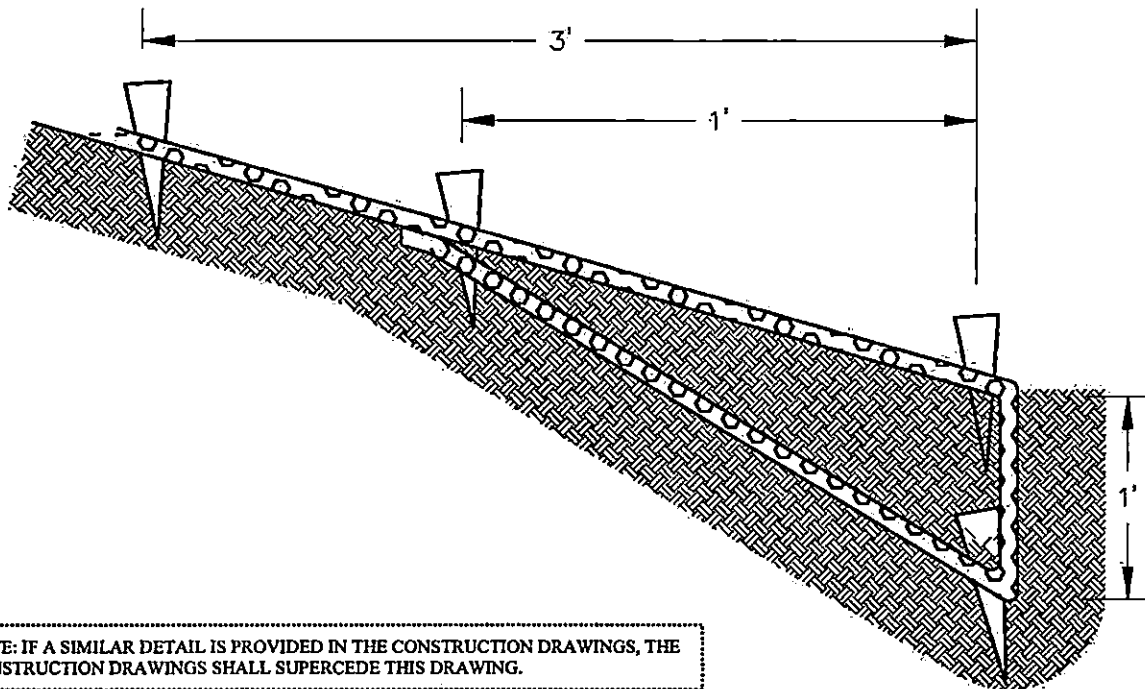
STORMWATER MANUAL

FIGURE 11-7
ANCHOR SLOT DETAILS FOR TRM
(OCTOBER 1, 2016)

UPSTREAM ANCHOR SLOT DETAIL



DOWNSTREAM ANCHOR SLOT DETAIL

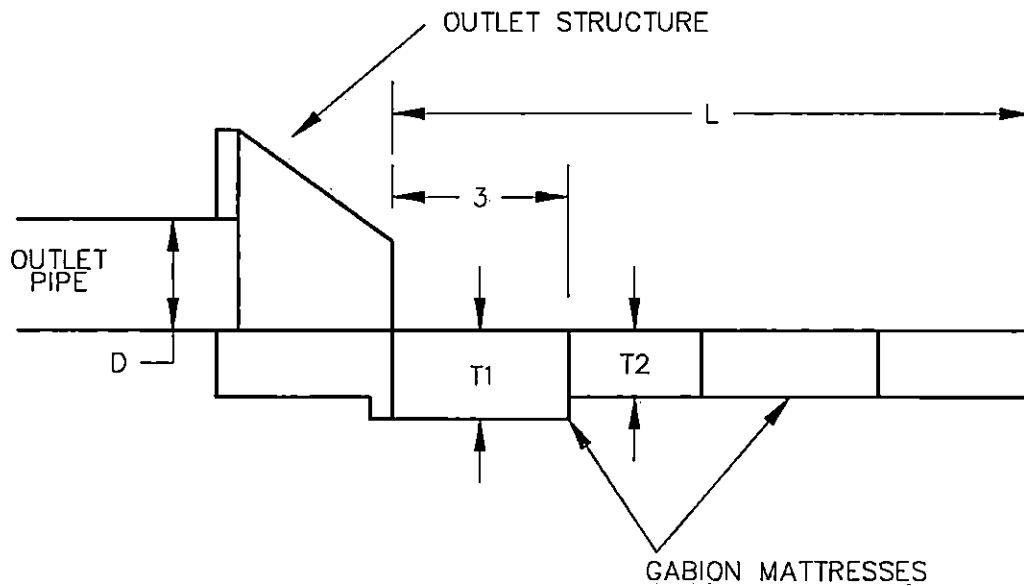


NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



STORMWATER MANUAL

FIGURE 11-8
CROSS SECTION AT
GABION MATTRESS OUTLET PROTECTION
(OCTOBER 1, 2016)



- T1** = THICKNESS OF FIRST 3 FEET OF GABION MATTRESS TO MATCH DEPTH OF OUTLET STRUCTURE FOUNDATION
- T2** = THICKNESS OF REMAINING GABION MATTRESS, 12 INCHES MINIMUM AND 18 INCHES MINIMUM FOR CALCULATED OUTLET VELOCITIES OF 10 TO 15 FEET PER SECOND.

FOR $D < 36$ INCHES, $L = 12$ FEET

FOR $D > 36$ INCHES, $L = 4 \times D$ FEET

D = HEIGHT OR WIDTH OF OUTLET, WHICHEVER IS GREATER

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.

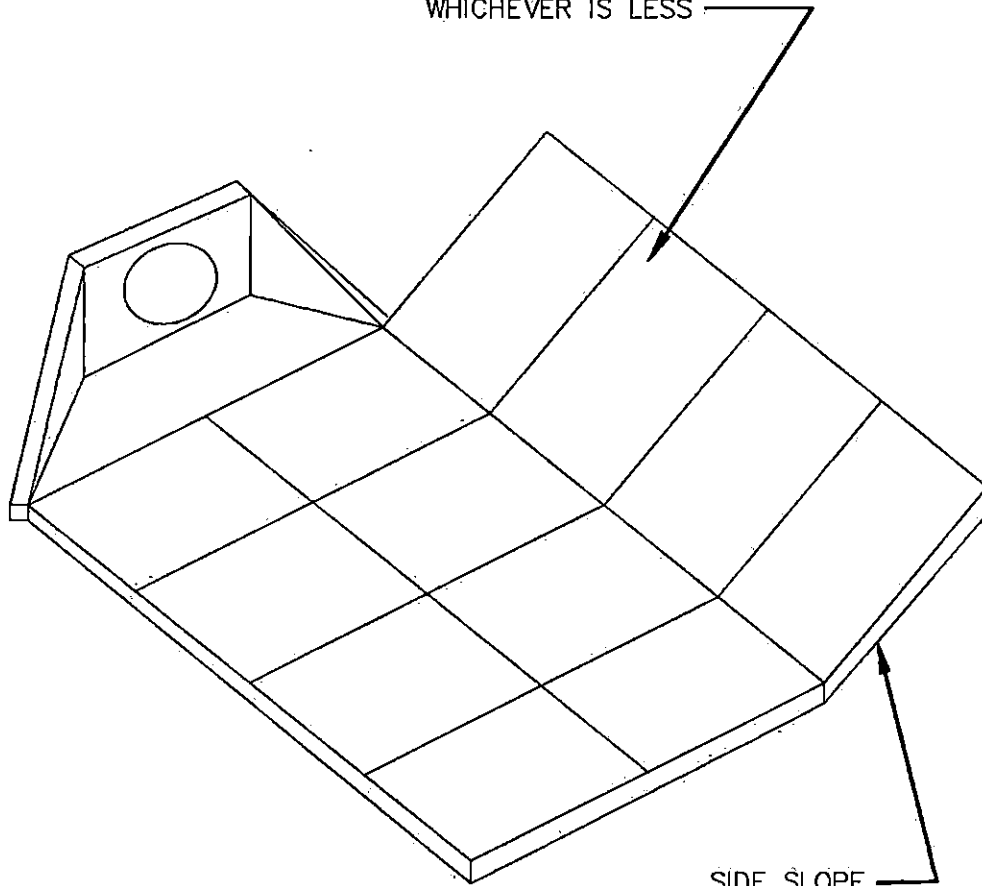


STORMWATER MANUAL

FIGURE 11-9
GABION MATTRESS AT OUTLET
INTO WELL-DEFINED CHANNEL

(OCTOBER 1, 2016)

EXTEND GABION MATTRESS UP SIDE SLOPE
OF CHANNEL TO TOP OF BANK OR 1' HIGHER
THAN MAXIMUM TAILWATER DEPTH,
WHICHEVER IS LESS



SIDE SLOPE
SHALL NOT EXCEED
2H:1V

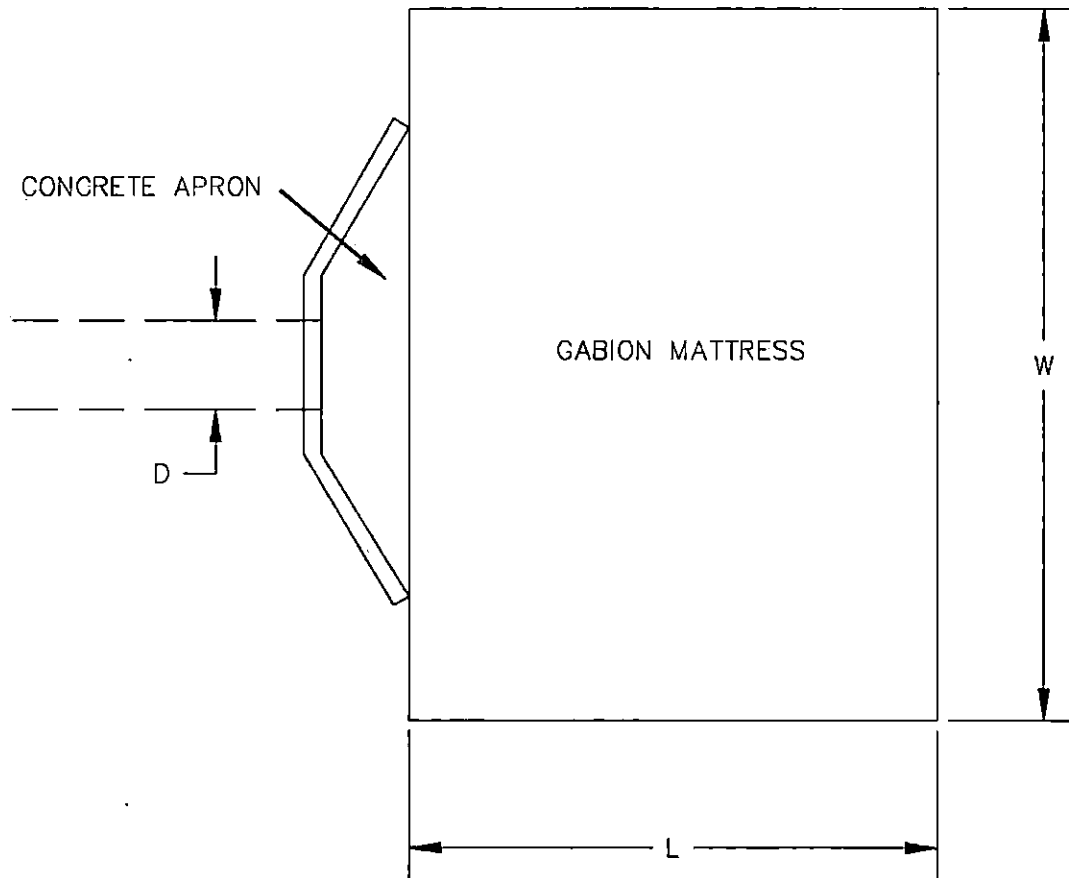
NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE
CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



STORMWATER MANUAL

FIGURE 11-10
PLAN VIEW OF GABION MATTRESS
AT OUTLET INTO FLAT AREA

(OCTOBER 1, 2016)



D = HEIGHT OR WIDTH OF OUTLET, WHICHEVER IS GREATER

FOR $D \leq 36$ INCHES:

$L = 12$ FEET MINIMUM

$W = (18 + D)$ FEET MINIMUM

FOR $D > 36$ INCHES:

$L = 4 \times D$ FEET MINIMUM

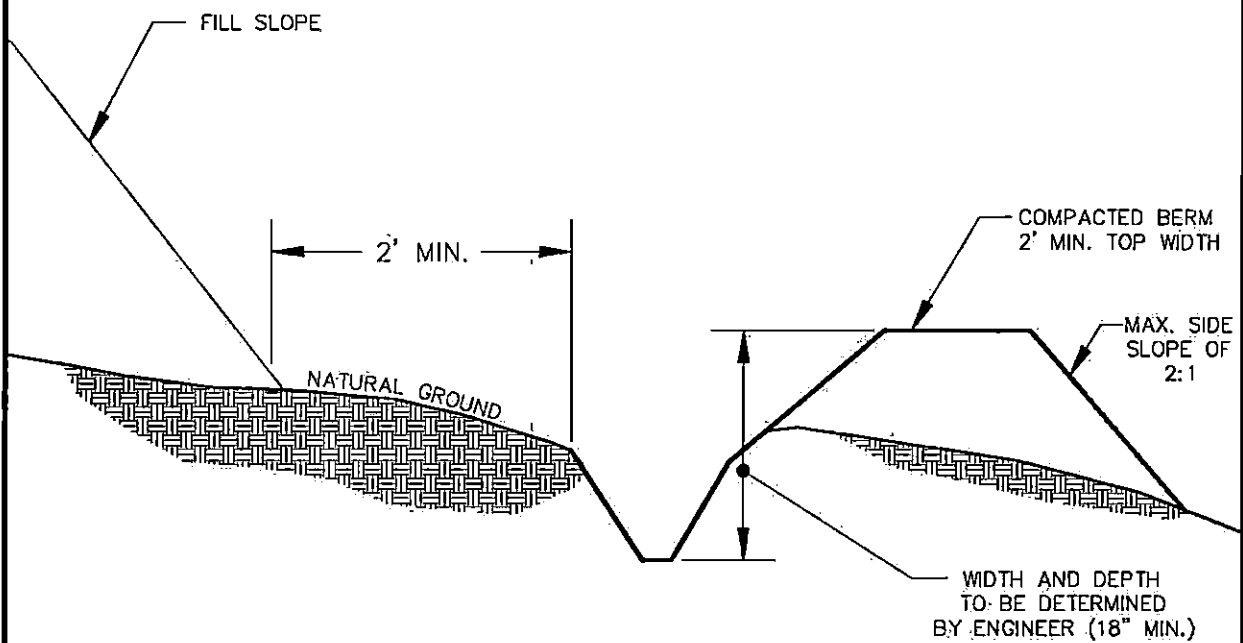
$W = (2L + D)$ FEET MINIMUM

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



STORMWATER MANUAL

FIGURE 11-12
TEMPORARY DIVERSION DITCH
(OCTOBER 1, 2016)



NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.

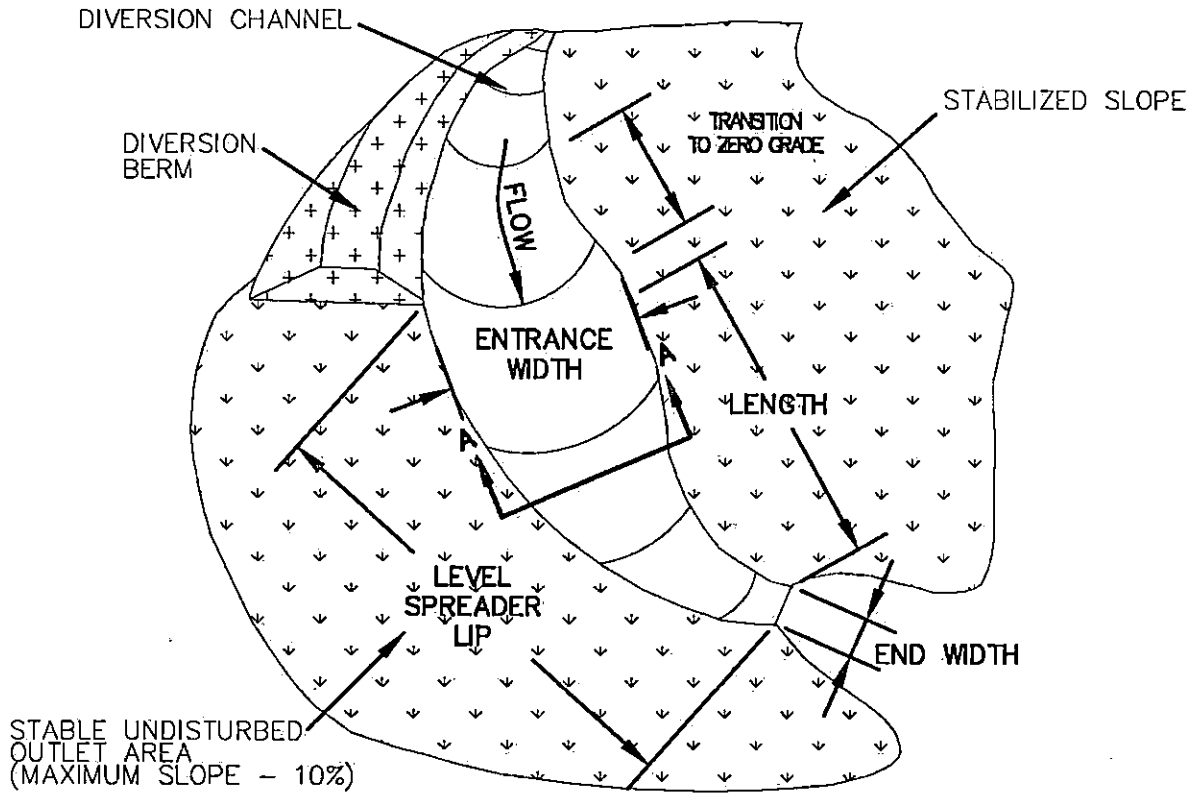


STORMWATER MANUAL

FIGURE 11-13

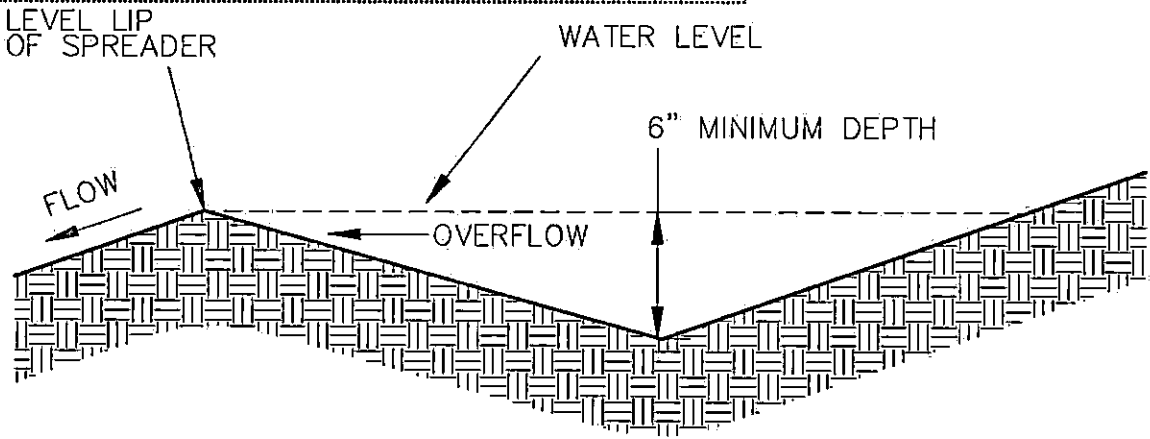
LEVEL SPREADER

(OCTOBER 1, 2016)



PERSPECTIVE

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.

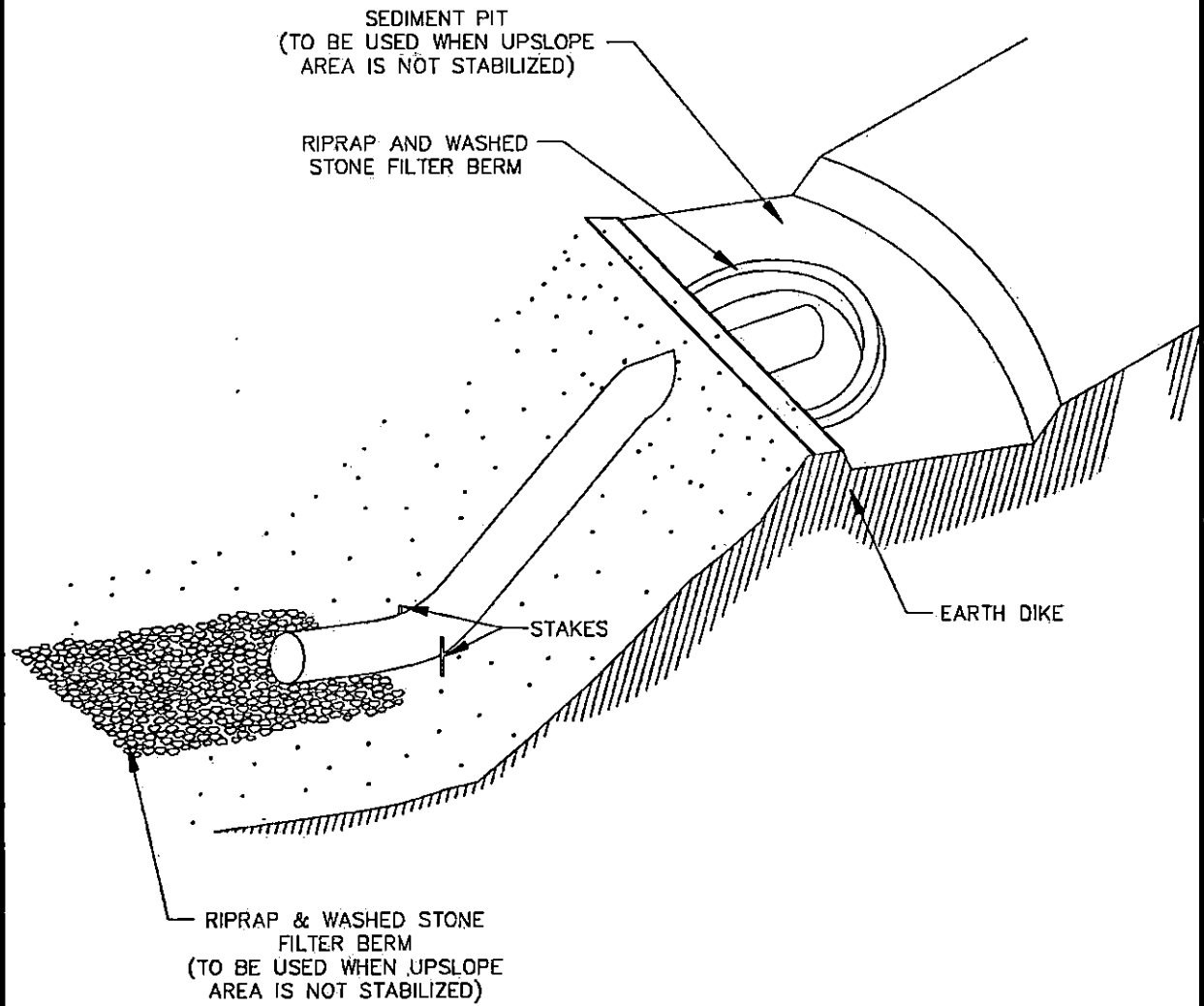


SECTION A-A



STORMWATER MANUAL

FIGURE 11-14
FLEXIBLE PIPE SLOPE DRAIN
(OCTOBER 1, 2016)

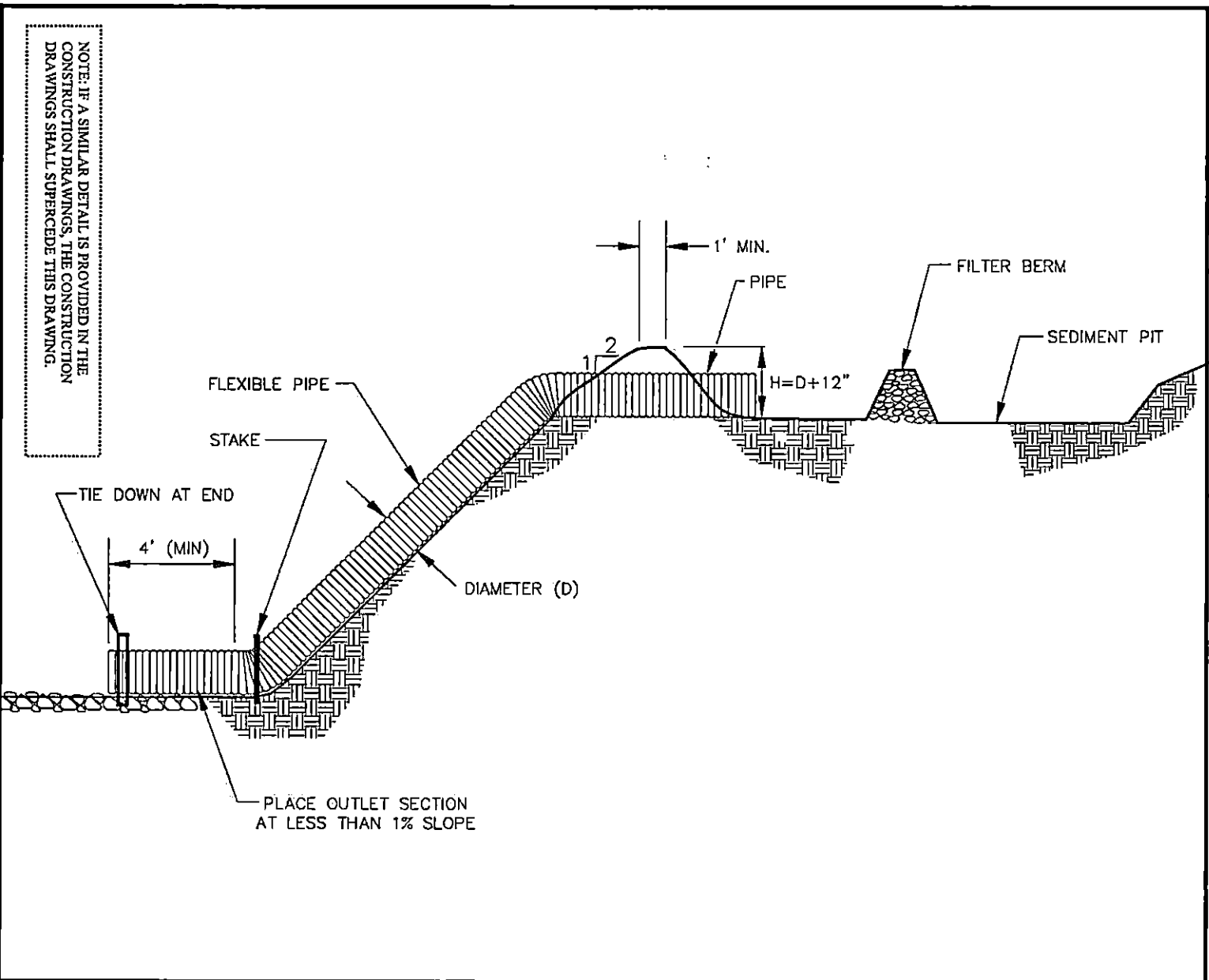


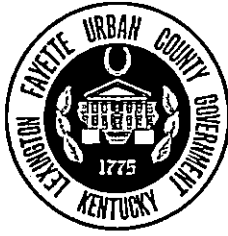
NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



STORMWATER MANUAL

FIGURE 11-16
SLOPE DRAIN - PROFILE
(OCTOBER 1, 2016)



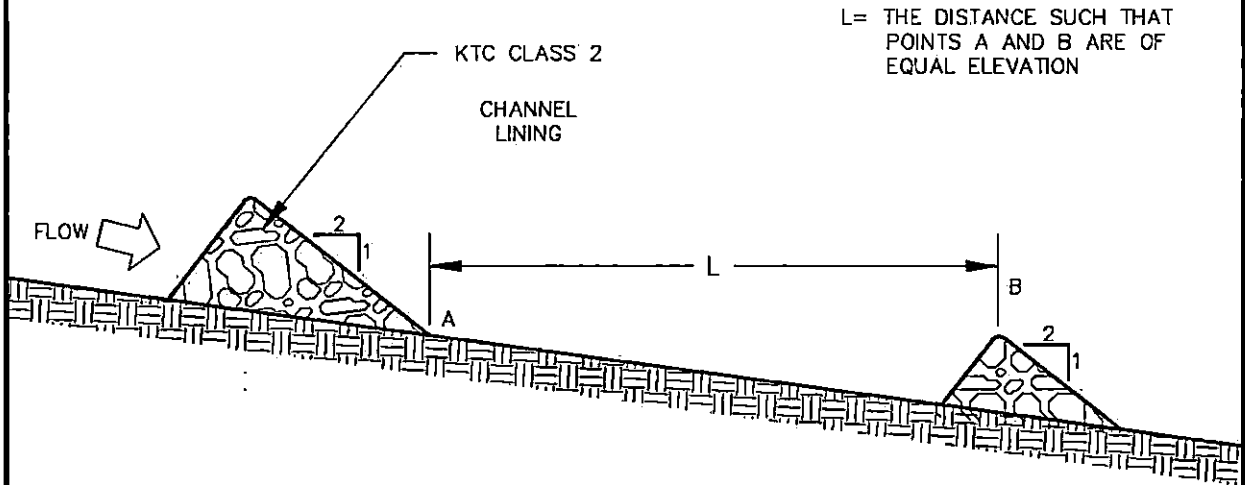


STORMWATER MANUAL

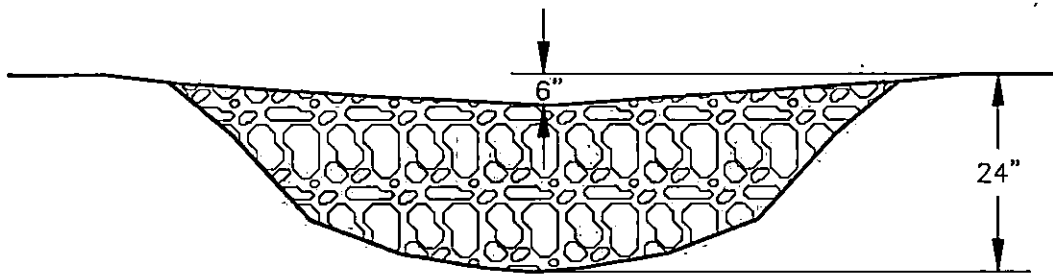
FIGURE 11-16

ROCK CHECK DAM

(OCTOBER 1, 2016)



LONGITUDINAL SECTION SHOWING
SPACING BETWEEN CHECK DAMS



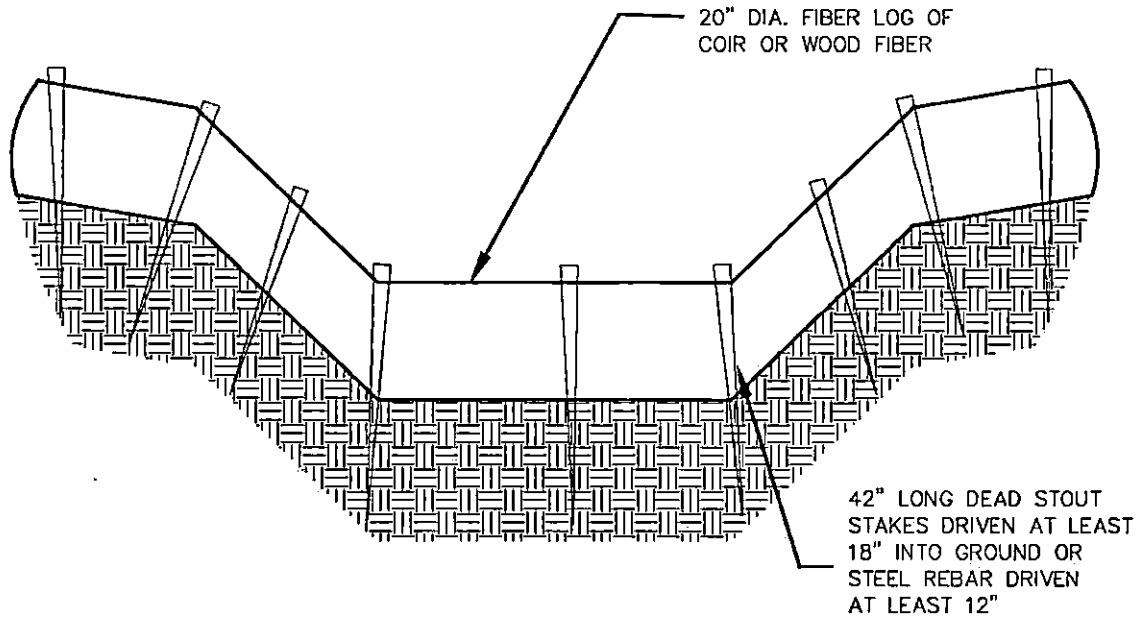
SECTION ACROSS CHANNEL

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



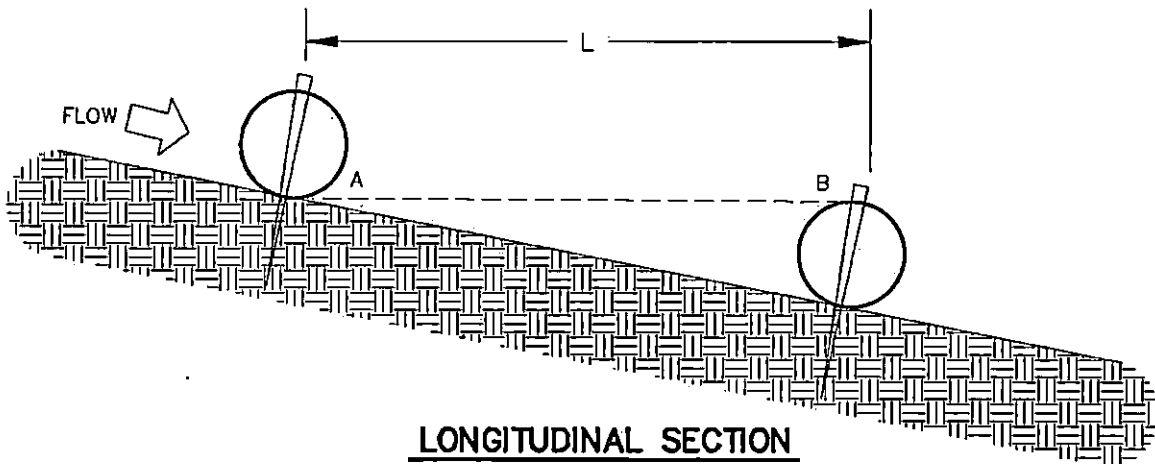
STORMWATER MANUAL

FIGURE 11-17
FIBER LOG CHECK DAM
(OCTOBER 1, 2016)



SECTION ACROSS CHANNEL

STAKES SHALL BE SPACED NO FURTHER THAN 24" AND SHALL BE DRIVEN AT EACH SIGNIFICANT SLOPE BREAK AND WITHIN 6" OF EACH END.



LONGITUDINAL SECTION

L = DISTANCE SUCH THAT POINTS A AND B ARE OF EQUAL ELEVATION

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.

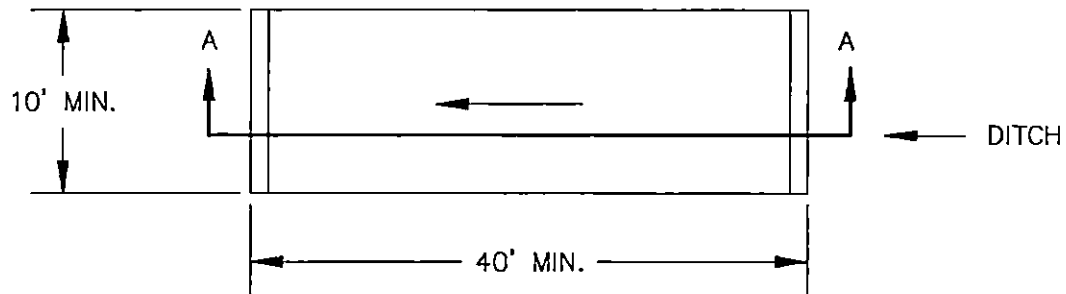


STORMWATER MANUAL

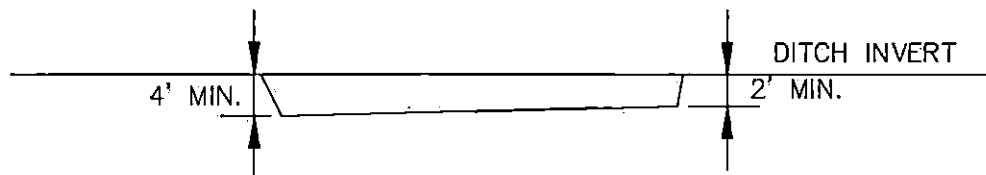
FIGURE 11-18

SEDIMENT TRAP

(OCTOBER 1, 2016)



PLAN VIEW



SECTION A-A

NOTES:

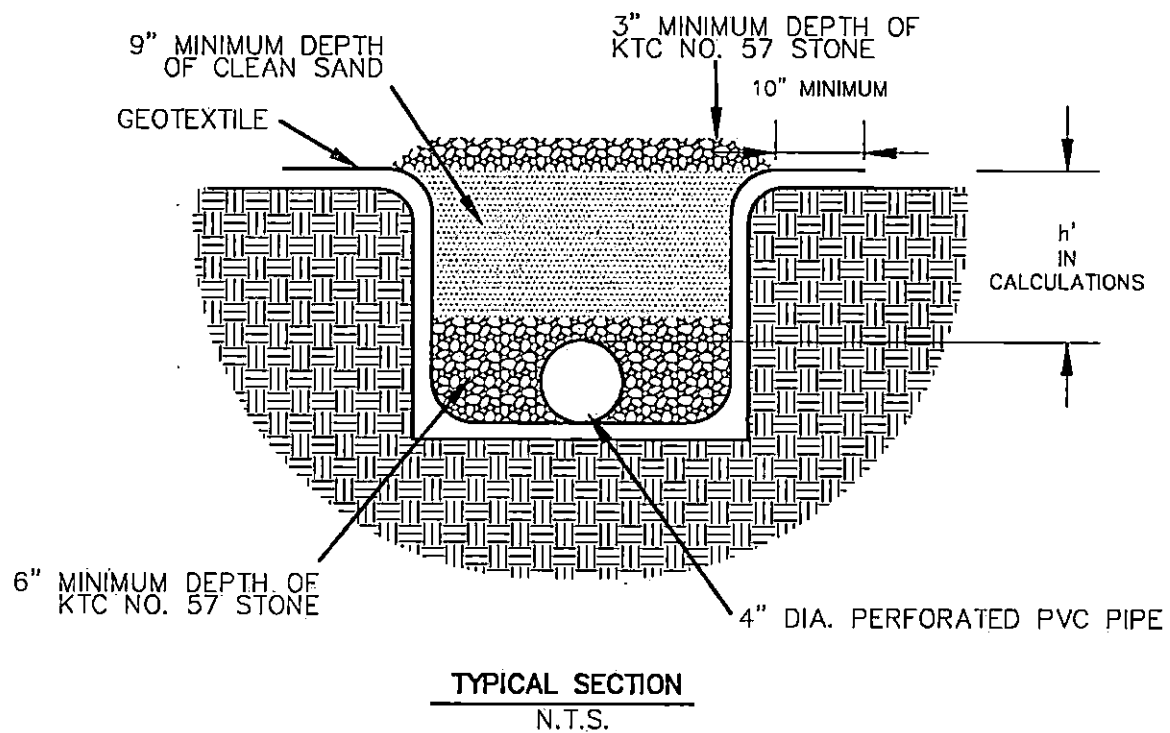
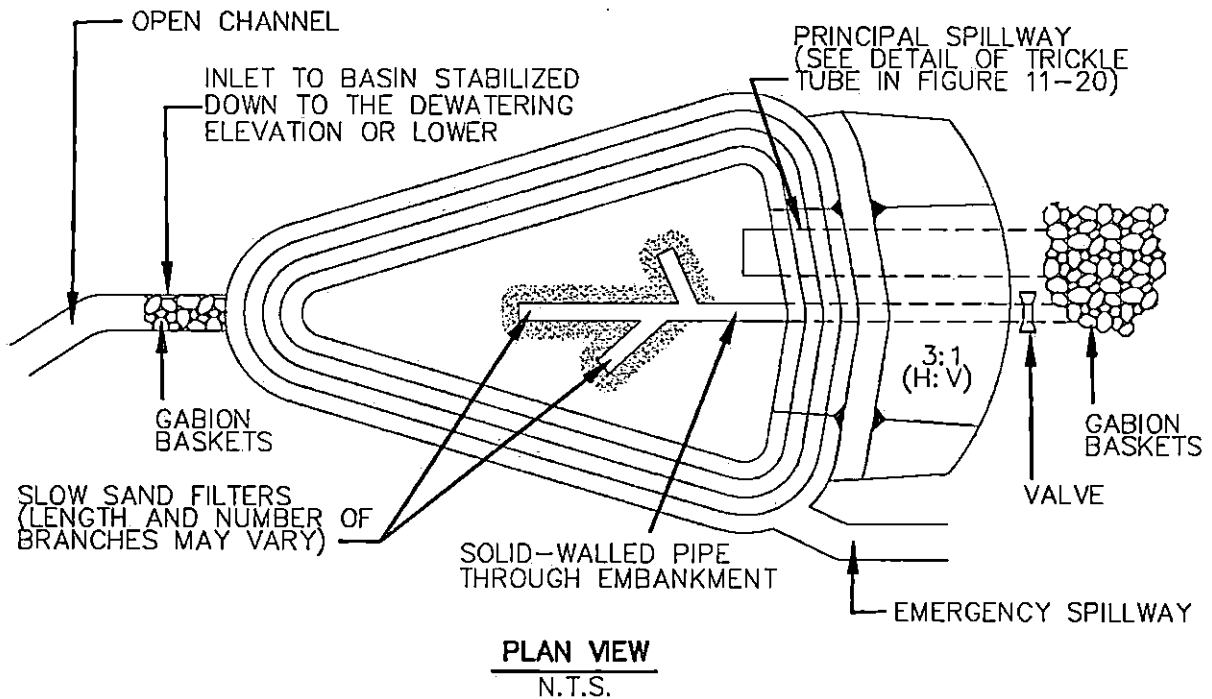
- 1) THE SIZE, SHAPE AND LOCATION OF TRAP MAY BE ADJUSTED FROM THAT SHOWN IN THE CONSTRUCTION PLANS, AS DIRECTED BY THE ENGINEER.
- 2) THE SEDIMENT TRAP MAY BE CONSTRUCTED AS DIRECTED BY THE ENGINEER AS LONG AS THE AREA AND DEPTH IS AT LEAST AS THAT INDICATED ON THE PLANS.
- 3) SEDIMENT TRAP SHALL BE CONSTRUCTED BY EXCAVATING THE BASIN IN NATURAL OR EXCAVATED CHANNELS. SEDIMENT DEPOSITS IN TRAP SHALL BE REMOVED EACH TIME THE TRAP IS APPROXIMATELY 50 PERCENT FILLED. WHEN THEIR USEFULNESS HAS ENDED, THE TRAPS SHALL BE REMOVED, SURPLUS MATERIAL DISPOSED OF AND THE ENTIRE DISTURBED AREA SHALL BE SEEDED AND PROTECTED, OR SODDED, AS DIRECTED. SEDIMENT TRAPS MAY REMAIN IN PLACE UPON COMPLETION OF THE PROJECT ONLY WHEN PERMITTED BY THE ENGINEER OR THE PLANS.

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



STORMWATER MANUAL

FIGURE 11-19
SEDIMENT POND WITH
SAND FILTER OUTLET
 (OCTOBER 1, 2016)

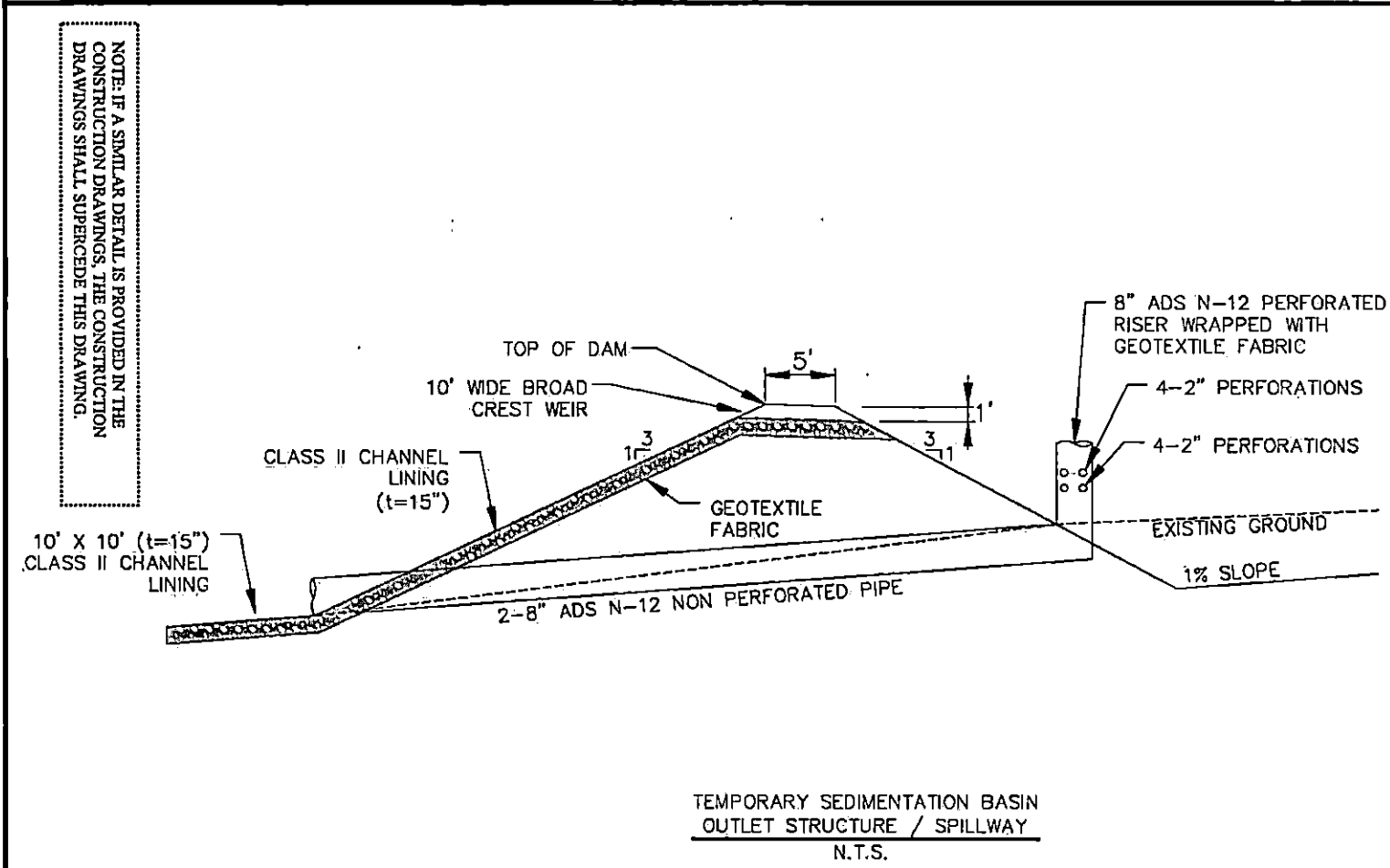


NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



STORMWATER MANUAL

FIGURE 11-20
TEMPORARY SEDIMENTATION BASIN
OUTLET STRUCTURE / SPILLWAY
DETAIL
(OCTOBER 1, 2016)

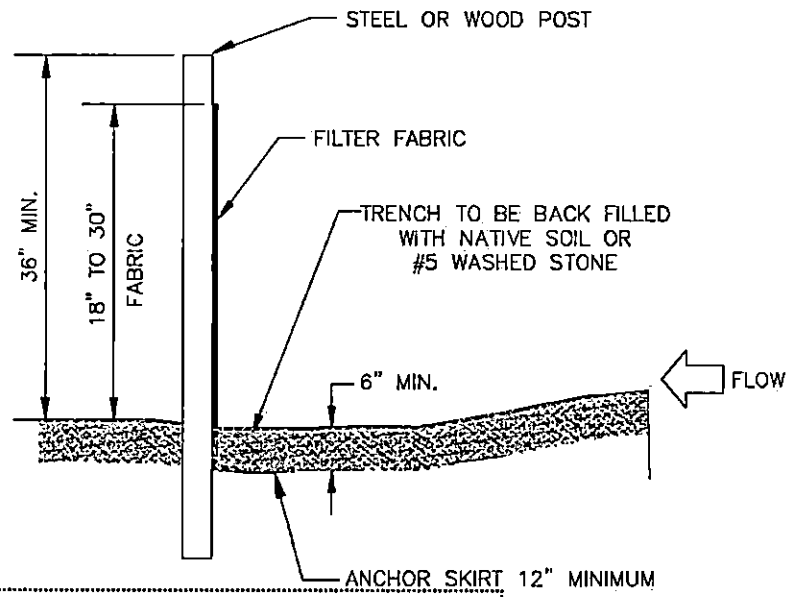
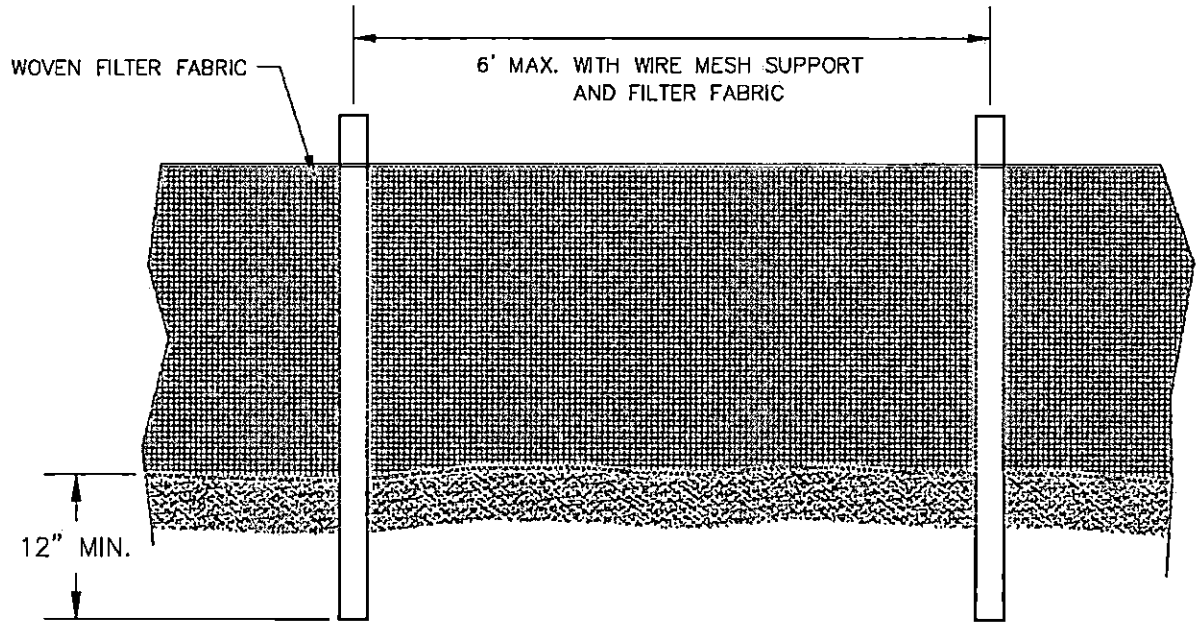




STORMWATER MANUAL

FIGURE 11-21
TEMPORARY SILT FENCE

(OCTOBER 1, 2016)



NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



STORMWATER MANUAL

FIGURE 11-22
TEMPORARY SILT FENCE
GENERAL NOTES
(OCTOBER 1, 2016)

GENERAL NOTES

1. FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL AND CUT TO THE LENGTH OF THE BARRIER. WHEN JOINTS CANNOT BE AVOIDED, FILTER FABRIC SHALL BE SPLICED TOGETHER ONLY AT A POST WITH 3 FOOT MIN. OVERLAP, AND SECURELY SEALED.
2. POSTS SHALL BE SPACED AT 6 FOOT INTERVALS IN AREAS OF RAPID RUNOFF.
3. POSTS SHALL BE AT LEAST 5 FEET IN LENGTH.
4. STEEL POSTS SHALL HAVE PROJECTIONS FOR FASTENING WIRE AND FABRIC.
5. WOOD POSTS SHALL BE 2 INCHES BY 2 INCHES OR EQUIVALENT. STEEL POSTS SHALL BE 1.33 LBS PER LINEAR FOOT.
6. A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST 1 INCH IN LENGTH, WIRE TIES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 2 INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
7. WASHED STONE SHALL BE USED TO BURY SKIRT WHEN SILT FENCE IS USED ADJACENT TO A CHANNEL, CREEK, OR POND.
8. TURN SILT FENCE UP SLOPE AT ENDS.

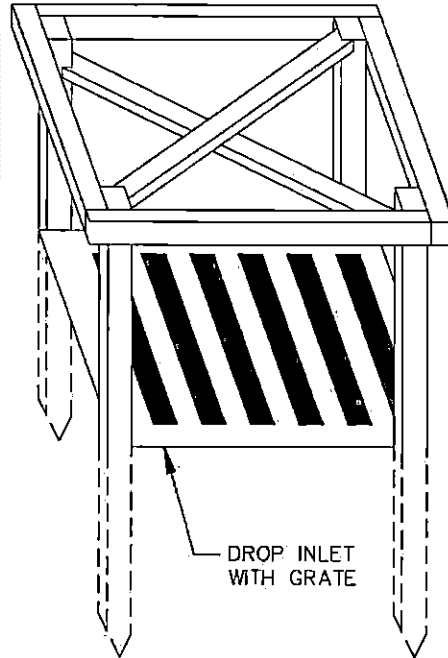
NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



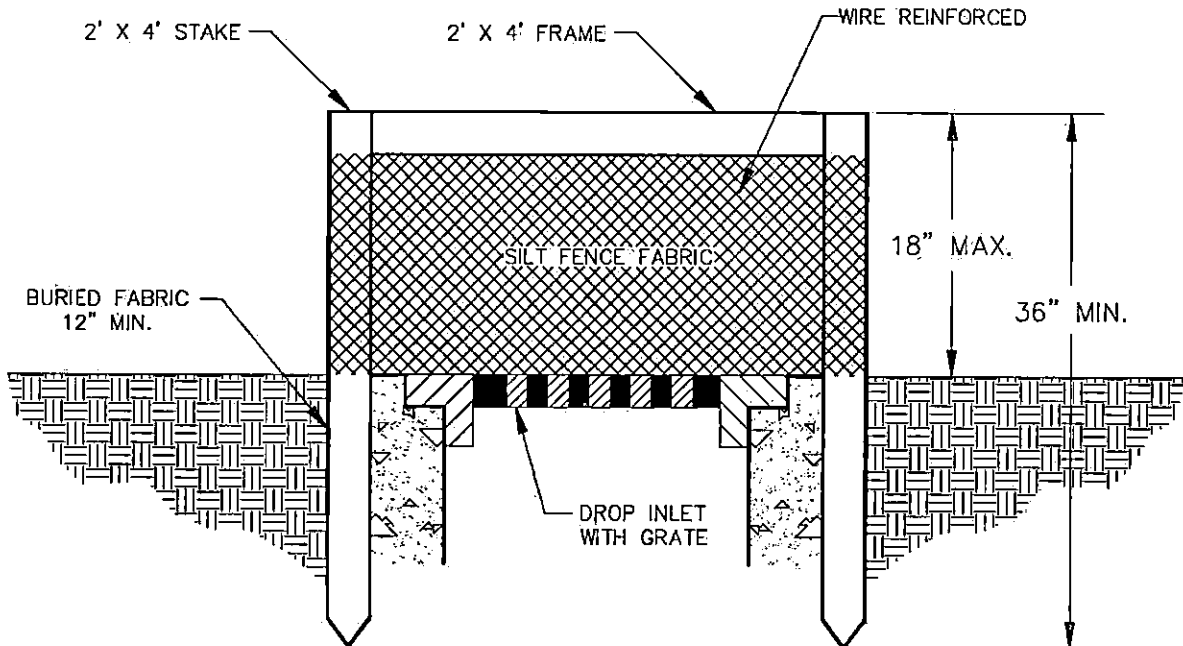
STORMWATER MANUAL

FIGURE 11-23
DROP INLET PROTECTION
USING SILT FENCE
(OCTOBER 1, 2016)

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



**ISOMETRIC VIEW OF
2 X 4 WOOD FRAME**

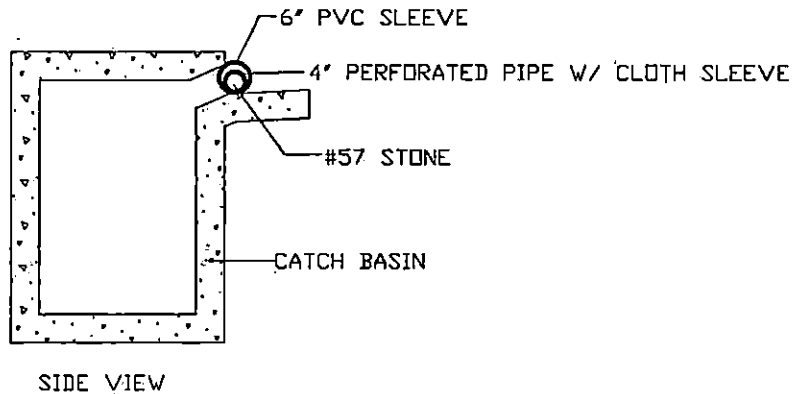
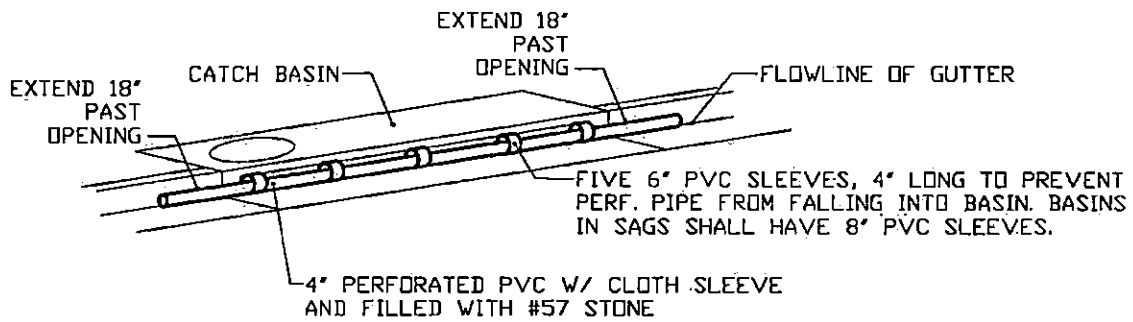


CROSS SECTION VIEW



STORMWATER MANUAL

FIGURE 11-24
CATCH BASIN INLET PROTECTION DETAIL
(OCTOBER 1, 2016)



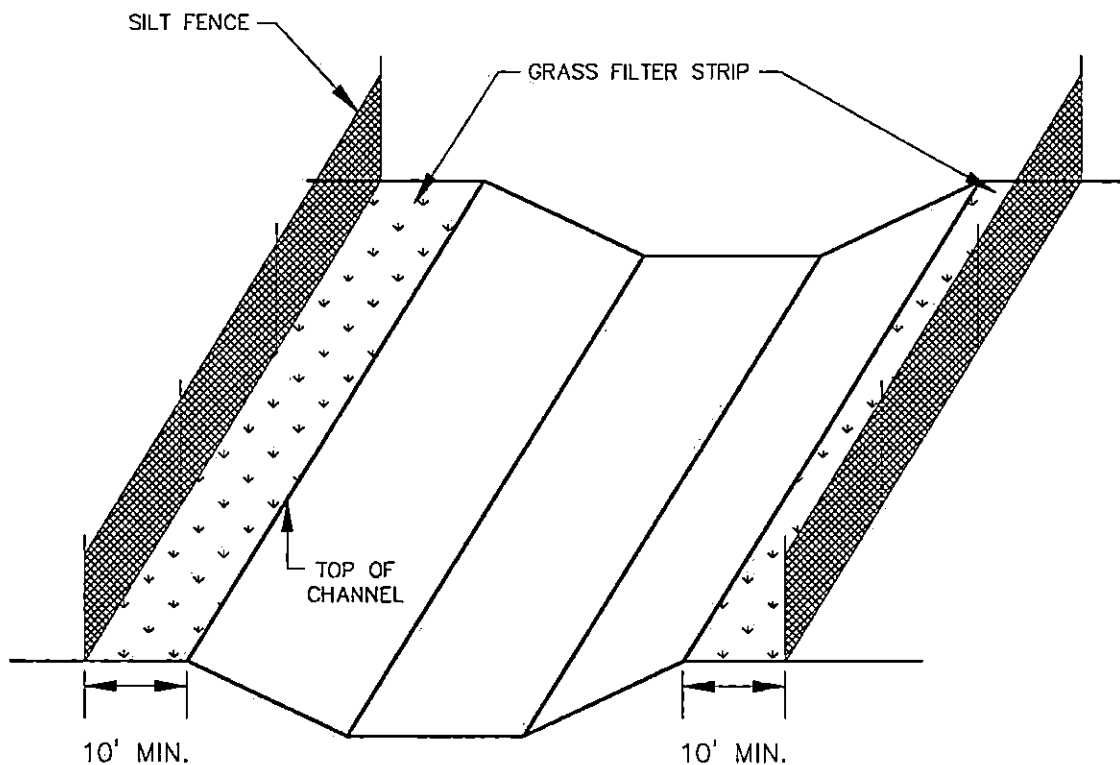
CATCH BASIN INLET PROTECTION DETAIL
N.T.S.

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.



STORMWATER MANUAL

FIGURE 11-25
FILTER STRIP FOR
CONSTRUCTED CHANNEL
(OCTOBER 1, 2016)

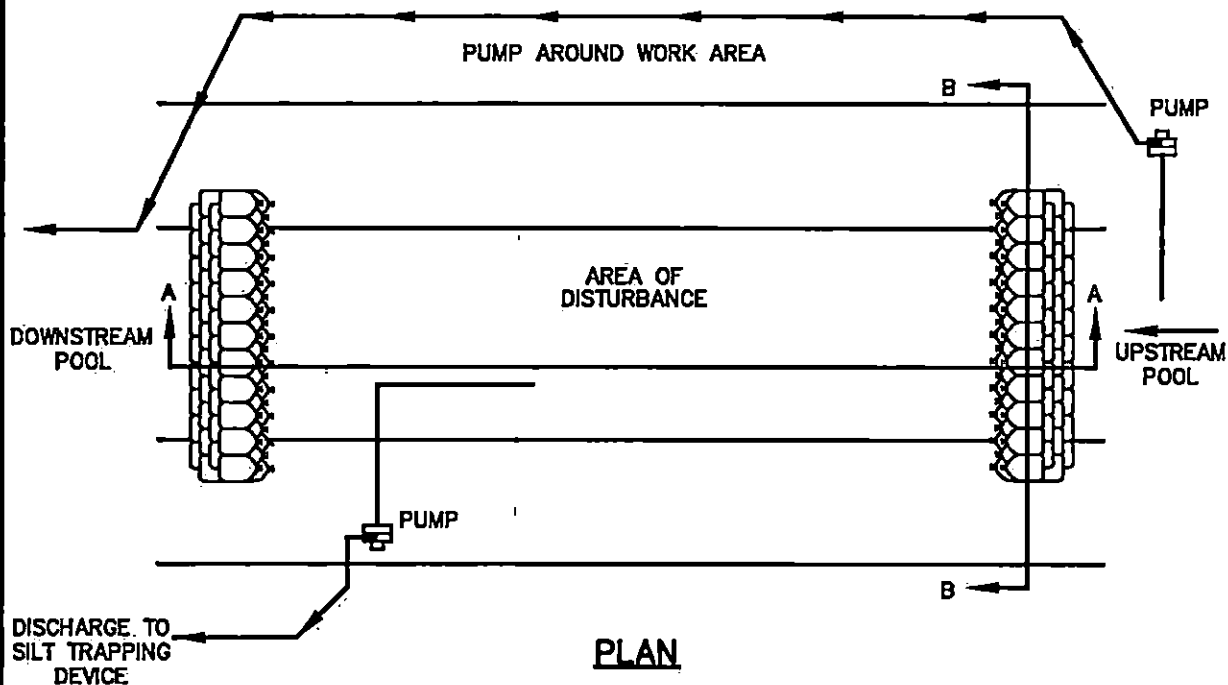


NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.

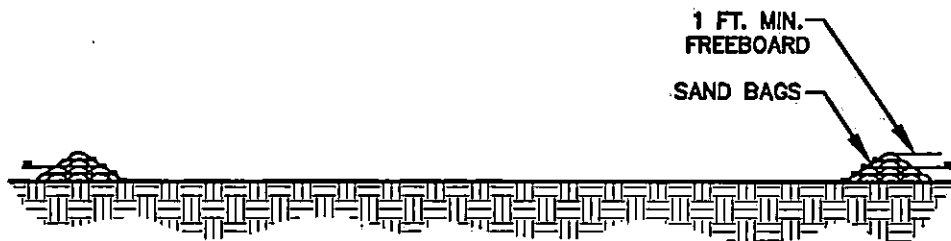


STORMWATER MANUAL

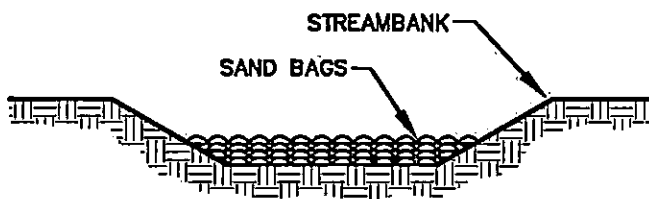
FIGURE 11-26
PUMP-AROUND FLOW DIVERSION
(OCTOBER 1, 2016)



PLAN



SECTION A-A



SECTION B-B

NOTE: IF A SIMILAR DETAIL IS PROVIDED IN THE CONSTRUCTION DRAWINGS, THE CONSTRUCTION DRAWINGS SHALL SUPERCEDE THIS DRAWING.

SECTION 02373 – STREAM CROSSINGS, STREAMBANK RESTORATION, AND STREAM BUFFER RESTORATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, and equipment required for installing all structural and vegetative features associated with stream crossings, streambank restoration, and stream buffer restoration areas. Work in this section may include installation of Constructed Riffles, Temporary Stream Crossings, Streambank Restoration, and/or Stream Buffer Restoration.
- B. The Contractor shall take all measures necessary to minimize the use of equipment within the banks of a stream.

1.02 PERMIT REQUIREMENTS

- A. The Contractor is responsible to meet and follow all of the requirements and provisions in all project permits. A copy of applicable permits acquired by the Owner is included in Section 00890 – Permits.

PART 2 – PRODUCTS

2.01 STREAM BUFFER PERMANENT SEEDING

- A. Stream buffer seeding shall be used for permanent seeding where land disturbance has occurred within 25 feet of the stream bank, with the following exceptions:
 - 1. If a property owner landscaping agreement differs from this specification, the property owner landscaping agreement shall be followed on that property, or
 - 2. The Construction Drawings identify a different location and/or seed mix.
- B. The Stream Buffer Permanent Seed Mix shall consist of the following mix spread at a rate of 20 lbs/acre:

Common Name	Scientific Name	%	Lbs/ac
Redtop	<i>Agrostis alba</i>	10%	2
Elm-leaved Goldenrod	<i>Solidago ulmifolia</i>	5%	1
Big Bluestem	<i>Andropodon gerardii</i>	20%	4
Virginia Wild Rye	<i>Elymus virginicus</i>	20%	4
Prairie Switchgrass	<i>Panicum virgatum</i>	15%	3
Cutleaf Coneflower	<i>Rudbeckia laciniata</i>	5%	1
Ox Eye Sunflower	<i>Heliopsis helianthoides</i>	5%	1
River Oats	<i>Chasmanthium latifolium</i>	15%	3
Black-eyed Susan	<i>Rudbeckia hirta</i>	5%	1
TOTAL		100%	20

2.02 WOVEN COIR FABRIC

- A. The Contractor shall submit a shop drawing for the proposed material for review and approval by the Owner's Engineer prior to placement.
- B. Woven Coir Fabric shall be woven from machine twisted coir twines made of bristle coir. Woven Coir Fabric shall be Rolanka BioD-Mat 90 or approved equal meeting the following minimum requirements:

PROPERTY	TEST METHOD	TYPICAL
Mass/Unit Area (oz/yd ²)	ASTM D 3776	29
Tensile Strength (Machine Direction) (lbs./ft)	ASTM D 4595	1776
Tensile Strength (Transverse Directions) (lbs./ft)	ASTM D 4595	936
Elongation (Machine Direction) (%)	ASTM D 4595	52
Elongation (Transverse Direction) (%)	ASTM D 4595	24
Thickness (in.)	ASTM D 1777	0.35
Recommended Shear Stress (lbs./ft. ²)	N/A	5
Recommended Flow (ft/s)	N/A	16

- C. Wooden stakes to fasten coir fabric to the soil shall be hardwood stakes that are solid and free of rot, with the following approximate dimensions: 1" x 2" x 18" (tapered to a point). The Contractor may fabricate or purchase stakes.
- D. Sod staples for anchoring void spaces of the coir fabric shall be bio-degradable wooden stakes.

2.03 CONTAINER PLANTS

- A. Tree and shrub plant species and quantities shall be in accordance with those listed or shown on the Construction Drawings. All trees and shrubs shall be in containers grown with air-root pruned technique, spin-out containers or equivalent.
- B. Woody plants shall exhibit a fully developed fibrous root system that allows the root ball to remain intact after removal from the container. Roots shall not be pot-bound or spiraling in the container.
- C. Double shredded hardwood mulch shall consist of the bark from hardwood trees which has been milled and screened to a maximum 4 inch particle size. Mulch shall provide a uniform texture free from sawdust, weed seeds, foreign materials and any artificially introduced chemical compounds detrimental to plant life. Mulch shall be well aged (a minimum age of 6 months).
- D. Nursery stock material shall be identified with attached, durable, waterproof labels and weatherproof ink. Labels shall state the scientific name of the specified plants. Common names are not acceptable. The scientific names must match those in the project plans. Plants that are unlabeled or improperly labeled shall not be accepted. Plant material shall be protected during delivery to prevent desiccation and damage to branches, trunk, root system, or earth ball.
- E. Plant material shall be checked for unauthorized substitution and to establish nursery grown status. Plant material showing desiccation, abrasion, sun-scald injury, disfigurement, or unauthorized substitution shall be rejected. Container-grown plant material shall show new

fibrous roots and the root mass shall contain its shape when removed from the container. Plant material with broken containers shall be rejected. All rejected plant material shall be removed from the project site by the Contractor by the close of each working day.

- F. Fertilizer for container plants shall be MYCOtabs 20-10-5 slow release mycorrhizal fertilizer tablets or equivalent.

2.04 LIVE STAKES

- A. Live stake plant species shall be silky dogwood unless otherwise denoted in the Construction Drawings. Cuttings shall be alive, but dormant, with side branches removed and bark intact.
- B. Cuttings shall be ½ to 2-inch diameter stock and 3 feet in length.
- C. The basal ends of the cuttings shall be cut on an angle to facilitate insertion into the soil.
- D. The materials may be collected or purchased.
- E. No species shall be substituted without prior written approval from the Owner.
- F. Cuttings shall be bagged and/or bundled by species and shall be identified with durable and waterproof labeling and/or weatherproof ink. Labels shall state the scientific name of the plant species grouping. Common names are not acceptable. The scientific names must match those in the specification. Plants that are unlabeled or improperly labeled shall not be accepted.
- G. Plant material that is damaged or desiccated, or does not meet the material specifications shall not be accepted. All rejected plant material shall be removed from the project site by the Contractor by the close of the working day.

2.05 BRANCH PACKING

- A. Material may consist of branches of silky dogwood species. Branches should be a minimum of 5 feet long and should be installed the same day that they are prepared, if harvested locally. Materials can be either harvested from existing living trees or purchased from a vendor. If immediate planting cannot be performed, the basal end of the plant shall be kept in water and the plant shall be refrigerated.

2.06 STONE

- A. All stone shall consist of clean limestone of the specified size; hard, durable, and angular in shape, and resistant to weathering. Stone shall not contain deleterious amounts of shale, as determined by the Engineer. Porous or friable stone shall not be accepted.
- B. Stone shall be of the size and quantity as shown on the Construction Drawings.

2.07 TOPSOIL

- A. Topsoil shall consist of the upper portion of the soil profile and shall be loose, friable soil that is free of stones larger than one inch (1"), sub-soil, refuse and other debris including stumps, roots, brush, weeds, and non-organic materials. The acceptable soil texture classification for topsoil, in accordance with the U.S. Department of Agriculture is: clay (40% maximum), silt (70% maximum), and sand (60% maximum). Manure and/or partially composted materials are not acceptable. Topsoil (both salvaged and furnished) shall meet the following minimum

standards through analytical testing, unless otherwise directed by LFUCG or the Owner's Engineer:

Organic Matter	> 3%
pH (range)	5.8 – 7.0
Soluble Salts	< 500 parts per million

The Owner's Engineer shall visually approve representative samples of topsoil. All operations involved in the placing, spreading, and rolling of the topsoil shall be subject to the approval of the Owner. Selected topsoil shall be obtained from approved stockpiles of materials from excavation, from stripping, from borrow areas, or from other approved sources.

PART 3 – EXECUTION

3.01 GENERAL

- A. All work within and along a stream shall be consistent with all project permits and the requirements of the state and local regulatory agencies.
- B. The Contractor shall take care to prevent the deposition of sediment into the stream.
- C. Stream diversion operations shall be scheduled such that work is completed as quickly as possible. Contractor shall not construct in a stream when rainfall is expected during the time excavation will be occurring in the stream.
- D. 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.
- E. Removal of riparian vegetation in the stream buffer and on the stream banks shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures shall be employed at all times during the project to prevent degradation of waters of the Commonwealth. Within 25 feet of a stream, site regrading and reseeding shall be accomplished within 7 days after disturbance.

3.02 STREAM BUFFER PERMANENT SEEDING

- A. Stream Buffer Permanent Seeding shall be conducted in accordance with the specifications of Section 02372, Article 3.04 - Permanent Seed using the seed mix listed in this Section 02373, Article 2.01 - Stream Buffer Permanent Seeding.

3.03 WOVEN COIR FABRIC

- A. When placing woven coir fabric, the surface of the soil should be smooth and free of rocks, roots and other obstructions.
- B. Seed the prepared soil areas in accordance with Section 02372, Article 3.04 – Permanent Seed prior to the installation of the coir fabric.
- C. Fabric shall be trenched, placed and staked in according to the Construction Drawings.

- D. Biodegradable wooden stakes shall be inserted sporadically within void spaces and areas with puckers in the fabric.

3.04 CONTAINER PLANTS

- A. Planting operations shall be performed only during periods when successful results are likely. To minimize stress or transplant shock, no plants shall be installed when ambient temperatures are forecasted to rise above 90°F at any point during a forty-eight (48) hour period following installation. In addition, no plants shall be installed when ambient temperatures are forecasted to drop below freezing. In general, trees and shrubs do best when planted in early spring or fall.
- B. If trees and shrubs are not planted through erosion control blanket, then mulch in the form of hardwood mulch or mulch mats shall be used.
- C. The Contractor shall mulch and fertilize.
- D. All trees and shrubs should be fertilized with MYCOtabs 20-10-5 slow release mycorrhizal fertilizer tablets or equivalent. Each containerized plant should receive one 21 gram tablet. All fertilizer tablets are to be installed 4 inches below and 4 inches to the side of the plant roots.
- E. All plants shall be watered thoroughly once unloaded and immediately after planting. Water until saturated once per week for the first four to six weeks and once every other week through the fall season. Water shall not contain elements toxic to plant life.
- F. Prior to shipping to the site, the Contractor shall request approval of trees, shrubs, and fertilizer ordered. A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery of trees and shrubs.
- G. If plants are not planted on the day of delivery, the plants shall be stored onsite in a shaded location and will be kept moist and cool.
- H. Each root ball from containerized woody stock shall be carefully removed from the container without damaging the root system or plant.
- I. When digging a planting hole for containerized woody stock, the diameter of the planting hole shall be at least 30% greater than the diameter of the root ball.
- J. Trees and shrubs shall be placed in the center of the hole with top of root ball 1 inch above finished grades.
- K. Following planting, each hole shall be backfilled with soil removed from the hole when the hole was formed.
- L. Where the removed soil is unacceptable, a soil amendment shall be required.
- M. Each planted tree and shrub shall have a minimum depth of 6 inches of organic material.
- N. Organic soil amendment may consist of composted wood chips, composted leaf mulch, or other suitable and available natural organic material.
- O. If amending the planting areas with topsoil, acceptable topsoil shall meet the material requirements of this Section 02373, Article 3.08 - Topsoil.
- P. Containerized trees and shrubs planted through erosion control blanket shall be planted through clean incisions in the blanket. Incisions shall be parallel to the direction of flow in the stream.

- Q. Portions of the erosion control blanket shall not be removed.
- R. The blanket incision shall be securely closed with wire staples or stakes.
- S. Seeded areas shall be inspected at least weekly after planting and after each rainfall of one-half inch or more. Areas requiring additional seed and mulch shall be repaired within 48 hours.
- T. If vegetative cover is not established within 21 days, the area shall be reseeded.

3.05 LIVE STAKES

- A. Live stakes shall be installed at any time during their dormant period when the ground is not frozen. Live stakes shall not be installed after dormancy is broken or after sprouting. Stakes that begin sprouting before planting will be rejected.
- B. Prior to shipping to the site, the Contractor shall request approval from the Owner's Engineer of live stakes ordered. A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery of live stakes.
- C. Plants shall be stored in a continuously cool, covered, and moist state.
- D. Live stakes shall be soaked for 24 hours prior to installation in clear water, with the basal end of the plant in the water and shall be removed from the water no more than 1 hour before planting.
- E. Live stakes shall not be soaked for a length greater than ten (10) days.
- F. The angled end of the live stakes shall be inserted into the soil manually or with the use of a dead blow hammer with the uncut end protruding for approximately 3/5 of the cutting length.
- G. In rock toe, live stakes shall be inserted to one-half their length into soil below stone fill with a minimum of two buds exposed above the stone fill. An iron bar or a stinger attached to a backhoe bucket can be used to make a pilot hole in firm or rocky soil.
- H. If a pilot hole is used, the diameter of the pilot hole shall be less than the diameter of the smallest live stake to ensure firm contact with the soil.
- I. Each live stake shall be positioned perpendicular to the slope at a 45° angle facing downstream followed by foot compaction around each cutting.
- J. Live stakes shall be installed in a random configuration.
- K. Live stakes that become split or "mushroomed" during installation shall be replaced at the Contractor's expense.

3.06 BRANCH PACKING

- A. Prior to shipping to the site, the Contractor shall request approval from the Owner's Engineer of live stakes ordered. A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery of live stakes.
- B. Plants shall be stored in a continuously cool, covered, and moist state.

- C. Branches shall be soaked for 24 hours prior to installation in clear water, with the basal end of the plant in the water and shall be removed from the water no more than 1 hour before planting.
- D. Branches shall not be soaked for a length greater than ten (10) days.
- E. The live branches should be placed in a crisscross configuration with the growing tips generally oriented toward the slope face.
- F. The density of the branches shall be 10-15 branches per linear foot.
- G. After the live branches are configured, cover with a thin layer of soil approximately 1" thick.

3.07 STONE

- A. All stone shall consist of clean limestone of the specified size; hard, durable, and angular in shape, and resistant to weathering. Stone shall not contain deleterious amounts of shale, as determined by the Engineer. Porous or friable stone shall not be accepted.
- B. Stone shall be of the size and quantity as shown on the Construction Drawings and shall be placed in the manner shown in Construction Drawings.

3.08 TOPSOIL

- A. All proposed planted areas, not including stream banks, are to be covered with a minimum of 6 inches of topsoil prior to seeding or planting. Do not place topsoil within a stream channel or on a stream bank where full bank flow could erode and remove the material.
- B. Topsoil shall be evenly placed and spread over the graded area to a depth of 6 inches.
- C. Minimize compaction during all operations by utilizing equipment having low unit pressure ground contact and by limiting repeat passes over the same areas.

3.09 PUMP AROUND FLOW DIVERSION FOR STREAM CROSSINGS

- A. For stream crossings, the Contractor shall install, maintain, and operate all cofferdams, pumps, and protective works needed to divert stream flow and other surface water through and around the project work zone.
- B. The Contractor is responsible to determine the number and sizes of pumps necessary for dewatering needs.
- C. The Contractor shall inform the Owner's Engineer of a plan for diverting the stream flow. The de-watering plan must be approved by the Owner prior to the start of work and it shall include information on the type, sizes of pumps, dam construction techniques, discharge outfall protection, and other relevant information.
- D. Operations shall be scheduled such that diversion installation, in-stream excavation, in-stream construction, stream restoration, and diversion removal are completed as quickly as possible.
- E. The Contractor shall not construct in a stream when rainfall is expected during the time excavation will be occurring in the stream.
- F. To capture or divert water flows, cofferdams can be used across the stream channel and secondary drainageways above (up-slope from) the work side as follows:

1. Cofferdams shall be constructed of materials that will have a minimal impact on the stream system. Cofferdams constructed of soil or material from the site shall not be used unless specifically directed by the Owner's Engineer.
 2. Acceptable materials shall include stone, water structures, plastic barriers, or sand bags filled with clean and washed sand.
 3. Contractor shall add sand bags filled with clean and washed sand as required to seal leaks in rock cofferdams.
 4. The Contractor is responsible to install all cofferdams/diversion structures in a safe and correct manner. Cofferdams must be installed so as to withstand the pressures exerted by the stream flow or ponded water against the cofferdam.
 5. Commercial projects used as cofferdams (i.e. water structures, plastic barriers) shall be installed in accordance with the manufacturer's specifications.
 6. The Contractor is permitted to make only minor disturbances to the streambed or banks as may be required to properly install the cofferdam.
- G. Stream flow shall be pumped around the cofferdams and discharged back into the same drainageway that the water was taken from.
- H. The Contractor shall be responsible to provide all pumps, hoses, pipelines, fuel tanks, and other items required to pump the stream flow around the work site, and for providing supervision of the pumping operation during all hours the pumps are running.
1. The Contractor shall be responsible for calculating the required pump capacity to handle the average stream flow in the area of the work.
 2. The Contractor shall provide pumps that are in good operating order and free of leaks. Pumps that are leaking fuel, lubricants, or other material, shall be immediately repaired or replaced as necessary. All pump equipment shall be properly equipped with mufflers and other noise suppression equipment to minimize noise impacts on the surrounding residences.
 3. Discharge hoses shall be reasonably free of leaks at either the fittings or the discharge hose casing. No leaks from discharge lines shall be allowed to cause erosion.
 4. The Contractor shall provide adequate suction hose length to allow the pumps to be placed back from the immediate edge of the stream. Electric sump type pumps are exempt from this requirement.
 5. Only clean water will be allowed to enter the storm system or stream. The pumping operation shall not allow for sediment from the stream bottom to be pulled into the pump.
- I. Contractor shall dewater the work area and pump the work zone dewatering water into a sediment trapping device.
- J. Outlet protection shall be installed as required at the discharge point to prevent erosion of soils and the streambed or bank.
- K. Contractor shall complete construction activities across the stream.
- L. Contractor shall restore the streambed and banks.
- M. Contractor shall remove all materials placed for the cofferdam and outfall protection and shut down pumping operation. (Salvage sandbags for future use if multiple stream crossings are

required on the project.) Contractor shall remove all sandbags from the stream, including damaged and empty bags.

3.10 TEMPORARY STREAM CROSSING

- A. Clearing and excavation of the streambed and banks shall be kept to a minimum.
- B. The structure shall be removed as soon as it is no longer necessary for project construction.
- C. Upon removal of the structure, the stream shall immediately be reshaped to its original cross section and properly stabilized.
- D. The approaches to the structure shall consist of stone pads with a minimum thickness of 6 inches, a minimum width equal to the width of the structure, and a minimum approach length of 25 feet on each side.
- E. The structure shall be inspected after every rainfall and at least once a week and all damages repaired immediately.

END OF SECTION

SECTION 02374 – ESC PERMITTING, INSPECTION, AND PERMITTING PROCEDURES

[Note to engineer: Verify that the most up to date version is included prior to advertising the project.]

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**Permitting, Inspection, and Enforcement Procedures for
Erosion and Sediment Control on Capital Projects
Division of Water Quality Remedial Measures Plan (RMP)**

RMP Program Manager: Vernon Azevedo

RMP Project Managers: Kevin Levesque

RMP Administrative Specialist Principal: Diann Williams

Construction Contract Administrators (CA): DWQ Consultants

Resident Project Representatives (RPR): DWQ Consultants

ESC Plan Reviewer: DWQ Stormwater Section – Amad AL-Humadi

ACCELA Data Entry: DWQ Compliance and Monitoring – Kevin Lyne

Permittee: Contractor

Permitting Procedures

1. Contractor shall develop a Stormwater Pollution Prevention Plan / Erosion and Sediment Control Plan (SWPPP/ESC Plan).

On some projects, the construction contract documents may contain a SWPPP/ESC Plan prepared by LFUCG's staff engineer or consultant for purposes of establishing bid quantities. If the Contractor chooses to use this SWPPP/ESC Plan to obtain the required permits, the Contractor takes sole responsibility for the content of the SWPPP/ESC Plan and the implementation of the SWPPP during construction.

2. Contractor must submit an application for a Land Disturbance Permit to the LFUCG Division of Engineering before beginning project construction. A permit application is on the LFUCG website at <https://www.lexingtonky.gov/new-development>.
3. Contractor must submit a Notice of Intent (NOI) to the KY Division of Water (KDOW) and obtain KYR10 Permit coverage before beginning construction of any kind on the site. The NOI can be submitted electronically at: <http://dep.ky.gov/formslibrary/Documents/KYR10PermitPage.pdf>.
4. Contractor cannot start project work until they have obtained the LFUCG Land Disturbance Permit and KYR10 Permit coverage. In addition, Contractor will be required to post an ESC Performance Bond before starting construction. (Note: ESC will be bid as lump sum. The value of the bond will be equal to the lump sum amount.)
5. Amad AL-Humadi reviews the SWPPP/ESC Plan, confirms that the Contractor has obtained KYR10 Permit coverage, and authorizes the Contractor to install the initial BMPs.
6. Amad AL-Humadi inspects the installation of the initial BMPs and authorizes DOE to issue the LFUCG Land Disturbance Permit.

Contractor Responsibilities

Contractor shall:

1. Attend a pre-construction conference with LFUCG.
2. Post the LFUCG Land Disturbance Permit and KYR10 Permit on the project sign at the site.
3. Follow the SWPPP/ESC Plan; revise and redline it as conditions change on the site.
4. Install and maintain BMPs to prevent sediment from washing into streets, storm sewers, and streams.
5. Conduct an ESC inspection at least once every 7 calendar days and within 24 hours after each rainfall event of 0.5 inches or greater (or a snow event of 4 inches or greater).
6. Complete an inspection form after each inspection.
7. Stabilize the site within 14 days after reaching temporary or final grade.
8. Maintain a 50-foot vegetative buffer strip along streams, wetlands, sinkholes, and inlets.
9. If work must be done within 50 feet of a stream, wetland, sinkhole, or inlet, complete work as soon as possible and stabilize the area within 24 hours after completing work.
10. File a Notice of Termination with the KY Division of Water, LFUCG Division of Engineering, and LFUCG Division of Water Quality when final stabilization has been achieved. Final stabilization is defined as follows from KYR10:

“All soil disturbing activities at the site have been completed and either of the two following criteria are met:

 - a. a uniform(e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70 percent of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or
 - b. equivalent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.”
11. Respond promptly to Verbal Warnings from LFUCG regarding correcting ESC problems.

Inspection Procedures of the RPR

RPR Monthly Field Inspection (two times a month if crossing a stream or in a floodplain)

1. Ensure the LFUCG Land Disturbance Permit and KYR10 Permit are posted at the site
2. Ensure ESC Plan and SWPPP are available for review
3. Ensure Contractors' weekly inspection forms are available for review
4. Walk the perimeter of the entire site
5. Note downgradient controls
 - Inspect silt fences, culvert/ditch outlets
 - Significant sediment discharges?
6. Walk around internal disturbed areas
 - Idle for more than 14 days . . . stabilized?
7. Inspect all inlets and ditches
 - Inlets protected, ditches stabilized?
8. Check out material/fuel storage areas
 - Spills? Leaks? Leaching pollutants?
9. Inspect concrete washout(s)
10. Inspect the construction entrance/exit
11. Inspect the vegetated buffer strip adjacent to streams (no disturbance allowed)
12. Complete the LFUCG monthly inspection checklist. Submit an electronic copy of the completed checklist to Kevin Lyne, the RMP Project Manager, and Diann Williams. Kevin will enter it into ACCELA.
13. Inspect the site the next working day after a storm event of 0.5 inches or greater and complete the inspection checklist. Submit a copy to the RMP Project Manager and Diann Williams.

Important things for the RPR to look for:

- Posted permits, plans, and inspection reports
- Graded areas stabilized with seed, mulch, blankets, mats, etc.
- Stabilized ditches
- Maintenance on silt fences and curb/drop inlets
- No mud on the street
- Trash and litter managed
- No disturbance in 50-foot buffer zone adjacent to streams, wetlands, sinkholes, and inlets, unless stabilized within 24 hours.

Enforcement Procedures

1. The Contractor will be paid for erosion and sediment control based upon a schedule of values established within the Measurement and Payment section of the specifications (e.g. 25% paid once initial ESCs have been installed and LDP obtained, 50% paid in equal monthly payments for maintenance over the construction period, 25% paid for removal of ESCs and final stabilization). The intent of this provision is to pay the Contractor for monthly ESC maintenance only if the BMPs are functioning properly.
2. When the RPR identifies ESC deficiencies, the RPR shall issue a verbal warning to the Contractor to address the deficiencies. If the deficiencies are not addressed after two verbal warnings, the RPR shall notify the RMP Contract Administrator of the deficiencies. In some cases, the RMP Contract Administrator should be notified immediately. **Refer to the attached Compliance Assistance Guidance for RPRs.**
3. The RMP Contract Administrator shall prepare a written summary of the deficiencies referred by the RPR, and shall notify the RMP Project Manager that additional enforcement measures are needed to achieve compliance.
4. The RMP Project Manager shall use all available means in the contract to obtain compliance, including:
 - a. stopping work
 - b. withholding payment
 - c. notifying the Contractor that LFUCG intends to initiate the process for declaring that the Contractor is in default of the contract and specifying a deadline for addressing the ESC deficiencies
 - d. initiating the process for calling the ESC Performance Bond
 - e. issuing NOVs

Compliance Assistance Guidance for RPRs on RMP Projects

Observed Condition	Verbal Warning to Correct within 3-5 days	Verbal Warning to Correct within 24 hours (See Note 1)	Notify RMP Contract Administrator Immediately
Construction Entrance to Public Road	Rock pad poorly installed/maintained	Rock pad not installed	
	Small amount of sediment on road	Rock pad completely covered with soil	
		Significant amount of sediment on road	
Unstabilized Areas	Flat inactive disturbed areas not stabilized in 14 days	Ditches not stabilized immediately after construction	
		Disturbed, inactive slopes not stabilized within 14 days	Disturbed, inactive slopes above waterways, wetlands, floodplains, critical areas not stabilized within 24 hours
Inlet Protection	Sediment needs to be removed around inlet protection	Curb inlet protection not in place or improperly installed	Discharge of concrete wash water, chemicals, other pollutants into inlets, streams, wetlands, etc.
Silt Fencing	Does not match ESC Plan but critical areas and roads are protected	Silt fence not installed per plan	
	Does not comply with Stormwater Manual but is functional	Blowouts have occurred with discharge of sediment to critical areas	
	Needs maintenance/repair, but is not near an inlet or surface water	Not trenched in, is not functional	
		Needs repaired in critical areas	
Soil Stockpiles	No perimeter controls, downstream BMPS in place	No perimeter controls, downstream BMPs not in place	
Permit Violations		Permit expired	Site not permitted
		Permit not posted or available on site	
		Contact name/phone not posted	
		No self-inspection reports; reports not on site	
		Self-inspection reports not current	
		ESC Plan / SWPPP not on site	
		Minor unapproved construction activities in 50-foot buffer zone around sinkholes, streams, wetlands, etc.	Major unapproved construction activities in 50-foot buffer zone around sinkholes, streams, wetlands, etc.
		Construction has started, BMPs not installed	

1. Refer issue to RMP Contract Administrator after 2nd Verbal Warning
2. Critical areas are streams, wetlands, sinkholes, and inlets

SECTION 02425

INITIAL TUNNEL SUPPORT

PART 1 -- GENERAL

1.01. SCOPE OF WORK

- A. The Work described by this Section consists of furnishing all materials and incidentals required for the initial support system(s) proposed by the Contractor to be provided as a part of the tunneling operations.
- B. The work shall be done in accordance with all Federal, State, and local laws, regulations and requirements as shown on the Drawings and as specified herein.
- C. All available and known geotechnical reports, logs, borings, and laboratory testing performed within close proximity of the project corridor have been made available as "technical data" and not part of the Contract Documents. These reports are provided as information only and solely for the convenience of Bidders. The Owner and/or the Consultant do not warrant or guarantee the accuracy or correctness of this material with respect to actual subsurface conditions. Subsurface conditions are considered unclassified and no expectation of quantity, specific location of ground conditions, or geotechnical baselines are provided or assumed herein.
- D. Contractor shall review all available geotechnical reports and data and perform any additional soil investigations the Contractor deems necessary at his own expense for the planning and the selection of tunneling techniques and methods in order to enable proper construction as shown on the Drawings and other requirements of Contract Documents.
- E. Contractor shall be responsible for designing, furnishing and installing the initial tunnel support system(s) that complement the means and methods selected in excavating the tunnels and shafts proposed for the Project.
- F. Contractor may increase the diameter of the initial support system(s) from that indicated on the Drawings and as listed in the Tunneling Method Table in Project Specific Notes (PSN), at no additional cost to the Owner, if the Contractor deems it necessary to provide additional internal work area to account for all project site conditions, variability in subsurface conditions, selected tunnel construction methods, operational procedures, carrier pipe support and restraint systems, steering and guidance system accuracy, and line and grade tolerances to meet the carrier pipe acceptance criteria for the project. Contractor may also elect to increase the diameter of the initial support system(s) from that indicated on the Drawings and as listed in the Tunneling Method Table in Project Specific Notes (PSN), at no additional cost to the Owner, to best fit the Contractor's selected tunnel excavation equipment diameter, worker safety, tunnel construction production efficiency, or to otherwise reduce project risk. If Contractor elects to modify the diameter from the minimum size shown in the Contract Documents, the Contractor accepts all responsibility for clearance from existing buried conflicts, acquiring approval for any modification or addenda to all right-of-way encroachment agreements, occupancy permits, or other established requirements and specifications of the entity being crossed. Contractor shall not increase the diameter of the initial tunnel support system if the combination of the selected tunnel construction means and methods and

the increased tunnel lining diameter increases the potential for surface settlement or damage to existing structures.

- G. Follow all OSHA regulations regarding confined space for installation of the initial support system(s).
- H. Conform with all Kentucky Transportation Cabinet (KYTC) and Federal Highway Administration requirements for work within their respective highway rights-of-way and any additional requirements of the contiguous property and utility owners.
- I. Conform with all railroad agency occupancy and encroachment agreements and specifications, if applicable.
- J. The Contractor shall retain the service of a professional engineer registered in the State of Kentucky to design the initial support system(s) and prepare submittals as described herein.

1.02. RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02340 – Tunnel by Guided Bore and Jack Method
- B. Section 02426 – Installation of Carrier Pipe in Tunnel
- C. Section 02431 – Tunnel Grout
- D. Section 02432 – Low Density Cellular Grout
- E. Section 02441 – Tunneling by Slurry Microtunnel Boring Machine
- F. Section 02442 – Tunneling by Tunnel Boring Machine
- G. Section 02444 – Tunneling by Pipe Jacking with Shield Method
- H. Section 02445 – Utility Hand Tunneling
- I. Section 02446 – Tunneling by Guided Bore and Jack Method
- J. Tunneling Method Table in Project Specific Notes (PSN).

1.03. REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 - 1. Applicable codes, ordinances, statutes and governing rules and regulations of governing municipalities and counties, the State of Kentucky, and the Federal Government.
 - 2. American Association of State Highway and Transportation Officials (AASHTO).

3. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.
4. Occupational Safety and Health Administration (OSHA) Regulations and Standards for Underground Construction 29 CFR Part 1926, subpart S and other applicable OSHA parts.
5. Applicable ASTM and AWWA Standards for materials and methods.
6. Kentucky Transportation Cabinet (KYTC) Permits Guidance Manual.
7. All applicable guidelines and restrictions of the United States Army Corps of Engineers (USACE) and Kentucky Department for Environmental Protection (DEP).

1.04 DEFINITIONS

- A. Unless otherwise stated or particular context otherwise requires, the definitions and provisions contained in this section shall govern the construction, meaning and application of words and phrases utilized in this specification. For purposes of this specification, the following terms are defined as follows:
1. **Face:** The vertical surface and associated area where installation of initial support is ongoing at the head of a tunnel excavation.
 2. **Foot Block:** Cement mortar, concrete or timber block foundation element that provides a reaction to the loads developed in a steel set.
 3. **Ground:** Undifferentiated rock/soil materials encountered during excavation.
 4. **Ground Class:** Characterization of the ground based upon physical observations and analysis.
 5. **Initial Tunnel Support:** Any combination of ground support elements installed in the underground excavations prior to placement of the final lining or carrier pipe. Initial tunnel support includes all forms of segmental and pipe jacked liners, jacking pipe, casings, or sleeves. Initial support is required to be installed within the tunnel excavations to fully support the ground until such time as the final lining is in place and is structurally capable of resisting the ground loads.
 6. **Lagging:** Short structural members used in ground requiring continuous support to bridge between steel sets and allow transfer of ground loads from the space between the steel sets to the steel sets. Lagging may be made from dimensional timber, steel mat lagging (heavy gauge wire mesh), or solid steel lagging.
 7. **Overbreak:** Earth excavated beyond the limits required to install the initial support system.
 8. **Steel Set:** A structural steel member for use in a tunnel or shaft consisting of structural steel sections, butt and foot plates, bolts, nuts, washers, tie rods, spreaders, blocking, collar braces, lagging, and other associated support

components as required to assemble, brace and fix the steel member, and continuously support ground loads, including those generated between the steel sets. Steel sets are rolled to an arch or circular shape and to the intended shape of the tunnel excavation. Steel sets may be provided with an invert strut member made from structural steel or concrete where ground conditions warrant this type of support. Steel sets are also referred to as Ribs or Ring Beams and shall be defined the same herein.

1.05 DESIGN CRITERIA

- A. The Contractor is responsible for the design, installation, maintenance, and safety of the tunnel initial support system(s). All design calculations provided by the Contractor as part of the required submittals shall be sealed by a Licensed Professional Engineer registered in the State of Kentucky.

1.06 SUBMITTALS

- A. Conform to Section 01300 – Submittals
- B. Submit manufacturer's product data for all materials required to be incorporated in the work.
- C. Shop Drawings for fabricated materials, including:
 - 1. Complete geometry, grade of materials used, and dimensions of all steel set support elements and assemblages, including butt and foot plates, welds, nuts and bolts, tie rods, braces, and lagging.
 - 2. Details of anchorage systems, end hardware, bending radii, connections, shim plates, extensions, splices, longitudinal connectors and other accessories required for rock reinforcement systems.
- D. Working Drawings and Method Statements:
 - 1. Working Drawings for all initial support system(s) proposed indicating the following:
 - a. Sizes, details, dimensions, spacing, and arrangement of elements, method of assembly, lists of materials, and such other data for all support elements and systems of elements, as required to check the adequacy of the proposed installation.
 - b. Design calculations for initial support systems and pre-support and face support measures, including estimates of support deformations for each ground class.
 - c. Design calculations for pipe jacked support systems, such as casings and jacking pipe, including estimates of jacking loads, the allowable axial compressive force of the jacking pipe or casing, and joint tolerances for each ground class.
 - 2. Method Statements:

- a. Sequence of installation of initial support systems and pre-support measures integrated into the excavation process, including requirements for assuring the transfer of ground loads to initial support systems.
 - b. Dimensions, spacing, and general pattern sequence of installation of the support systems with respect to the excavations and final lining tolerances.
 - c. Proposed construction methods and equipment for excavating and installing support systems, including pre-support measures.
 - d. Methods and details for supporting and grouting areas of overbreak or voids, if encountered.
 - e. Methods and details for repairing damage to initial support.
3. See Sections 02425, 02426, 02431, 02432, 02441, 02443, 02444, 02445 and 02446 for additional submittal requirements for tunneling support systems.

E. Quality Control:

1. Identify how the quality of materials and installation will be controlled including:
 - a. A written statement of site-specific quality control plans required by the Contractor's design engineer.
 - b. Methods for and frequency of monitoring initial support elements for loosening, deformation, or distress; and means for tightening, or supplementing with additional initial support.
 - c. Contingency support measures in the event that ground loads exceed the capacity of the initial support.

F. Provide resume and written documentation of the qualifications of the project manager, superintendent and shift foremen in accordance with Section 1.07.

G. Recordkeeping:

1. As-built records of all erected support, including locations, spacing, lengths, types, thicknesses, weights, and number. Integrate this information into daily records specified for tunnel excavation.
2. Records of all testing performed as required by the Contractor's design engineer.

1.07 QUALITY ASSURANCE

- A. Work shall be supervised by at least one (1) person with five (5) years of recent experience in installation of the type of initial support system being installed. Experience shall include at least 2 projects of similar size and in similar ground conditions.

1.08 DELIEVERY, STORAGE, AND HANDLING

- A. The Contractor shall accept material on site and inspect for damage.
- B. The Contractor shall handle, support and store material to prevent injury or damage to the material.

PART 2 – MATERIALS

2.01 STEEL CASING PIPE

The casing pipe shall be smooth wall or spiral welded carbon steel pipe. The minimum interior diameter of the casing pipe shall be as indicated on the Drawings. Casing pipe shall be leak-proof construction and be capable of withstanding highway or railroad loadings where applicable. Casing pipe shall be steel pipe in sizes 12-inches and larger manufactured from steel having a minimum yield stress strength of 35,000 psi and shall have a minimum wall thickness as indicated by the Tunneling Method Table in Project Specific Notes (PSN).

- A. All joints shall be butt welded with a full depth, single "V" groove weld. Machined, interlocking, press-fit joints such as made by Northwest Pipe Company of Vancouver, WA or equal may be substituted if written acceptance has been acquired by all property owners and permitting authorities associated with crossing.
- B. The casing pipe shall conform to ASTM A 139, Grade B (without hydro-test) or ASTM A53, Grade B (without hydro-test), and AWWA C200-75.

2.02 SEGMENTAL STEEL LINER PLATE

- A. All segmental steel liner plate selected and installed by the Contractor shall be designed by a registered Professional Engineer licensed in the State of Kentucky and shall meet the latest AREMA specifications Chapter 1, Part 4 with the following factors of safety:
 - 1. Joint Strength = 3.0,
 - 2. Minimum Stiffness = 3.0 for 2-flange and 1.5 for 4-flange,
 - 3. Critical Buckling = 2.0, and
 - 4. To meet all appropriate corrosion protection through the selection of coatings and cathodic protection as needed.
- B. All 2 flange liner plate shall be minimum 10 gage or thicker.
- C. All 4 flange liner plate shall be minimum 8 gage or thicker.
- D. The maximum width of liner plate shall be 18-inches.
- E. Liner plate shall be fabricated from structural quality, hot rolled, new carbon-steel sheets or plates conforming to ASTM Specification A 569. The plate shall be hot-dip galvanized in accordance with ASTM Specification A 123 and AASHTO Designation M 167 but shall not be applied at a rate less than two (2) ounces of "Prime Western" zinc per square foot total of both sides.

- F. All plates shall be punched for bolting on both longitudinal and circumferential seams and shall be so fabricated as to permit complete erection from the inside of the tunnel.
- G. Structural Grout, see Section 02431, shall be placed under pressure to fill any voids which exist between the initial tunnel lining and the undisturbed earth through threaded grout holes with plugs. Holes shall be provided in every third ring of liner plate (a minimum of three grout holes per ring required unless otherwise directed by the Engineer) to permit grouting as the erection of tunnel liner plate progresses.
- H. Bolts and nuts shall be a minimum of 5/8 inch diameter and length as recommended by the manufacturer of the liner plate and be manufactured domestically. For plate thicknesses equal to or greater than 0.209 inches, bolts shall conform to ASTM Specification A 449. For plate thicknesses less than 0.209 inches, bolts shall conform to ASTM A307. All nuts and bolts shall be galvanized in accordance with ASTM Specification A 153.

2.03 RIBS AND LAGGING

- A. Structural steel for use in initial support shall be manufactured in accordance with ASTM A36.
- B. Bolts, nuts, and fasteners conforming to ASTM A307.
- C. End plates and foot plates shall be fabricated from steel conforming to ASTM A36.
- D. Timber used for blocking, cribbing or any other structural use shall be Douglas Fir No. 1 grade or equal and of rectangular cross section.
- E. Geotextile fabric shall be a monofilament synthetic fabric consisting of polyester or polypropylene in a manner approved by the Engineer. Geotextile shall be treated to resist degradation due to exposure to ultraviolet light and shall have a minimum of 90% retention of strength after 500 hours of exposure to UV. Geotextile fabric shall be Mirafi FW700 as manufactured by Mirafi, Inc., or approved equal.

PART 3 – EXECUTION

3.01 INSTALLATION – GENERAL

- A. Work shall not begin until the required submittals have been made and the Engineer has reviewed and accepted all submittals related to the initial support system(s) to be utilized.
- B. Continuously support the ground using a combination of steel sets, blocking, lagging, liner plate, casing, jacking pipe, structural sleeve, and ancillary support using the materials, methods, sequences, and contingency plans submitted, reviewed, and accepted.
- C. Contractor shall notify Engineer of any changes that may be required or proposed due to unforeseen conditions.

3.02 INSTALLATION OF STEEL CASING

- A. Steel casing shall be installed using one of the tunneling methods listed in the Tunneling Method Table in Project Specific Notes (PSN).
- B. Promptly following completion of the casing installation, pressure grout to fill all voids existing outside of the casing pipe for all casings 36-inches and larger in outside diameter. If the outside diameter is less than 36-inches then the annular space outside the casing is to be grouted if the excavated diameter is more that 1inch larger than the outside diameter of the casing.
- C. Grouting shall be performed from the interior of the casing pipe through grouting holes. Lubricant shall be displaced by the grout. Grouting shall be started in the lowest connections and shall proceed until grout begins to flow from upper connections. The void shall be completely filled. Displaced lubricant shall be disposed of off-site in accordance with applicable regulations and codes of all Federal, State, and local agencies.
- D. Grout shall be in accordance with Section 02431 – Tunnel Grout.
- E. Liquid grout pressure shall not exceed one-half of the existing overburden pressure.
- F. After grouting is complete, pressure shall be maintained by means of stopcocks or other suitable devices until the grout has set sufficiently in the judgment of the Engineer, or for a minimum of 24 hours, whichever is longer. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.

3.03 INSTALLATION OF STEEL LINER PLATES

- A. Steel liner plates shall be assembled in accordance with the manufacturer's instructions.
- B. The bottom 25% of culvert periphery shall be covered with concrete (or asphalt) to a depth of 1 inch above the crest of the corrugations. The concrete pavement shall be reinforced with 6 x 6 (W2.9 x W2.9) welded wire fabric. This wire shall be attached to the liner plate by either directly welding to the liner plate or by mechanical attachment to the bolts.
- C. Exterior grouting of all segmental tunnel lining shall be kept as close to the heading as possible, using grout stops behind the liner plates if necessary. Grouting shall proceed as needed to cut off inflow of groundwater and material and stabilize the excavation, but in no event shall more than 6 lineal feet of tunnel excavation be progressed beyond the grouting. Grout shall be in accordance with Section 02431 – Tunnel Grout.

3.04 INSTALLATION OF RIBS AND LAGGING

- A. Scale excavated surfaces and remove loose material prior to placing and blocking steel ribs. Brace each steel rib with blocking, collar braces, shims, and wedges as necessary to transfer ground loads to the steel sets.
- B. Secure steel ribs against horizontal movement and distortion using tie rods and collar braces.
- C. Immediately install lagging in the form of substantial timber or steel lagging.

- D. Immediately crib areas of overbreak or over excavation with timber to provide contact between excavation and steel sets.
- E. Perform all surveys necessary in a timely manner such that steel sets do not encroach on the necessary clearance for the final lining and any embedments.
- F. Monitor installed support to ensure that any increase of loading with time, i.e. squeezing loads, is detected. Monitor for excessive deformations and instability locally. Install additional support in a timely manner to mitigate overstressing of the initial support system.
- G. Final exterior grouting for rib & lagging shall take place immediately following installation of the rib & lagging. The distance from the face of tunnel to grouted segment section shall not exceed 6 feet. Grout shall be in accordance with Section 02431 – Tunnel Grout.
- H. Liquid grout pressure shall not exceed one-half of the existing overburden pressure.
- I. Low Density Cellular Grout shall be placed within the tunnel for all tunneling methods which include ribs and lagging.

3.05 CARRIER PIPE INSTALLATION

- A. Contractor shall install carrier pipe in casing in accordance with Section 02426 – Installation of Carrier Pipe in Tunnel.

3.06 SITE AND WORK SAFETY:

- A. Comply with applicable regulations of Federal Government, OSHA 29CFR 1926, and applicable criteria of ANSI A 10.16 "Safety Requirements for Tunnels, Shafts, and Caissons", as amended to date.
- B. Safety is the full responsibility of the Contractor.

- END OF SECTION -

SECTION 02426
INSTALLATION OF CARRIER PIPE IN TUNNELS

PART 1 - GENERAL

1.01 SCOPE

- A. This Section covers handling, transporting, and installing carrier pipe in two-pass tunnels.

1.02 SUBMITTALS

- A. The following information shall be submitted in accordance with Section 01300 – Submittals.
1. Carrier pipe installation plan. A brief description of method of lowering pipe into shaft; method of transporting carrier pipe into the tunnel; method of positioning, aligning, and jointing pipe; and blocking plan. Include sketches for means of carrier pipe transporting, hoisting, and positioning and sketch of carrier pipe blocking plan.
 2. Shop Drawings for casing spacers shall be prepared and submitted if casing spacers are the proposed means of carrier pipe support.
 3. Buoyant force calculations, provisions to prevent floating, bulkhead design, and blocking details. The calculations shall include an analysis of the stresses and deformation induced on the carrier pipe. Submittal shall be signed and sealed by a Professional Engineer registered in the State of Kentucky. Professional liability insurance shall be provided as specified in the Supplementary Conditions and Encroachment Permits.

PART 2 - PRODUCTS

2.01 PIPE MATERIAL

- A. The carrier pipe shall be as listed in the Tunneling Method Table in Project Specific Notes (PSN).
- B. Contractor shall be responsible for selecting appropriate pipes and pipe joints to safely carry the loads imposed during construction.

2.02 ANNULAR BACKFILL GROUT

- A. Grout for filling of the annular space between pipe and tunnel initial support or jacking pipe shall be as specified in Section 02431 - Tunnel Grout or Section 02432 - Low Density Cellular Concrete and only be installed when the Contractor utilizes ribs and lagging tunnel liner.

PART 3 - EXECUTION

3.01 ACCEPTANCE CRITERIA FOR LINE AND GRADE TOLERANCES

- A. Prior to installing the carrier pipe, Contractor shall verify that the initial support has been constructed so that the carrier pipe may be placed in conformance with the Contract Documents and all specified tolerances.

- B. Deviation tolerances from line and grade shown on the Drawings for the carrier pipe installed in the initial tunnel support are to be as listed in the Tunneling Method Table in Project Specific Notes (PSN). Water shall be free draining between any two points at the pipe invert. Reverse grades and low points or sags shall NOT be permitted or accepted. Notify Engineer, should misalignment of the initial support system preclude installation of the carrier pipe to the tolerances specified. For areas where alignment is installed with a curve, maximum pipe segment length shall be coordinated with pipe manufacturer to assure that the maximum joint opening and deflection are not exceeded.

3.02 PIPE HANDLING

- A. Handle and transport pipe into the tunnel in a manner that prevents damage to the pipe, joints and gaskets. Do not install pipe damaged during placement operations. If any damage occurs the Contractor may propose repair procedures for review and approval of Engineer or replace the pipe at no additional expense to the Owner.

3.03 TUNNEL CLEANUP

- A. Prior to pipe placement in the tunnel, remove temporary tunnel utilities, such as electrical cord and ventilation piping. Remove loose material, dirt, standing water, and debris prior to pipe placement.
- B. Temporary steel construction tracks may be left in place if they do not interfere with alignment of the carrier pipe or interfere with final placement of the annular grout.

3.04 PIPE MANUFACTURER REPRESENTATIVE

- A. At the discretion of the Engineer, during the carrier pipe installation and annular backfill grouting, each pipe manufacturer shall provide his own supervisor to instruct the Contractor's pipe laying personnel in the correct procedure to be followed at no additional expense to the Owner.

3.05 CARRIER PIPE BLOCKING AND SUPPORT

- B. Provide support and anti-flotation blocking adequate to:
 - 1. Establish final pipe grade.
 - 2. Support weight of carrier pipe without deformation or collapse during installation.
 - 3. Provide restraint to hold carrier pipe stable to prevent flotation or movement during grouting operations.
- C. Support and anti-flotation blocking may include steel beams, wooden blocking, casing spacers, initial grout or concrete bedding, liquid ballasting, or other methods as designed by Contractor's Engineer.
- D. If casing spacers are used then a minimum of four (4) casing spacers shall be provided per 20 foot joint of pipe with one (1) near each end and two (2) equally spaced along the carrier with a maximum spacing of 8-feet apart. Additional casing spacers shall be provided as recommended by the casing pipe manufacturer.
- E. Secure the pipe support to the pipe and initial support in accordance with approved design.

3.06 JOINING PIPE IN TUNNELS

- A. Join pipe segments to properly compress the gaskets and allow for the correct final positioning of the pipe for line and grade. Closely align pipes by bringing them loosely together by means of hydraulic jacks, locomotives, pipe mobiles, or winches. Once pipes have been loosely joined, pull them home by means of a hydraulic tugger or other similar method while suitably protecting pipe and joints against damage. Impact jointing such as ramming with locomotives or other mechanical equipment is not permitted. All joining of pipe shall at minimum be in accordance with manufacturer's recommendations.
- B. When diameter allows for personnel entry, provide stationing on the inside of the pipe at the spring line of the tunnel carrier pipe written in bright fluorescent orange paint every 50 feet in numbers at least two (2) inches in height that will be visible during the internal videotaping process as described in Technical Specification 02532 – Sewage Collection Lines, Section 3.05-D TV Survey.

3.07 LIMIT ON CARRIER PIPE INSTALLATION

- A. Carrier pipe installation shall be constructed in reaches (lift segments) of manageable length that can be surveyed, inspected, and tested for acceptance then grouted in place (only when ribs and lagging is used) prior to installing the next carrier pipe reach. Carrier pipe installation segments shall be limited in length to the maximum grouting reach as indicated the Carrier Pipe Installation Schedule – Annular Backfill Grouting, Maximum Lift Segment Length below. Maximum lengths are based on the Contractor's submitted density tests Annular Backfill Grout mix design see Specifications 02431 – Tunnel Grout and 02432 – Low Density Cellular Grout for definitions and grout mix design requirements. Under no circumstances shall the grouting pressures, lift segments lengths, lift depths, or heat of hydration during curing exceed carrier pipe manufacturer recommendations.

SCHEDULE - ANNULAR BACKFILL GROUTING, MAXIMUM LIFT SEGMENT LENGTH

TESTED IN-PLACE WET DENSITY	MAXIMUM LIFT SEGMENT LENGTH
≥ 130 pcf	≤ 50 feet
120 pcf – 129 pcf	≤ 100 feet
110 pcf – 119 pcf	≤ 125 feet
100 pcf – 109 pcf	≤ 200 feet
90 pcf – 99 pcf	≤ 250 feet
80 pcf – 89 pcf	≤ 300 feet
75 pcf – 79 pcf	≤ 350 feet

- B. Maximum length of annular backfill grout pours shall not exceed annular backfill grouting maximum reach (lift segment) requirements in the schedule above unless Contractor can clearly demonstrate that placement beyond these lengths can be accomplished assuring complete backfill of the annulus with no thermal or pressure damage to the carrier pipe.
- C. Grout set times for selected mix design shall be used to modify the grout lift segments provided in the table above. Grout lift segments must be limited to appropriate length and volume that the complete lift segment can be monolithically grouted prior to initial grout set and loss of fluidity.

3.08 BULKHEADS AND CRADDLE SUPPORTS

- A. Construct bulkheads to withstand imposed grout pressure without excessive leakage at the terminal ends of the casing/tunnel in accordance with the Drawings and at intermediate points as required.
- B. Terminal bulkheads shall be constructed using concrete brick and mortar and have air and water vent holes. Wall shall be constructed flush with casing pipe opening. Brick shall have a nominal size 2-1/4 inches by 3-3/4 inch by 8 inch. Mortar shall be one part Portland cement blended with three parts sand (100% passing #4 sieve and minimum 95% passing No. 8 sieve) and have a minimum 7-day compressive strength of 500 psi. Prepared bag mixes are acceptable if approved by the Engineer.
- C. Provide concrete cradles using Class A3 concrete in accordance with Kentucky Transportation Cabinet (KYTC) requirements at terminal ends of casing/tunnel. Cradles shall be provided from the end of the casing/tunnel bulkhead to the first pipe joint outside the casing/tunnel.

3.09 TESTING PRIOR TO GROUTING ANNULAR SPACE

- A. Carrier pipe invert shall be surveyed and hydraulic grade line verified prior to grouting of annular space.
- B. After carrier pipe is installed in the initial support system the carrier pipe shall be pressure tested or joint tested in accordance with Specification 2532 Sewage Collection Lines

3.010 GROUTING OF CARRIER IN INITIAL SUPPORT SYSTEM

- A. Upon completion of low pressure air testing or joint testing the annular space between the carrier and the initial support system shall be grouted (only if ribs and lagging is utilized as the tunnel lining) as specified in Section 02431 -Tunnel Grout or Section 02432 - Low Density Cellular Concrete.

3.10 ACCEPTANCE TESTING

- A. Perform an as-built survey on installed carrier pipe of man-entry size pipe after grouting (All pipe 36 inches diameter or larger). Take invert elevations at each pipe joint in man-entry size pipe. Take two diameter readings, at right angles, randomly at an average of 20 feet spacing or less in man-entry size pipe. Pull a mandrel through non man-entry size pipe to check for excessive deflection in accordance with Specification 2532 Sewage Collection Lines.

- END OF SECTION -

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SECTION 02431

TUNNEL GROUT

PART 1 - GENERAL

1.01 SCOPE

- A. This Section covers mix design requirements, testing, furnishing and production of grout for:
1. Grouting of annular space between initial support system/casing and excavation;
 2. Grouting of annular space between carrier and initial support system/casing;
 3. Grouting voids in ground resulting from caving, loss of ground or settlement;
 4. Cutoff grouting after excavation for eliminating or retarding groundwater infiltration into the underground excavations;
 5. Consolidation grouting at tunnel face prior to excavation to provide excavation stability for tunneling operations;
 6. Permeation Grouting near the exit shaft to fill the pores in soil and voids/fractures in disintegrated rock.
- B. Requirements for furnishing and installing low density cellular concrete (LDCC) are covered in Section 02432 – Low Density Cellular Concrete.

1.02 DEFINITIONS

- A. **Annular Backfill Grout:** Fluid grout mix used to fill the annular space, including all voids, between the tunnel carrier pipe and the initial support system/casing under low-pressure.
- B. **Final Exterior Grouting:** Grouting of the exterior of tunnel support system/casing and the unexcavated ground.
- C. **Ground Stabilization Grouting:** Grout injected under gravity or pressure from the surface, through the initial tunnel support or at the face of the tunnel as selected and designed by the Contractor. Ground stabilization grouting includes the following:
1. Grout used to fill voids, fissures, or under-slab settlement due to caving or loss of ground.
 2. Grout used to retard the flow of groundwater.
 3. Grout used for consolidation prior to excavation to provide stability at tunnel face.
 4. Grout used to fill pores, voids, and fractures in disintegrated rock.
- D. **Void Repair Grouting:** Pressure grouting of the exterior of the initial tunnel support or jacking pipe for the immediate filling of voids or larger overcut space to prevent settlement during tunnel excavation.

1.03 REFERENCE STANDARDS

- A. ASTM C 138. Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of

Concrete.

- B. ASTM C 144. Standard Specification for Masonry Mortar. ASTM C 150. Standard Specification for Portland Cement.
 - C. ASTM C 494. Standard Specification for Chemical Admixtures for Concrete.
 - D. ASTM C 618. Standard Specification for Fly Ash and Raw or Calcinated Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
 - E. ASTM C 869. Standard Specification for Foaming Agents and in Making Preformed Foam for Cellular Concrete.
 - F. ASTM C 937. Standard Specification for Grout Fluidifier for Preplaced Aggregate Concrete.
 - G. ASTM C 939. Test Method for Flow of Grout for Preplaced Aggregate Concrete.
 - H. ASTM C 940. Standard Test Method for Expansion and Bleeding of Freshly Mixed Grout for Preplaced Aggregate Concrete.
 - I. ASTM C 942. Standard Test Method for Compressive Strength of Grout for Preplaced Aggregate Concrete into Laboratory.
 - J. ASTM C 953. Standard Test Method for Time of Setting of Grout for Preplaced Aggregate Concrete in the Laboratory.
 - K. ASTM C 1017. Standard Specification for Chemical Admixture for use in Producing Flowing Concrete.
 - L. U.S. Army Corps of Engineers Specification CRD C 621, Non-shrink Grout.
- 1.04 SUBMITTALS. The following information shall be submitted in accordance with the submittals section:
- A. A grout work plan addressing all four (4) grout type applications as defined in section 1.02 of this specification, including,
 - 1. Description of materials and grout mix.
 - 2. Working drawings and descriptions of proposed grouting systems and methods detailing type and location of equipment and operational procedures to accomplish each grouting operation, injection points, means of accurately measuring grout pressures and volumes, venting method, flowlines, grouting sequence, schedule and limits of lift segments, and stage volumes.
 - B. Copies of independent laboratory test reports, including all test data certifying that the selected products will produce grouts with the characteristics and the qualities required for completion of the Work.
 - C. A grout mix design report, including:
 - 1. Grout type and designation.
 - 2. Grout mix constituents and proportions, including materials by weight and volume.
 - 3. Grout densities and viscosities, including wet density at point of placement per ASTM

C567.

4. Initial set time of grout per ASTM 403.
 5. Flow per ASTM C939.
 6. Bleeding, shrinkage/expansion per ASTM C827 and CRD-C621.
 7. Compressive strength per ASTM 495.
- D. Logs of grouting operations indicating pressure, density, and volume for each grout placement.
- E. The carrier pipe manufacturer's maximum allowable pressure that can be applied during backfilling accounting for grout density (unit weight) and volume of annular space (difference in outside diameter of carrier pipe and inside diameter of initial tunnel lining). Grouting pressure calculations showing grout pressure during annular space grouting will not exceed the carrier pipe manufacturer's recommendations for allowable grouting pressure and safety factor for each lift.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Grouting Materials: Conform to this section or Section 02432 - Low Density Cellular Concrete (LDCC), except as modified in the following paragraphs.
- B. Grout Type Applications.
1. Grout for Annular Backfill Grouting. Standard sand-cement mix, structural sand-cement mix or LDCC for all carrier pipe installations. See Specification Section 02426 – Installation of Carrier Pipe in Tunnel.
 2. Ground Stabilization. Standard sand-cement mix or structural sand-cement mix.
 3. Final Exterior Grouting: Structural sand-cement mix.
 4. Void Repair Grouting: Bentonite slurry or bentonite-cement mix.
- C. Do not include toxic or poisonous substances in the grout mix or otherwise inject such substances underground.

2.02 GROUT

- A. Employ and pay for a commercial testing laboratory, acceptable to Engineer, to prepare and test the grout mix design. Develop one or more mixes based on the following criteria as applicable:
1. Size of the annular void between final lining and initial support, or size of the void between initial support and the surrounding soil.
 2. Absence or presence of groundwater.
 3. Adequate retardation.

4. Non-shrink characteristics.
 5. Pumping distances.
- B. Prepare mixes that satisfy the required application. Materials used in sand-cement grout mixes shall meet the following standards:
1. Cement: ASTM C 150, Type II.
 2. Fly Ash: ASTM C 618.
 3. Water: Potable.
 4. Slurry: ASTM C 138.
 5. Sand for sand-cement mortar mix: ASTM C 144.
- C. Prepare mixes that satisfy the required application. Materials used in bentonite-cement grout mix shall meet the following standards:
1. Cement: ASTM C 150, Type II.
 2. Fly Ash: ASTM C 618.
 3. Water: Potable.
 4. Slurry: ASTM C 138.
 5. Easy-to-mix, finely ground (200-mesh), premium-grade, high-yielding Wyoming sodium bentonite.
- D. Provide grout that meets the following minimum requirements:
1. Standard sand-cement mortar grout and bentonite-cement mortar grout shall have minimum compressive strength (ASTM C495) of 100 psi, attained within 3 days, and sufficiently flowable to inject through lining and fill voids, with prompt setting to control grout flow and carrier pipe buoyancy. Wet density (unit weight) at placement shall be minimum 75 pcf.
 2. Standard sand-cement mortar grout and bentonite-cement mortar grout shall have minimum compressive strength (ASTM C495) of 200 psi, attained within 28 days.
 3. Structural sand-cement mortar grout shall have minimum 28-day unconfined compressive strength of 1,000 psi.
 4. Laboratory Determine strength by ASTM C 942.
- E. Fluidifier. Use a fluidifier, meeting ASTM C 937, which holds the solid constituents of the grout in colloidal suspension and is compatible with the cement and water used in the grouting operations.
- F. Admixtures.
1. Use admixtures meeting ASTM C 494 and ASTM C 1017 as required, to improve pumpability, to control time of set, to hold sand in suspension and to reduce segregation and bleeding.

2. Do not use admixtures that promote steel corrosion.
3. Ensure that admixtures used in a mix are compatible. Provide written confirmation from the admixture manufacturers of their compatibility.

2.03 QUALITY ASSURANCE

- A. Pipe Manufacturer Representative. Refer to Section 02426 – Installation of Carrier Pipe in Tunnel for pipe manufacturer field services employee requirements during annular backfill grouting.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Notify Engineer at least 24 hours in advance of grouting operations.
- B. Select and operate grouting equipment to avoid damage to new or existing underground utilities and structures.
- C. In selection of grouting placement consider pipe flotation, length of pipe, length of tunnel, depth from surface, type of final lining, type of pipe blocking and bulkheading, grout volume and length of pipe to be grouted between bulkheads.
- D. Operate any dewatering systems until the grouting operations are complete.

3.02 EQUIPMENT

- A. Batch and mix grout in equipment of sufficient size and capacity to provide the necessary quality and quantity of grout for each placement stage.
- B. Use equipment for grouting of a type and size generally used for the work, capable of mixing grout to a homogeneous consistency, and providing means of accurately measuring grout component quantities and accurately measuring pumping pressures. Use pressure grout equipment which delivers grout to the injection point at a steady pressure.

3.03 GROUND STABILIZATION GROUTING

A. General

1. Ground stabilization grouting operations shall be carried out in accordance with approved shop drawings for each type of grout employed.
2. Carry out all hole washing, pressure testing, and grout injection operations in the presence of the Engineer.
3. Contractor shall modify the grout mixes as necessary to meet the characteristics of each hole.
4. All sanded grout mixtures shall contain a fluidifier, as required.

B. Materials Storage.

1. Furnish in undamaged, moisture proof sacks or other containers bearing manufacturer's label.
2. Store adequate supply at site to prevent delays.
3. Protect and keep dry, observing all manufacturer's recommendations.
4. Cement. Use 100 mesh screen to remove any cement lumps or other deleterious materials, if found in the cement.
5. Fluidifier. Reject material which has become hard due to moisture absorption.

C. Equipment

1. Drilling Equipment.
 - a. Use rotary and/or percussion drilling equipment.
 - b. Dry drilling shall not be permitted.
2. Grouting Equipment – General.
 - a. Designed for mixing and injecting grout, maintained in satisfactory operating condition at all times, and capable of satisfactorily mixing and agitating the grout and forcing it into the grout holes in a uniform flow and at a constant pressure.
 - b. The grouting equipment shall be on hand and in working order prior to start of tunnel and shaft excavation
 - c. Clean equipment and tanks by constant recirculation of grout and by periodic flushing with water.
 - d. Pipe system designed so that water flushing can be accomplished by closing grout injection valve, opening water supply valve and running grout pump at full speeds.
 - e. Depending on type of grouting operation, the grouting equipment and fittings shall be capable of, and furnished with, sufficient fittings to simultaneously grout up to five (5) grout connections.

D. Pipes and Fittings.

1. Provide 1- 1/2 inch or larger grout pipe.
2. Embed pipes in the rock surface, and/or concrete bulkheads for consolidation grouting connections and/or air vents.
3. Set the inner end of pipes not less than two inches back from the finished inside surface.
4. Set the grout pipes so that grout can flow freely to the voids and crevices.

5. For Final Exterior Grouting clean out the grout ports installed in the tunnel pipes by drilling through the pipe ports and two inches into unexcavated rock.
6. Provide suitable stop valve at collar of hole for use in maintaining pressure required until grout has set.

E. Mixers and Agitators.

1. Provide mixer with transfer pump for transferring grout to agitator holding tank.
2. Deliver grout to injection point at a steady pressure without pulsation, using a grout pump at agitator tank.
3. Provide sufficient tank capacity to insure an uninterrupted supply of slurry to grout pump.
4. Provide means to increase or decrease water-cement ratio.
5. Equip water supply connection with accurate meter.

F. Grout Hose and Connections

1. Provide 1- 1/2 inch or larger grout hose capable of withstanding maximum anticipated water and grout pressures.
2. Make connections so as to prevent leakage.
3. Remove plugs on ends of grout holes or pipes to permit escape of air and water and the filling of spaces with grout.
4. At point of injection, provide suitable valves and accurate pressure gages so that pressure and grout flow at grout hole may be monitored and regulated by increasing or decreasing the flow in the grout return line.
5. Provide shutoff valve and flow-regulating diaphragm valve at each connection.

G. Pressure Gauges.

1. Provide one (1) at each point of injection on the manifold.
2. Provide one (1) at the grout pump.
3. Provide each gauge with seal preventing grout from entering gage.
4. Select gauge range so that maximum operating pressure is about two-thirds maximum capacity.
5. Do not grout without appropriate gauges in place and in working order.
6. Provide calibrated check gauge and check operating gages

H. Voids

1. Completely fill voids outside the limits of excavation caused by collapse of ground or in areas indicated in the Drawings. Fill with gravity or pressure injected standard sand-cement grout as necessary to fill the void.

- a. Take care in grouting operations to prevent damage to adjacent utilities or public or private property. Grout at a pressure that will not distort or imperil any portion of the work or existing installations or structures.
- b. Verify that the void has been filled by volumetric comparisons and visual inspection. In the case of settlement under existing slabs, take cores as directed by Engineer, at no additional cost to Owner, to demonstrate that the void has been filled.

3.04 VOID REPAIR GROUTING

- A. Immediately upon discovery of a void or void(s) outside the limits of excavation caused by over excavation, overbreak, boulder or obstruction removal, an existing void, or collapse of ground, contractor shall stop tunnel excavation activities and backfill void space to prevent enlargement of void space and potential for surface settlement. Pump bentonite slurry or bentonite-cement mix to temporarily fill void until completing installation of initial tunnel support. Upon completion of installation of initial tunnel support fill the voids in accordance with final exterior grouting requirements below.

3.05 FINAL EXTERIOR GROUTING

- A. Pump structural grout to grout the annular space between initial tunnel support and excavation. The schedule for installing and methodology for installing this grout and will be in accordance with Section 02425 – Initial Tunnel Support.

3.06 ANNULAR BACKFILL GROUTING FOR RIBS AND LAGGING

- A. Fill the annular space between the carrier pipe and the tunnel initial support or jacking pipe with grout as defined herein.

B. Placement

1. Placement Limits: The limits of each grout placement stage shall be predetermined by the size and capacity of the batching equipment and the initial set time of the proposed grout. Under no circumstances shall placement continue at an injection point longer than that period of time for the mix to take initial set. Grout hole spacing, and locations shall be located according to the number of stages necessary to complete the grouting process. A stage or lift cannot be installed on another lift until a proper set has been attained. Placement procedures shall be approved by the admixture or additive manufacturer and submitted in writing to the Engineer.
2. Limit pressure on the annular space to prevent damage or distortion to the carrier pipe or initial support. Define the limiting and estimated required pressure range. Provide an open ended, high point tap or equivalent vent and monitor it at the bulkhead opposite to the point of grouting.
3. Pump grout until the material discharging is similar in consistency to that at point of injection.
4. Length of carrier pipe installed between grouting shall not exceed the annular backfill grouting maximum reach (lift segment) requirements in Specification Section 02426 – Installation of Carrier Pipe in Tunnel unless Contractor can clearly demonstrate that placement beyond these lengths can be accomplished with complete backfill of the annulus (no voids), no pressure damage to the carrier pipe and no thermal damage to the carrier pipe. Repeat this cycle until all carrier pipe is installed and grouted.

C. Protection and Clean Up

1. Take all necessary precautions to protect and preserve the interior of the carrier pipe from damage. Spills shall be minimized and shall be cleaned up immediately. Any damage to the pipe caused by or occurring during the backfilling operations shall be repaired by a method approved by the Engineer, at no additional cost to the Owner.
2. During backfill grouting work, provide for adequate disposal of all waste and wastewater. Remove and properly dispose of all waste resulting from backfill grouting operations.

3.07 STRUCTURAL GROUTING

- A. Completely fill voids or structures as indicated on the Drawings. Fill with gravity or pressure injected structural sand-cement grout as necessary to fill the void.
- B. Take care in grouting operations to prevent damage to adjacent utilities or public or private property. Grout at a pressure that will not distort or imperil any portion of the work or existing installation or structures.
- C. Verify that the void or structure has been filled by volumetric comparisons and visual inspection.

3.08 FIELD QUALITY CONTROL

- A. General. Field control tests, including unit weight (wet density), and compression tests shall be performed by the Contractor and the results submitted to the Engineer.
 1. The frequency specified herein for each field control test is approximate. A greater or lesser number of tests may be made, as required by the Engineer.
 2. Test specimens shall be collected within the tunnel at or near the connection where the grout is being injected.
 3. The Contractor shall assist the Engineer in obtaining test cylinders. Supply all materials necessary for obtaining the test cylinders, including cylinder molds.
 4. Monitor carrier pipe temperature for one week after grout placement no less than once per day. Submit temperature readings for the entire period to the Engineer.
- B. Unit Weight. Unit weight (wet density) tests shall be made from the first batch mixed each day, after a change in mix design, every 30 minutes during pumping, and from each batch of grout from which compression test cylinders are made. Unit weight shall be determined in accordance with ASTM C 567. Unit weight at the point of placement shall be within plus or minus 5 percent of the unit weight established for the mix design being placed. Adjust mix as required to obtain the specified wet density.
- C. Compression test cylinders shall be made in the field, cured and stored in the laboratory, and tested in accordance with ASTM C 495.
- D. Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, the location (station) in the work where the grout represented by the cylinder was placed, batch number, and unit weight (wet density).
- E. Each set of test cylinders shall consist of six (6) cylinders. Two cylinders from each set will be tested at an age of 3 days, two cylinders from each set will be tested at an age of 28 days and two cylinders from each set shall be kept as spares in case further testing is required.

- F. Compressive strength of grout shall be considered satisfactory if both of the following requirements are met:
1. Average of three consecutive compressive strength tests equal or exceed the specified unconfined compressive strength. (A strength test shall be the average of two compressive strengths of two cylinders made from the same concrete sample and tested at the age specified.)
 2. No individual compressive strength test (average of the two cylinders) is below the specified unconfined compressive strength by more than 20 percent.
- G. Contractor to provide testing of grout as follows:
1. Annular Grouting for final lining in Tunnels or Tunnel Casings.
 - a. Make one set of six (6) compressive test specimens for every 100 cubic yards of grout installed in two-pass tunnel.
 2. Ground Stabilization Grouting.
 - a. Make one set of four (4) compressive test specimens for every 100 cubic yards where ground stabilization grouting is performed.
 3. Structural Grouting
 - a. Make one set of four (4) compressive test specimens for every 100 cubic yards where ground stabilization grouting is performed.

- END OF SECTION -

SECTION 02432

LOW DENSITY CELLULAR CONCRETE

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes filling the annular space and any voids outside the carrier pipe installed in the tunnels utilizing ribs and lagging, with low density cellular concrete (LDCC). In the event of conflicts with Section 02431 – Tunnel Grout, this specification takes precedence.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02426 – Installation of Carrier Pipe in Tunnels
- B. Section 02431 - Tunnel Grout

1.03 DEFINITIONS

- A. Low Density Cellular Concrete (LDCC). A lightweight cementitious material that contains stable air or gas cells uniformly distributed throughout the mixture of a volume percentage greater than 20 percent.
- B. Annular Backfill Grouting. Grout used to fill the annular space between the tunnel carrier pipe and the initial support system/casing.
- C. Foamed Density. The Foamed Density for this specification section shall mean the final low density mixture (unit weight) of the in-place LDCC which includes the combined mixed volume of wet concrete slurry and the added foaming agent.

1.04 REFERENCE SPECIFICATIONS, CODES AND STANDARDS.

- A. American Concrete Institute (ACI):
 - 1. ACI 523.1 R, Guide for Cast-in-Place Low Density Concrete.
 - 2. ACI 523.3R, Guide for Cellular Concretes above 50 pcf, and for Aggregate Concretes above 50 pcf with Compressive Strengths Less than 2500 psi.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C 94, Specification for Ready-Mixed Concrete.
 - 2. ASTM C 138, Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
 - 3. ASTM C 150, Specifications for Portland Cement.
 - 4. ASTM C 495, Standard Test Method for Compressive Strength of Lightweight Insulating Concrete.

5. ASTM C 567, Standard Test Method for Unit Weight of Structural Lightweight Concrete.
6. ASTM C 618, Specifications for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
7. ASTM C 796, Standard Method of Testing Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam.
8. ASTM C 869, Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete.

1.05 SUBMITTALS

A. The following shall be submitted in accordance with Section 01300 - Submittals.

1. **Quality Control.** Submit qualifications of Contractor/Subcontractor, personnel, and manufacturer in accordance with the requirements of this section.
2. **Qualifications.** The Contractor or Subcontractor supplying and placing LDCC shall be capable of developing a mix design, and batching, mixing, handling and placing low density cellular concrete under tunnel conditions; shall have furnished and placed low density cellular concrete on at least four (4) tunnels within the last eight (8) years of the general type and the size specified herein and have been in successful operation; and shall have a record of experience and quality of work using low density cellular concrete that is satisfactory to the Engineer. Provide written evidence of these qualification requirements including project name, location, owner's name and contact information.
3. **Personnel Qualifications.** Workers, including the LDCC Contractor's superintendent and foreman, shall be fully qualified to perform the work. The LDCC Contractor's superintendent shall have previous experience under similar ground and tunnel conditions consisting of at least four (4) completed tunnels. At the discretion of the Engineer, placement of the LDCC shall be performed under the supervision of the foaming agent supplier's representative.
4. **Product Data.** Mix designs for each cellular concrete mix proposed for use. Each mix design shall show the ingredients of the mix and shall include:
 - a. Type, brand, source, and amounts of cement, pozzolans, admixtures, and other additives.
 - b. Source and amount of water.
 - c. Representative samples of materials for materials testing and mix proportion testing.
 - d. Combined grading of each mix design.
 - e. Specific gravity of all materials.
 - f. Results of required tests.
 - g. A certificate of compliance signed by the supplier identifying the type of fly ash and stating that the fly ash is in accordance with ASTM C 618 and these specifications. Supporting test data shall be furnished when requested by the Engineer. All testing and sampling procedures shall be in accordance with ASTM C 311.

- h. Water: Use potable water. Verify with foaming agent supplier that water supplied contains no substance deleterious to the foaming agent.
 - i. Concrete Admixtures: Material specifications and instructions for use.
 - j. Air content, unit weight, and compressive strength test results for proposed mix design.
- 5. Equipment and associated manufacturer's specifications and operation instructions for equipment.
 - a. Pumps.
 - b. Foam generators and ancillary equipment.
- 6. Work Plan. The work plan for placing low density cellular concrete including sequence of work, type(s) of equipment, location of equipment, placing procedures, (i.e., batching, mixing, and pumping procedures), pumpline arrangement (including moving and breaking), intermediate and end bulkhead details, communications provisions, methods for monitoring mix, testing procedures, and cleanup procedures. The work plan shall include pumping pressures, pumping rates, volumes to be placed per day, injection locations, valving at injection locations to facilitate testing, method for monitoring carrier pipe temperature, and sequence of placement and pumping.
- 7. Test Reports and Certifications
 - a. Mill test reports for cement.
 - b. Certificates of compliance for each load of cement and pozzolan.
 - c. Certificates of compliance for all admixtures.
 - d. A delivery ticket with the information stated in section 16 of ASTM C 94; excepting actual scale weights of materials shall be furnished to the Engineer with each batch of concrete before unloading at the site.
 - e. A printout of the actual scale weights for all loads batched shall be submitted to the Engineer at the end of each working day.
 - f. Daily reports and records of LDCC placement, including but not limited to, volumes placed, stationing of placement, injection locations, pressures, unit weight and air content testing results, time of placement, and designation of cylinder samples prepared that day.
 - g. Test reports indicating the results of compressive strength tests from a certified testing laboratory.
- 8. Provide grouting pressure calculations showing grout pressure during annular space grouting will not exceed the carrier pipe manufacturer's recommendations for allowable grouting pressure and safety factor for each lift segment. Annular volume, grade, length of lift segment, carrier pipe material, groundwater pressure, and subsurface conditions outside the initial tunnel lining shall be accounted for in submitted calculations.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Cement. Portland Cement, ASTM C 150, Type I or 11.
- B. Water. Use potable water free from deleterious amounts of alkali, acid, and organic materials which would adversely affect the setting time or strength of the LDCC.
- C. Admixtures. Admixtures may only be used when specifically approved by foaming agent supplier in writing.
- D. Foaming Agent. Foaming agent shall comply with ASTM C 869 when tested in accordance with ASTM C 796.
- E. Type and Manufacturer. Aerlite, Aerlite iX, or Mearl Geofom Liquid Concentrate manufactured by Aerix Industries, Golden, CO, Foam Liquid Concentrate manufactured by Cellufoam Concrete Systems, Rheocell 30 manufactured by BASF Construction Chemicals, LLC of Cleveland, OH, or Elastizell EF by Elastizell Corporation of America of Ann Arbor, MI or approved equal.
- F. Fly ash. Type F.

2.02 MIX DESIGN

- A. General. Low density cellular concrete mix shall be designed in accordance with the requirements of ACI 523.1R, ACI 523.3R and the additional requirements specified herein. Mixes shall be adjusted in the field as necessary to meet the requirements of these specifications. The foaming agent material manufacturer's field services representative shall approve all changes to the mix designs.
- B. Minimum 28-day compressive strength (ASTM C495): 200 psi. Minimum 56-day compressive strength (ASTM C495): 250 psi.
- C. Limiting Requirements. Each LDCC mix shall be designed and controlled for the purposes of filling all annular voids, displacing water, and within the following limits unless otherwise specified:
 - 1. Foamed Density (unit weight) of the LDCC shall be not less than 80 pcf, plus or minus 5 pcf, at the point of placement, unless a higher density is required to achieve strength requirements.
 - 2. Only Type F flyash will be permitted. Flyash/cement ratios shall not exceed 1.0 by weight.
- D. Preformed Foam. Preformed foam shall be generated by combining controlled quantities of air, water, and foaming agent under pressure. Foam shall retain its stability until the cement sets to form a self-supporting matrix. The resulting LDCC shall have essentially closed cell and low water absorptive characteristics. The concentration of foam agent shall be in accordance with the foaming agent material manufacturer's recommendations.
 - 1. Admixtures: The admixture content, batching method, and time of introduction to the mix shall be in accordance with the manufacturer's recommendations for minimum shrinkage and for compliance with these specifications. Admixtures may be used when specifically approved by foaming agent material manufacturer and shall be in accordance with their recommendations. No calcium chloride or admixture containing chloride, other than impurities from admixture ingredients, will be acceptable.
 - 2. A test mix shall be designed and tested in accordance with ASTM C 796 for each consistency intended for use. These results will be compared with field test results to

confirm consistent properties are obtained in the field. Testing for each mix shall be as follows:

- a. Two sets of compression test cylinders (3 inches by 6 inches), three cylinders per set, shall be made from each proposed LDCC mix.
- b. One set of three cylinders shall be tested at an age of 7 days and the other set shall be tested at an age of 28 days. LDCC test specimens shall be made, cured, stored, and tested in conformity with ASTM C 495.
- c. Determine total air content of each proposed LDCC mix in accordance with ASTM C 796.
- d. Determine unit weight of each proposed LDCC mix in accordance with ASTM C 567.

2.03 EQUIPMENT

- A. Use equipment for mixing and injecting LDCC which is designed for underground backfill grouting service. Provide batching, mixing and pumping equipment that is compatible and of sufficient size and capacity to place LDCC to distances and volumes proposed by the Contractor.
- B. LDCC shall be made using preformed foam process equipment approved by the foaming agent material manufacturer.
- C. Maintain equipment in good operating condition, capable of satisfactorily mixing, agitating, and forcing LDCC backfill into injection ports at a uniform flow rate under the required constant pressure.
- D. Backfill grouting equipment shall be configured so flushing can be accomplished with grout intake valves closed, with water supply valve open, and with grout pump running at full speed.
- E. An adequate inventory of spare parts or backup equipment shall be provided to ensure that operable backfill grouting equipment is available at all times during the work. Maintain sufficient quantities of spare pressure gauges, stop valves, and other wear parts on site.
- F. Batch system shall provide graphical or digital printout records of batch scale readings, accurate to one (1) pound, of the dry mix ingredients before delivery to mixer.
- G. At the point of injection, suitable valves and calibrated pressure gauges shall be provided so that the pressure and grout flow at the grout hole may be regulated and monitored. Provide at or very near the point of injection, a system of valves in the line transporting the grout that will allow easy access for collection of test specimens. Provide an automatic bypass valve set to the maximum pressure specified. Provide suitable stop valves at the injection point for use in maintaining pressure, as required, until grout has set. Use hoses or pipes of proper type and diameter to withstand maximum injection pressures used.

2.04 QUALITY ASSURANCE

- A. Field Services. The foaming agent material manufacturer shall provide engineering field services to review the project and the material application prior to any preparation; to approve the applicator, the material used, the equipment, and the procedure to be used; to approve setup before production of LDCC; and to observe during initial application. The field representative of the material manufacturer shall submit, in writing, approvals of proposed material, equipment, application procedures, applicator, and setup before production.

- B. Pipe Manufacturer Representative. Refer to Section 02426 – Installation of Carrier Pipe in Tunnel for pipe manufacturer field services employee requirements during annular backfill grouting.

PART 3 - EXECUTION

3.01 GENERAL

- A. Low density cellular concrete shall be placed in accordance with the approved work plan.
- B. Bulkheads shall be constructed at the end of each reach of pipe (lift segment) to be backfilled.
 - 1. Bulkheads shall be constructed so the annular space will be completely backfill grouted.
 - 2. Bulkheads shall incorporate a minimum 1-inch diameter drain pipe in the invert of the tunnel and invert of each grout lift to facilitate drainage of water during backfill grouting. This pipe shall be securely capped and plugged once LDCC backfill begins to flow from the drain line.
 - 3. A minimum 1-inch diameter vent pipe shall be provided in the tunnel crown to allow entrapped air to escape and allow for visual confirmation that the annular space is filled. Vent outlets shall be provided where required by the contractor's bulkhead design.
- C. Inform the Engineer at least 24 hours in advance of the times and locations where placement of LDCC is anticipated.

3.01 BATCHING AND MIXING

- A. General. Conform to the requirements of accepted submittals and the foaming agent manufacturer's recommendations.
- B. Mixing. All LDCC shall be mechanically mixed to produce a uniform distribution of the materials with a suitable consistency and the specified limiting requirements. Excessive mixing shall be avoided in order to reduce the possibility of changes in unit weight and consistency.
 - 1. In batch mixing operations, follow the manufacturer's recommendations concerning the order of charging the mixer with the various ingredients. The as-cast unit weight shall be monitored at the point of placement. Allowance should be made for any additional mixing that may result from the method of placement, such as mechanical or pneumatic pumping, and for any unit weight changes that may result from these methods.
 - 2. For continuous mixing operations, provision shall be made for reasonably uniform and continuous rate of addition of all mix components at appropriate positions in the mixing machine, and in the correct ratio, to assure uniformity and the specified limiting requirements at the point of placement.

3.03 PLACING LDCC

- A. General Requirements. All void space outside of the carrier pipe shall be completely filled with low density cellular concrete. Force LDCC into all irregularities around the tunnel to completely fill the tunnel annulus to the crown with low density cellular concrete to the maximum extent possible. Place LDCC in accordance with approved submittals.
- B. Monolithic pours shall only be permitted if the carrier pipe is completely filled with water and Contractor can demonstrate that his placement techniques will not induce movement of the pipe.

- C. If Contractor elects to not fill carrier pipe with water, Contractor shall place LDCC in three or more equal volume lifts.
- D. Contractor shall submit calculations demonstrating that his method of placement shall not cause the carrier pipe temperature to exceed the maximum allowable temperature as designated by the pipe manufacturer from the heat of hydration of the LDCC.
- E. Before installing carrier pipe in sections of tunnel that require structural sand-cement mortar grout for annular backfill, installation of upstream or downstream carrier pipe shall be temporarily suspended; a bulkhead shall be constructed, and the annulus backfilled with LDCC.
- F. Similarly, when pipe installation is completed in a section of tunnel requiring structural sand-cement mortar grout in the annulus; installation of pipe shall be temporarily suspended; a bulkhead shall be constructed, and the annulus backfilled with the required material.
- G. Length of carrier pipe installed between LDCC pours shall not exceed the annular backfill grouting maximum reach (lift segment) requirements in Specification Section 02426 – Installation of Carrier Pipe in Tunnel unless Contractor can clearly demonstrate that placement beyond these lengths can be accomplished with complete backfill of the annulus (no voids), no pressure damage to the carrier pipe and no thermal damage to the carrier pipe. Repeat this cycle until all carrier pipe is installed and grouted.
- H. Pressure gauges of appropriate range for monitoring the low density cellular concrete injection pressures shall be located in the line transporting the LDCC as close to the point of injection as possible.
- I. Volume of LDCC injected shall be calculated on an indirect basis and compared with the anticipated volume per foot of pipe backfilled.
- J. Provide a means of direct communication between the injection point and the pump operator.

3.04 FIELD QUALITY CONTROL

- A. **General.** Field control tests, including unit weight (Foamed Density), air content test, and compression tests shall be performed by the Contractor and the results submitted to the Engineer.
 - 1. The frequency specified herein for each field control test is approximate. A greater or lesser number of tests may be made, as required by the Engineer.
 - 2. Test specimens shall be collected within the tunnel at or near the connection where the LDCC is being injected.
 - 3. The Contractor shall assist the Engineer in obtaining test cylinders. Supply all materials necessary for obtaining the test cylinders, including cylinder molds.
 - 4. Monitor carrier pipe temperature for one week after LDCC placement no less than once per day. Submit temperature readings for the entire period to the Engineer.
- B. **Unit Weight.** Unit weight (Foamed Density) tests shall be made from the first batch mixed each day, after a change in mix design, every 30 minutes during pumping, and from each batch of LDCC from which compression test cylinders are made. Unit weight shall be determined in accordance with ASTM C 567. Unit weight at the point of placement shall be within plus or minus 5 percent of the unit weight established for the mix design being placed. Adjust mix as required to obtain the specified Foamed Density.

- C. Air Content. An air content test shall be made from the first batch mixed each day, and from each batch of LDCC from which concrete compression test cylinders are made. Air content at the point of placement will be the difference between the Foamed Density at the point of placement less the Foamed Density at the point immediately before the addition of preformed foam. Air content shall be determined in accordance with ASTM C 138 except there will be no vibration or rodding of the sample.
- D. Compression test cylinders shall be made in the field, cured and stored in the laboratory, and tested in accordance with ASTM C 495. One set of six (6) test cylinders (3 inches by 6 inches) shall be made for each shift when LDCC is placed. Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, the location in the work where the LDCC represented by the cylinder was placed, batch number, unit weight (Foamed Density), and the air content. One additional set shall be made from each additional 200 cubic yards, or major fraction thereof, placed in any one shift. Two cylinders from each set will be tested at an age of 28 days and two cylinders from each set will be tested at an age of 56 days.
- E. Compressive strength of LDCC shall be considered satisfactory if both of the following requirements are met:
 - 1. Average of three consecutive compressive strength tests equal or exceed the specified unconfined compressive strength. (A strength test shall be the average of two compressive strengths of two cylinders made from the same concrete sample and tested at 28 days.)
 - 2. No individual compressive strength test (average of the two cylinders) is below the specified unconfined compressive strength by more than 20 percent.

3.05 PROTECTION AND CLEAN UP

- A. Take all necessary precautions to protect and preserve the interior of the pipe from damage. Spills shall be minimized and shall be cleaned up immediately. Any damage to the pipe caused by or occurring during the backfilling operations shall be repaired by a method approved by the Engineer, at no additional cost to the Owner.
- B. During backfilling work, provide for adequate disposal of all waste and wastewater. Remove and properly dispose of all waste resulting from backfill grouting operations.

- END OF SECTION -

SECTION 02441

TUNNELING BY SLURRY MICROTUNNEL BORING MACHINE (MTBM)

PART 1 - GENERAL

1.01 SCOPE

- A. The work described by this Section consists of furnishing all labor, materials, equipment, supplies as required to install jacking pipe by pressure slurry microtunneling method as shown on the Drawings and specified herein. In tunnels where two pass is indicated on the Drawings, placement of the carrier pipe inside the tunnel shall be in accordance with Section 02426 – Installation of Carrier Pipe in Tunnels and the Tunneling Method Table in Project Specific Notes (PSN).
- B. Work shall be done in strict accordance with the Contract Documents, and in accordance with all Federal, State and local laws, regulations, and requirements.
- C. All available and known geotechnical reports, logs, borings, and laboratory testing performed within close proximity of the project corridor have been made available as "technical data" and not part of the Contract Documents. This is provided as information only and solely for the convenience of Bidders. The Owner and/or the Engineer do not warrant or guarantee the accuracy or correctness of this material with respect to actual subsurface conditions. Subsurface conditions are considered unclassified and no expectation of quantity, specific location of ground conditions, or geotechnical baselines are provided or assumed herein.
- D. For all excavations defined under this Section, Contractor shall install the jacking/casing pipe using techniques and methods selected by the Contractor that are appropriate for prevailing ground conditions. Contractor shall review all available geotechnical reports and data and perform any additional soil investigations he deems necessary, at his own expense, for the planning and the selection of tunneling techniques and methods in order to enable proper construction as shown on the Drawings and other requirements of Contract Documents.
- E. Tunneling installation techniques and methods of construction shall include all equipment, all associated support systems and their operation, ground modification where needed, lubrication to reduce jacking forces as needed, cutting face tooling and sizing, face access capabilities, and the use of engineered fluids, slurries, and soil conditioners as required to maintain face stability, reduce wear, advance heading within line and grade tolerances, transport spoils, and accomplish productivity assumed in Bid.
- F. The minimum dimensions of the cross section of the tunnel excavation shall be determined by the Contractor based off of following:
 - 1. The construction requirements for final installation of the carrier pipe.
 - 2. Minimum size limitations of the annular space as required for installation and to meet line and grade tolerances.
 - 3. The minimum inside diameter of the casing pipe indicated on the Contract Drawings and in the Tunneling Method Table in Project Specific Notes (PSN).
 - 4. Any right of way, encroachment, or occupancy requirements and specifications of governing permitting agencies such as the Kentucky Transportation Cabinet (KYTC).

- G. Contractor may choose to increase the casing diameter, at no additional cost to the Owner, as needed to account for the Contractor's selected means and methods, operational procedures, and to provide adequate internal tolerance to account for the prevailing project site and subsurface conditions. If Contractor elects to modify casing diameter from size shown in the Contract Documents, the Contractor accepts all responsibility for acquiring approval for any modification or addenda to all right-of-way encroachment agreements, occupancy permits, or other established requirements and specifications of the entity being crossed.
- H. All tunnel enlargements made for construction purposes shall be fully supported during the excavation of the tunnel.
- I. Where warranted in the experience of the Contractor or where identified on the Drawings, Ground Modification shall be applied as part of the appropriate preparation for tunneling activities to reduce risk of surface settlement and heaving, protect nearby structures and utilities, and successfully install the piping system within line and grade tolerance. Contractor shall design and include in Bid furnishing of all labor, equipment, materials, and supplies necessary for soil stabilization by jet grouting, compaction grouting, void filling, soil mixing, slurry walls or other ground modification technologies to meet project objectives specified herein.
- J. Dewatering shall be controlled such that the launching and exit shafts are free of water, but the surrounding ground water table is not substantially lowered such that settlement along the tunnel drive or nearby existing structures and foundations does not occur.
- K. The Contractor shall furnish all labor, equipment, and material required to complete the work by microtunneling including but not limited to the following:
 - 1. Microtunneling and jacking system and all related accessories.
 - 2. Spoil transportation, separation apparatus, removal and disposal.
 - 3. Safety and security
 - 4. Hoisting and lifting
 - 5. Control equipment and required power.
 - 6. Launching Pit and Exit Pit construction including, but not limited to, rehandling and disposal of unsuitable and excess materials, control of groundwater and surface water, utility adjustment/supports, tests, excavation, sheeting and shoring, pit/shaft wall thrust blocking, jacking frame, backfilling, cleanup, and restoration of surface features, and all other work necessary for construction as specified and/or shown on the Drawings.
- L. Follow all OSHA regulations regarding tunnel construction including but not limited to OSHA code 1926. Obtain all permits required associated with OSHA regulations and requirements for confined space entry.
- M. Conform with all requirements of the Kentucky Transportation Cabinet (KYTC) Kentucky Transportation Cabinet (KYTC) encroachment agreements for work within their rights-of-way.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02222 – Excavation
- B. Section 02225 – Excavating, Backfilling and Compaction for Sewers

- C. Section 02426 – Installation of Carrier Pipe in Tunnels
- D. Section 02431 – Tunnel Grout
- E. Section 02432 – Low Density Cellular Concrete
- F. Tunneling Method Table in Project Specific Notes (PSN).

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 1. Applicable codes, ordinances, statutes and governing rules and regulations of governing municipalities and counties, the State of Kentucky, and the Federal Government.
 2. American Association of State Highway and Transportation Officials (AASHTO).
 3. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.
 4. Occupational Safety and Health Administration (OSHA) Regulations and Standards for Underground Construction 29 CFR Part 1926, subpart S and other applicable OSHA parts.
 5. Applicable ASTM and AWWA Standards for materials and methods.
 6. Kentucky Transportation Cabinet (KYTC) Kentucky Transportation Cabinet (KYTC) Permits Guidance Manual
 7. All applicable guidelines and restrictions of the United States Army Corps of Engineers (USACE) and Kentucky Department for Environmental Protection (DEP).

1.04 DEFINITIONS

- A. Unless otherwise stated or particular context otherwise requires, the definitions and provisions contained in this Section shall govern the construction, meaning and application of words and phrases utilized in this specification. For purposes of this specification, the following terms are defined as follows:
 1. **Annular Space:** The void created between the outside of the jacking/casing pipe being installed and the extreme outer excavation limits created by MTBM shield. If a two-pass tunnel is installed the annular space is also the void space between the casing pipe and the carrier pipe.
 2. **Carrier Pipe:** A pipe used for conveyance of water or sewer. Carrier pipe shall be as specified in Section 02426 – Installation of Carrier Pipe in Tunnels.
 3. **Cutter Head:** Rotating tool or system of tools on common support excavating at face of bore.
 4. **Control Console:** Electronic unit, located at ground surface controlling operation of microtunneling machine. Electronic information is transmitted to control console from heading of machine. This information includes head position, steering angle, jacking force, progression rates, and laser position.

5. Drive: Section of pipe installed by microtunneling from launching shaft to exit shaft.
6. Entrance and Exit Seals: Seals placed at the breakout into and out of the shafts. The seals are intended to prevent groundwater inflow and loss of ground into the shafts. The seals shall also prevent the lubricant from escaping from annular space during microtunneling.
7. Exit Shaft or Retrieval Pit: Shaft utilized for retrieval of the microtunneling equipment.
8. Engineered Fluid: Slurry fluid normally water based which may contain Bentonite, polymers, and other Contractor selected additives used in closed loop system of the microtunneling machine to accomplish the following tasks:
 - a. Counterbalance the earth and groundwater pressures at the face of the machine,
 - b. Form a filter cake to limit the amount of fluid loss into the ground and to stabilize the ground,
 - c. Mix with the excavated material to transport the material to the surface for separation,
 - d. Aid in the separation of the solids from the liquid at the separation plant.
9. Intermediate Jacking Stations (IJS): A series of hydraulic jacks spaced around the pipe circumference and temporarily installed between two pipe segments. The jacks are installed inside a steel casing fabricated to the same outside diameter as the pipe. The stations are used to distribute the thrusting force along the pipe string by dividing the string into independent reaches. Each intermediate jacking station pushes the reach of pipe segments located between that station and the next station forward in the direction of the tunnel drive.
10. Jacking Frame: Structural component housing hydraulic cylinders used to propel microtunneling machine and pipeline. Jacking frame serves to distribute thrust load to pipeline and reaction load to thrust wall or block.
11. Jacking Pipe: A casing pipe used as the initial support in a two-pass tunneling operation serving as the casing pipe only and not a carrier pipe. In a one-pass tunnel operation, the jacking pipe tunnel excavation support and the carrier pipe are one and the same. The Tunneling Method Table in Project Specific Notes (PSN) will indicate a carrier pipe within a casing pipe or initial tunnel lining system for two-pass tunnel operations. One-pass tunneling shall only be allowed where expressly indicated as such.
12. Launching Shaft: Excavation from which microtunneling equipment is launched for the installation of tunnel. May incorporate a thrust block or wall to spread reaction loads to the ground.
13. Lubricant: Fluid used during microtunnel installation to reduce friction between the jacking pipe and subsurface materials to reduce the overall jacking loads on jacking pipe.
14. Microtunneling: Microtunneling is an underground method of constructing a tunnel that involves installing a pipe by jacking it into place from a launch shaft using hydraulic jacks without removal of the ground above the pipe. Excavation is carried out with a remotely controlled, fully shielded, steerable, laser-guided, articulated Microtunneling Boring Machine attached to the front of the jacking pipe.
15. Microtunneling Boring Machine (MTBM): Microtunneling Boring Machine shall be a fully shielded, remotely operated – no man entry required, steerable, laser-guided, articulated

shield. The shield shall be capable of exerting a continuous, controllable pressure at the tunnel heading, utilizing pressurized slurry (Slurry Shield) to prevent groundwater inflows and soil movement into the heading. MTBM is propelled by thrust from a continuous string of jacking pipe that is advanced from the launching shaft by hydraulics jacks.

16. **Obstruction:** An Obstruction is defined as any buried object that meets all of the following conditions:
 - a. lies within the cross section of the tunnel,
 - b. that impedes continued forward progress along the design path,
 - c. is an object that is greater than 1/3 the diameter of the base tunneling machine, and
 - d. is a rock fragment having an unconfined compressive strength of 20,000 psi or greater or an impediment of foreign material that cannot be crushed or ingested such as metal or other foreign material not naturally occurring.
17. **Obstruction Removal Shafts:** A contingency shaft built to remove an obstruction to a MTBM, repair a damaged MTBM or retrieve an obstructed MTBM.
18. **Obstruction Standby Time:** Duration of work stoppage resulting from Obstruction encounter and removal. Contractor Daily Rate provided in Bid for Obstruction Standby Time shall include all costs of specialist labor only, materials, equipment, production loss and other non-labor related costs associated with the work stoppage caused by an encountered Obstruction.
19. **Slurry:** A fluid, normally water, used in a closed loop system for the removal of spoil and for the balance of groundwater pressure during microtunneling.
20. **Slurry system:** System including pumps, valves, pipe and other appurtenances utilized in Slurry Shields to convey excavated muck mixed with the slurry away from the heading and into the separation plant where separation of soil and slurry occurs.
21. **Slurry Separation:** Process in which excavated material is separated from circulation slurry.
22. **Spoil:** Excavated soil and bedrock material that has been mixed with either water or slurry and pumped to the surface to be separated and recycled or disposed.
23. **Thrust block:** Concrete or steel wall at the back of the launching shaft providing a reaction for jacks pushing the pipe.
24. **Tunneling Methodology:** A written description, together with supporting documentation that defines Contractor's plans and procedures for the tunneling operations.
25. **Two-Pass Tunneling:** Tunneling where initial support is installed concurrent with the excavation process to stabilize the tunnel excavation and a carrier pipe is installed in a subsequent phase or the second pass.
26. **One-Pass Tunneling:** Tunneling where the jacking pipe serves as the tunnel excavation support and the carrier pipe. One-pass tunneling shall only be allowed where expressly indicated as such in the Contract Documents.

1.05 DESIGN CRITERIA

- A. Microtunneling equipment selected for the project shall be compatible with the geologic conditions described in all available geotechnical data provided as Technical Data, and not included in the Contract Documents. Contractor shall perform any additional geologic testing as he deems necessary to select appropriate equipment.
- B. Remotely operated microtunneling equipment shall be used for all microtunneling work described.
- C. Design of the jacking pipe, including pipe joints, reinforcement, stiffness, compressive strength, and determining acceptable pipe fabrication tolerances is the responsibility of the Contractor as it relates to the all loading on the pipe due to installation. Maximum compressive stresses applied to the pipe shall not exceed the manufacturer's recommended allowable stresses.
- D. Contractor's Engineer shall design the launching and exit shafts meeting any minimum requirements provided in Specification Section 02222 – Excavation.
- E. Design backstops, thrust block and concrete seal for all earth loads, and to prevent significant water intrusion. The thrust block shall be perpendicular to the proposed pipe alignment and shall be designed to withstand the maximum jacking pressure to be used, with a factor of safety of at least 2.0, without excessive deflection or displacement.
- F. The MTBM shall be capable of mining through and/or removing cobbles and boulders from the cutter face up to the Obstruction size defined above.
- G. All design calculations provided by the Contractor as part of the required submittals shall be sealed by a Licensed Professional Engineer registered in the State of Kentucky.

1.06 SUBMITTALS

- A. Conform to Section 01300 – Submittals
- B. Microtunneling
 - 1. Equipment: Submit the following describing the microtunneling equipment and construction methods to be employed.
 - a) A detailed description of the microtunneling equipment and procedures to be employed. Provide manufacture's literature describing in detail the microtunneling system to be used including machine type, spoil removal system, guidance system, and provisions for injecting pipe lubricants. Describe machine capabilities and procedures for exerting a stabilizing pressure at the tunnel heading and minimizing loss of ground. Indicate range of face pressures anticipated to be required to stabilize the heading, and the methods and equipment to be used to monitor and control pressures. Contractor shall provide descriptions of projects on which this system has been successfully used including names, addresses, and telephone numbers of owner's representatives for these projects as well as length, diameter, and pipe material used.
 - b) Scheduling for microtunneling work identifying all major construction activities as independent items. The schedule shall include as a minimum the following activities: mobilization; construction of impervious barriers and plugs; shaft excavation and excavation support; jacking equipment setup; tunneling for each drive; backfill and contact grouting of pipe; site and greenway restoration; cleanup; and demobilization. The schedule shall also include the working hours for each activity, and a written description of the construction methods and equipment, to be employed in completing each of the work activities shown on the

schedule. The schedule shall be reviewed with the Owner and Engineer and be updated and resubmitted by the Contractor every two weeks.

- c) A description of the alignment control and steering systems. Provide manufacturer's literature, drawings showing set up and support provisions, and other details for the laser. Submit a description of surveying methods to set laser positions and a description of procedures to check laser and reset or realign laser during construction. Confirm that these systems can achieve the required tunnel line and grade within the specified tolerances.
 - d) Capacity, number and arrangement of main jacks. Provide details of thrust ring, jacking controls, and pressure gauges. Provide an estimate of the maximum jacking force expected to be required to complete each drive.
 - e) Thrust block and jacking frame design and details. Submit calculations demonstrating that the ground behind the thrust block will sustain the maximum planned forces developed by the main jacks with a minimum safety factor of 2.0.
 - f) Details of pipe lubrication injection system and pipe lubricants to be used during microtunneling including manufacturer's literature.
 - g) Details of slurry system including slurry handling, separation, transport, and disposal equipment and procedures including details of the slurry additives, slurry separation plant, and the location of slurry and spoil disposal sites.
 - h) Drawings and design details for launching shaft and exit shaft, indicating number required, proposed spacing, or criteria for installing, and method of operation.
 - i) Drawings and design details for intermediate jacking stations, indicating number required, proposed spacing, or criteria for installing, and method of operation.
 - j) A safety plan for the microtunneling operations including provisions for lighting, ventilation, and electrical system safeguards.
 - k) Details of entrance and exit seals including materials and installation methods.
 - l) A detailed description; with a readily understandable visual representation, of all MTBM operation functions as seen by the operator (control operation computer screen), including what each function means and what the normal operating range is for that function.
2. Jacking Pipe: Submit details of the pipe to be used indicating materials of construction, wall thickness, reinforcement details, joint details, joint cushioning materials, gaskets, and grout fittings for all jacking pipe. Submittal shall include:
- a) Test reports
 - b) Certificates
 - c) Prior to shipment of the pipe, submit certified affidavit of compliance stating that the pipe for this contract was manufactured in accordance with the specifications.
3. Calculations: Submit the following calculations:
- a) Design calculations for the jacking pipe demonstrating that the proposed pipe and pipe joint is capable of withstanding the jacking forces anticipated by the

Contractor for each microtunneling run and the final in place loading conditions. The criteria for truck loading shall be HS-20 in accordance with AASHTO requirements.

- b) Design calculations demonstrating that the projected slurry pressure will not exceed the maximum allowable face pressure that can be exerted at the tunnel face without fluid loss at the surface, adjacent surface waters, other structures or features or heave of ground.
 - c) Detailed shoring calculations for the launching and the exit shafts construction including all support members.
4. Settlement Monitoring Plan and Site Assessment:
- a) Submit a settlement monitoring plan for review prior to construction. The plan shall be in accordance with section 3.03 below.
5. Installation Plan:
- a) Submit description of proposed construction plan, dewatering plan, and plan to establish and maintain vertical and horizontal alignment.
 - b) Submit proposed jacking pipe annular space grout hole locations.
 - c) Identify methods used to control stormwater from entering pits/shafts and to maintain normal stormwater flow adjacent to pits/shafts.
 - d) Supply details of procedures and resources that will be employed to carry out the work including method and sequence of:
 - (i) Establishment of drive line of MTBM and elevation at base of shaft.
 - (ii) Pipe handling and connections
 - (iii) Maintaining line and grade, and re-establishment of line and grade as required.
 - (iv) Spoil separation and disposal or recycle process.
 - (v) Spoil and slurry containment during microtunneling work.
 - (vi) Submit emergency response procedures to handle situations when jacking pipe is compromised and jeopardizes integrity of installation or safety.
 - (vii) Submit detailed schedule for microtunnel operation including construction of pits/shafts, thrust blocking, equipment setup, jacking pipe, carrier pipe installation (where applicable), testing, equipment removal, pit closure and restoration.
6. Materials; Supply full details of the following materials:
- a) Design mixes for all concrete and grout.
7. Other Contingency Plans; Detailed contingency plans are required for the following:

- a) High jacking forces.
 - b) Damaged pipe.
 - c) Obstruction(s).
 - d) Surface settlement or heaving.
 - e) Loss of line and grade.
 - f) Major mechanical breakdown.
 - g) Stoppage of jacking.
 - h) Loss of cutter tools on the cutter head of the MTBM.
8. Reports and Records: The Contractor shall submit the Daily Activity Log, per section 3.12 below, each day of microtunneling.
9. Record Drawings: Maintain at construction site a complete set of field drawings for recording of as-built conditions. All marks and notes shall be dated, and thorough. Submit the following:
- a) Submit record of actual locations of jacking pipe and elevations. Elevations shall be taken at each pipe joint and recorded to the nearest eighth of an inch (0.01 feet). Horizontal coordinates of all surveyed points shall be on the coordinate system utilized by the Owner.
 - b) Submit written report to verify there are no voids or defective joints in the entire length of jacking pipe. Upon completion of the pipe installation, the Contractor shall allow two (2) business days for the Engineer or other representative of the Owner to inspect the completed pipe installation.
 - c) Submit written Log of each drive to the Engineer and Owner for review within three (3) business days of completing each drive.
10. Permits: The contractor shall be responsible for executing the requirements of permits obtained from the KYTC, Railroad companies, United States Army Corps of Engineers and any State and local authority where the project is located. The Contractor shall be responsible for any phase submittals required by the permits. All submittal information required by the project permits shall be channeled through the Engineer.

1.07 QUALIFICATIONS

- A. Minimum Experience Requirements for Tunnel by Slurry Microtunnel Boring Machine (MTBM) are as follows:
- 1. The contractor or subcontractor intending to perform Tunneling by Slurry Microtunnel Boring Machine shall have a minimum of five (5) years' experience performing microtunneling of similar size and scope.
 - 2. The contractor or subcontractor intending to perform Tunneling by Slurry Microtunnel Boring Machine shall have installed a minimum of 2,500 linear feet of pipe by pressure slurry microtunneling.

3. The contractor or subcontractor intending to perform Tunneling by Slurry Microtunnel Boring Machine shall have installed a minimum of 1,000 linear feet of 36-inch or larger jacking pipe/casing.
4. The contractor or subcontractor intending to perform Tunneling by Slurry Microtunnel Boring Machine shall have experience including three (3) tunnel projects completed in the last 10-years performed with a slurry microtunnel boring machine with individual, single drives of 500 linear feet or greater with reinforced concrete jacking pipe, fiberglass reinforced jacking pipe or carbon steel jacking pipe.
5. The contractor or subcontractor intending to perform Tunneling by Slurry Microtunnel Boring Machine shall have experience including two (2) tunnel projects completed in the last 10-years performed with a slurry microtunnel boring machine in moderate or higher strength hard rock with either mixed face or full face rock excavation.
6. The contractor or subcontractor intending to perform Tunneling by Slurry Microtunnel Boring Machine shall have successfully installed a carrier pipe and grouted without voids the annular space of a minimum of 2,500 linear feet of tunnel construction.
7. The contractor or subcontractor intending to perform Tunneling by Slurry Microtunnel Boring Machine shall have experience including three (3) underground construction projects completed in the last ten (10) years that involved the design and construction of a temporary or permanent shaft excavated in soft ground below the groundwater table.

B. See Tunneling Contractor Qualifications worksheets in Specification Section 00410.

1.08 QUALITY ASSURANCE

- A. Work shall be supervised by at least one (1) person with five (5) years of recent experience in microtunneling process. Experience shall be in a minimum of five (5) previous microtunneling projects of similar size and scope. Microtunneling operations shall be performed under the direction of the microtunneling supervisor who shall be in responsible charge throughout the microtunneling operation.
- B. All tunneling operations shall be performed under the supervision of experienced shift foremen with at least five (5) years of recent on-the-job supervision experience on similar projects, involving tunnels of similar size constructed using similar methods.
- C. Operators shall be experienced in microtunneling with prior knowledge and ability to properly operate systems being employed. Operators shall have a minimum of five (5) years experience in performing microtunneling of similar size (with at least 2 projects with a minimum outside diameter jacking pipe equivalent to the size tunnel they will be performing work on), segment lengths and ground conditions.
- D. Operate systems following manufacturer's instructions and recommendations. Make available at all times copies of operations manuals to the Engineer and operational personnel on site.
- E. Test full system in accordance with manufacturer's recommendations on completion of set up and before commencing drive. Record the test results and provide a copy of the test report to the Engineer.
- F. Drive Start Up:
 1. Before commencement of any drive, demonstrate to the Engineer that required set up procedures and system checks are complete and required materials are at hand to commence drive.

2. Do not commence drive until construction of receiving pit has been completed.

1.09 PRE-INSTALLATION MEETING

- A. At least three weeks prior to commencing the work of this section, convene a Pre-Installation Meeting at the job site to be attended by:
 1. Contractor and any sub-contractor performing any related work.
 2. Owner.
 3. Engineer.
 4. Any other pertinent stakeholder as identified by Owner, Engineer, or Contractor.
- B. Meeting shall cover settlement monitoring, work hours, safety, staging and storage of materials, schedule, any changes to on-site staff from original Work Plan submittal, permitting, and the development of record drawings, etc. to ensure successful implementation of all requirements of this specification during tunnel construction.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall accept material on site and inspect for damage.
- B. The Contractor shall handle, support and store pipe to prevent injury or damage to the pipe.
- C. Support piping with nylon double slings during handling. Protect ends from damage affecting integrity of connection. The Contractor shall consult with the pipe manufacturer prior to delivery and comply with any additional recommendations made by manufacturer.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Conduct operations to not interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.
- B. Conduct operations to not interfere with roadway traffic, except with prior approval by the Kentucky Transportation Cabinet (KYTC) or other governing authority (where applicable) and the Owner.
- C. Provide temporary facilities to prevent erosion of disturbed construction area in accordance with the approved Erosion & Sedimentation Control Plan and Contract Documents.
- D. Maintain existing stormwater flow patterns or submit measures to temporarily bypass in accordance with the Erosion & Sedimentation Control Plan and Contract Documents.

1.12 COORDINATION

- A. Coordinate work with local, state and federal authorities and utility owners to avoid interference with or damage to existing facilities in or adjacent to construction areas.

PART 2 – PRODUCTS

2.01 JACKING PIPE for TWO PASS

- A. Jacking pipe shall be steel pipe in accordance with Section 02425 – Initial Tunnel Support unless otherwise approved by the Engineer.

2.02 CARRIER PIPE

- A. The carrier pipe shall be in accordance with the Tunneling Method Table in Project Specific Notes (PSN).

2.03 GROUT FOR JACKING PIPE EXTERIOR ANNULAR SPACE

- A. Grout for pressure injection between the jacking pipe and the earth shall in accordance with Section 02431 – Tunnel Grout.

2.04 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 0.090-inches 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 spacer 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.
- C. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe with the casing pipe, within two (2) feet of each side of a pipe joint, and the rest evenly spaced. Each segment of pipe shall have a minimum of four (4) spacers installed on it. Manufacturer's recommendations may govern these requirements.

2.05 TUNNEL END SEALS

- A. The ends of the tunnel shall be filled with concrete brick or cap block and mortar with two (2) weep holes at the bottom. Weep holes shall use 1-inch PVC pipe.

2.06 WATER

- A. Water used in the preparation of pipe lubricant shall be clean, fresh potable water, free from oil, acid, alkali, organic matter or other deleterious substances.

2.07 BENTONITE

- A. Neat bentonite without additives shall be high quality Wyoming bentonite or similar. General grade civil engineering bentonite shall not be used as a pipe lubricant.

2.08 POLYMERS

- A. Polymers used as pipe lubricant or additive to bentonite or slurry water shall be non-toxic.

PART 3 – EXECUTION

3.01 PROJECT SITE CONDITIONS:

- A. Microtunneling shall not begin until the following have been completed:
1. Required submittals have been made and the Engineer has reviewed and accepted all submittals.
 2. Notify the Owner and Engineer at least 30 days before beginning any excavation.
 3. Launching shaft, exit shaft, thrust block, entrance and exit seals have been completed in accordance with the approved shop drawings and Contract Documents.
 4. Groundwater control for breaking out and breaking into the shafts has been established.
 5. A Safety Officer has been designated and prepared a Health and Safety Plan in accordance with OSHA requirements for tunnel construction. The Safety Officer shall have held safety meetings and provided safety instruction for new employees as required by OSHA.
 6. Pre-installation meeting has been held and all comments have been addressed from the meeting.
 7. Settlement monitoring system is in place and preconstruction readings have been provided to the Engineer.
 8. Pre-construction survey documents have been submitted to the Engineer.
- B. Perform microtunneling for the jacking pipe to the extent indicated on the Drawings so as not to interfere with, interrupt or endanger surface activity thereon, and minimize subsidence of surface, structures, and utilities above and near tunnel. Roadway, utilities, and/or structures damaged by microtunneling operations shall be repaired or replaced as necessary to restore them to their original condition prior in a timely manner, unless otherwise directed by the Engineer, at no additional cost to Owner.
- C. Furnish all necessary equipment, power, water, and utilities for microtunneling, pipe lubricant mixing and pumping, slurry separation, removal and disposal of spoil, and other associated work required for the Contractor's methods of construction.
- D. Promptly clean up, remove, and dispose of any spoil or slurry spillage.
- E. Furnish all maintenance of traffic and establish and maintain all safety procedures on any highways whose thoroughfare is interrupted due to the microtunneling operation.
- F. Inspect the locations where microtunneling will be conducted, verify conditions under which the work will be performed and provide all necessary details, whether shown or specified on the Drawings or not, for the orderly prosecution of the work.
- G. No vertical obstruction removal shafts shall be allowed within the limits of the travel ways of roads and highways without approval from the governing agency of the effected right-of-way. Vertical obstruction removal shafts may be permitted by the Engineer in areas outside of the travel way. Horizontal excavation rescue methods may be permitted by the Engineer. All proposed obstruction rescue shafts are subject to review and approval by the Kentucky Transportation Cabinet (KYTC) or LFUCG as applicable.
1. Should the Contractor need to construct an obstruction rescue shaft, the Contractor shall submit in writing for review by the Engineer, Owner, along with KYTC (where applicable) a complete plan for MTBM rescue methods.

2. The Contractor shall be responsible for obtaining all necessary permits as they relate to the proposed rescue operations.

3.02 PREPARATION

- A. Existing utilities shown on Drawings are shown for general information only. Contractor shall verify locations, sizes and configurations of existing systems within potential conflict of installation operations.
- B. Complete any required testing, inspection, surveying, etc., of any existing utilities required by the Contract Documents,
- C. Call Local Utility Line Locate Service (811) not less than five working days before performing Work.
- D. Request underground utilities to be located and marked within and surrounding the construction areas.
- E. Locate, identify, and protect utilities indicated to remain from damage.
- F. Protection:
 1. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.
 2. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic. Repair or replace items damaged during construction.
 3. Repair or replace structures raised more than 0.50 inch due to pressure from tunneling operations including pavement, and sidewalk.
- G. Ventilation
 1. Furnish and operate a temporary ventilation system and air monitoring system conforming to the requirements of OSHA at all times that personnel are underground. Operate and maintain a ventilation system that provides a sufficient supply of fresh air and maintains an atmosphere free of toxic or flammable gases in all underground work areas.
 2. Before any personnel enters the tunnel, the air quality must be tested and verified that the OSHA requirements pertaining to air quality are met or exceeded.
- H. Barricades
 1. Protect pits, shafts and other open excavations with barricades and security fencing as indicated on the Drawings and with additional measures approved by the Engineer and Owner as required to prevent unauthorized personnel from accessing.
 2. During non-work hours, isolate with additional measures approved by the Engineer and Owner as required to prevent unauthorized personnel from accessing.
 3. Remove equipment daily from vehicular and pedestrian roads, sidewalk and pathways not contained within the direct work area to permit access and use by public.

3.03 SETTLEMENT MONITORING:

- A. The Contractor will be held solely responsible for damages to highway or street surfaces, railroads or damage to pavements, structures, structural embankments, sidewalks, curbing, or public utilities resulting from subsidence, collapsed jacking pipe, or ground losses into the pipe and for the refilling of voids with grout. Where such ground losses are so severe that they result in damage to underground or surface pavement, existing utilities or structures, the Contractor shall be solely responsible for remedying such damage. Where the filling of voids cannot be effectively carried out from below, the Engineer reserves the right to order the Contractor, at no additional cost to the Owner, to make openings from the surface for the purpose of backfilling the voids.
- B. As a minimum, surface monitoring points shall be established consisting of settlement markers to detect surface movement of roadway and pavement.
- C. Survey the site showing locations and elevations of existing ground, pavement, and other permanent features to establish a baseline for existing conditions along the centerline of the proposed pipe/tunnel, and along two parallel lines 20-feet on either side of the centerline. All surveying performed for settlement monitoring to be performed by a surveyor licensed in the State of Kentucky.
- D. Surface settlement marks:
1. Markers shall be located at 25-foot centers along three horizontal lines parallel to the tunnel center line.
 2. Markers shall be located at three (3) lines;
 - a) One along tunnel centerline.
 - b) Two lines parallel to the tunnel centerline, offset 20-feet on each side.
- E. All markers/points shall be surveyed as follows:
1. Prior to beginning any work.
 2. Every 24 hours by the licensed surveyor during microtunneling operation.
 3. At the completion of the tunnel.
 4. The same points shall also be surveyed 90 days after the work is completed and both shafts have been backfilled.
- F. Ground Surface Movement:
1. The microtunneling machine shall be operated so as to prevent both surface heave and loss of ground during microtunneling.
 2. The use of engineered fluid including Bentonite is required for microtunneling in poorly graded, rounded and subrounded, granular material below the groundwater table having less than 12% fines as defined by ASTM D2487 to ensure earth pressure balance, soil stability, and prevention from slurry migration during microtunneling as no additional cost to the Owner.
 3. Unless more stringent requirements are set forth by third party agencies, settlement or heave of the ground surface along the alignment shall not exceed 0.25 inch.
 4. If the ground subsidence or heave exceeds 0.25 inch the microtunneling operations shall stop and remedial measures approved by the Engineer shall be implemented.

5. If any movement or settlement occurs which causes or might cause damage to an existing structure over, along or adjacent to the work, immediately stop any or all work except that which assists in making the work secure and in preventing further movement, settlement or damage. Resume tunneling only after all necessary precautions have been taken to prevent further movement, settlement or damage, and repair the damage at the Contractor's own cost and to the satisfaction of the Engineer.
 6. Restrict the excavation of the materials to only those materials that are physically displaced by the shield itself in order to prevent loss of ground and settlement of possible damage to overlying structures. Control the advance rate and monitor the volume of material excavated and adjust operations as required to avoid loss of ground, over-excavation or surface heave.
- G. Lateral Displacements: Unless more stringent requirements are set forth by third party agencies, lateral movement or deflection of pit/shaft excavation support system shall be limited to 0.5 inch.
- H. Report any settlement or movement immediately to the Engineer and applicable agency and take immediate remedial action.

3.04 GROUNDWATER CONTROL

- A. Intercept and divert surface drainage precipitation and groundwater away from excavation through use of dikes, curb walls, ditches, pipes, sumps or other means within the conditions permitted by the approved Erosion & Sedimentation Control Plan and the Contract Documents.
- B. Develop substantially dry subgrade for prosecution of subsequent operations.
- C. Launching and exit shaft subgrade shall be kept continuously free from ground and surface waters during tunneling operations. Dewatering shall be controlled such that the launching and exit shafts are free of water, but the surrounding ground water table is not substantially lowered such that settlement along the tunnel drive occurs.
- D. Keep removal of soil particles to a minimum.
- E. Water discharge from dewatering operations shall be directed into approved receiving basins or silt bag in accordance with all applicable regulatory requirements and the approved erosion and sedimentation control plan for the project.
- F. Should settlement or displacement be detected, notify the Engineer and applicable agency immediately and act to maintain safe conditions and prevent damage.

3.05 GROUND MODIFICATION PRIOR TO TUNNELING

- A. Ground modification grout requirements are set forth in Section 02431 – Tunnel Grout.
- B. The use of permeation, compensation, jet or compaction grouting, soil mixing, ground freezing or other approved method of stabilization shall be carefully considered by the Contractor to safely permit Contractor's selected tunneling activities in loose and flowable soils or in rock that is fractured with joints, bedding planes, shears, or fault zones under the groundwater table and having loose and flowable overburden. Contractor shall determine if ground modification is needed to maintain stabilized tunnel face and bore during tunneling by Contractor's selected means of excavation and be fully liable for the determination of the necessity, selection, design, and implementation of ground modification strategies.
- C. Ground modification strategies shall be designed to work in concert with Contractor's selected excavation methods and implemented as needed to increase bearing capacity,

provide settlement control, reduce permeability and/or increase stand-up time along the face of excavation within the tunnel alignment or in the areas of excavation required to construct all launch, reception, and access structures and shall be included in the Bid.

- D. Contractor shall submit proposed ground modification strategies for review and acceptance including soils stabilization methods, surface settlement prevention plan for area along the tunnel heading, void filling, and blocking of the underground flow of water to prevent rapid dewatering through tunneling activities.
- E. Contractor shall furnish all labor, equipment, materials, and supplies necessary for ground modifications required to meet project objectives specified herein.

3.06 MICROTUNNELING EQUIPMENT

- A. **Microtunneling Boring Machine (MTBM):** The Microtunneling Boring Machine shall be a pressurized face, slurry machine manufactured by a company that specializes in the design and fabrication of this type of equipment and has at least ten (10) years of experience. The machine shall be capable of excavating the tunnel(s) in geologic conditions as described in all available geotechnical data for the project site and shall satisfy the following requirements:
 - 1. The machine shall be capable of fully supporting the face during both excavation and shutdown periods, and shall have the capability of exerting a controllable, continuous, stabilizing pressure at the face as required to prevent loss of ground and groundwater inflows. The machine shall be capable of synchronizing the rate of excavation removed at the tunnel face with the rate of machine advance so there is no over-excavation or loss of ground.
 - 2. The machine shall have an enclosed chamber for containing the slurry under pressure. A pressure gauge shall be provided so the operator can monitor the chamber pressure. The system shall be capable of measuring ground and groundwater pressure and making the adjustments required to counterbalance the ground and groundwater pressures as needed to prevent loss of slurry or groundwater inflow. Control slurry pressure system using variable flow slurry pumps, pressure control valves and minimum of two (2) flow meters, one (1) on feed side and one (1) on return side.
 - 3. The machine shall be remotely operated, laser-guided, and monitored continuously by the operator. A display showing the position of the machine in relation to design line-and grade shall be provided at the operation console to allow the operator to monitor face pressure, roll, inclination, laser position, steering altitude, rate of advance, installed length, thrust force, and cutterhead torque.
 - 4. The machine shall have an articulated shield that is steerable in both vertical and horizontal directions to maintain line and grade within the specified tolerances. The cutter head shall have a reversible drive system so that it can rotate in either direction to minimize rotation or roll of the pipe during installation.
 - 5. Provide a slurry separation plant that is appropriate for the ground being excavated, and compatible with the anticipated excavation rate that is effective in removing the spoil from the slurry and is acceptable in terms of the available construction staging areas.
 - 6. A pipe lubrication injection system shall be provided to inject pipe lubricants to minimize jacking forces. Lubrication of pipe exterior is determined by the Contractor during tunnel excavation and jacking pipe installation, but equipment shall be capable of continuously utilizing bentonite slurry lubrication or other approved material.

7. The tail of the machine shall have gaskets and/or seals to prevent material from flowing into the tunnel at the contact between the tail skin and the pipe.
 8. The jacking system, including any intermediate jacking stations used, shall be capable of continuously monitoring the jacking pressure, the rate of advancement, and the distance jacked. The jacking system shall develop a uniform distribution of jacking forces on the end of the pipe. Use hydraulic cylinders with automatic shut off to prevent overstressing pipe being jacked.
 9. The MTBM shall be equipped with the high-pressure water jetting system capable of cleaning the cutter head and the extraction/crushing chamber to improve production in the cohesive soils.
 10. The MTBM shall be capable of mining through the conditions outlined for the tunnel crossing and through boulders in sizes up to the diameter as defined by "Obstruction" in paragraph 1.04.16.
 11. The MTBM shall conform to OSHA requirements for tunneling in potentially gassy conditions.
 12. The MTBM shall allow personnel safe access to the tunnel face for cutter maintenance and removal of obstructions such as boulders through a suitable access door and through an air pressure chamber. The machine shall have equipment with the capability to place the tunnel face under pressure, if required.
- B. The MTBM Control System shall provide the following minimum information to operator on uninterrupted basis:
1. Deviation of MTBM from required line and grade of casing, normally by reference to laser beam.
 2. Grade and roll of MTBM.
 3. Jacking load.
 4. Torque and RPM of cutter head.
 5. Instantaneous jacking rate and total distance jacked.
 6. Indication of steering direction.
 7. Volume of slurry flow in both supply and return sides of slurry loop.
 8. Indication of slurry by-pass valve position.
 9. Indication of pressure of slurry in slurry chamber.

3.07 INSTALLATION – LAUNCHING AND EXIT SHAFTS

- A. Excavate launching and exit shafts in accordance with Section 02225 – Excavating, Backfilling and Compaction for Sewers and Section 02222 – Excavation.
- B. Provide excavation supports as designed by the Contractor's Engineer.
- C. Locate shafts as indicated on Drawings. Alternate locations and sizes are subject to review by the Engineer.

- D. Support soil, pavement, utilities or structures existing outside excavation.
- E. Construct shafts to limit intrusion of ground water. Install equipment to maintain shafts free of water while limiting effect on surrounding groundwater table. Dewatering pumps shall discharge into a sediment filter bag(s) or into a sediment trap(s) in accordance with local and State erosion and sediment control and stormwater requirements.
- F. Furnish and install, to the extent required, thrust blocks or such other provisions as may be required in driving the jacking pipe forward.
- G. Do not apply jacking loads until any concrete blocking used has achieved required design strength.
- H. Upon completion of boring operations remove pits/shafts. Backfill, compact and restore disturbed area in accordance with Contract Documents.

3.08 INSTALLATION OF MICROTUNNEL

- A. Provide a suitable jacking frame and thrust block to carry out the work that meets the specified requirements of this Section.
- B. Prior to starting microtunneling operations, survey the location and orientation of the pipe guide rails to ensure they are on the proper line and grade and check to see that they are properly supported.
- C. Set the pipe to be jacked on properly braced and supported pipe guide rails.
- D. The axial forces from the thrust jacks shall be distributed to the pipe uniformly through a properly designed thrust ring and cushion material to prevent damage to the ends of the pipe. The jacking system shall be capable of continuously monitoring the jacking pressure and advance rate.
- E. Pipes shall be jacked into position following the design line and grade of the pipeline without damaging the pipe. In the event a section of pipe is damaged during the jacking operations, the pipe shall be jacked through to the exit shaft and removed. Other methods of repairing the damaged pipe may be used, subject to approval by the Engineer.
- F. The Contractor shall have a redundant lubricant injection system connected for immediate use in the event the primary system fails during the microtunnel operation. Lubricant injection shall be continuous until the casing is fully installed.
- G. If in the judgment of the Engineer, a portion of the installed jacking pipe requires reinforcing because of collapse, the Engineer may direct the Contractor to furnish and place such reinforcement at no additional cost to the Owner. Reinforcement may also be directed when the stability of the soil adjacent to the pipe has been affected by the loss of ground.
- H. The MTBM shall apply slurry pressure at the heading to stabilize the tunnel excavation and to balance the groundwater pressure and soil pressure, where applicable. The slurry pressure shall be maintained at a level slightly in excess of normal hydrostatic pressure and measured active soil pressure and monitored continuously.
- I. The machine shall be steered to maintain line and grade within the tolerance specified. This shall be achieved by continuously monitoring line, grade, machine inclination, roll and steering attitude during the operation. As a minimum, the thrust force, slurry chamber pressure, torque, rate of advance, distance along the drive, deviation from line and grade, roll, and steering adjustments shall be monitored and recorded for each pipe section installed.

- J. The lengths of some microtunneling drives may require utilization of an Intermediate Jacking Station(s). The use of intermediate jacking stations (IJS) in a specific microtunneling drive is at the discretion of the Contractor. This capacity requires the IJSs pipe jacking equipment shall be not less than 50 percent greater than the calculated maximum jacking load (including factor of safety as specified).
 - K. Intermediate Jacking Stations (if used) shall be provided of sufficient numbers and spacing to ensure completion of the drive and be of individual capacity compatible with the maximum safe jacking capacity of the pipe.
 - L. Regardless of the results of design calculations or proposed pipe installation means and methods, the Contractor will be required to have at least two (2) Intermediate Jacking Stations available on site at all times until completion of microtunneling. However, the actual number of the IJS's at the site may be higher than two (2) and shall be determined by the Contractor.
 - M. Perform operations so trucks and other equipment do not create dirt or other nuisance on roads and streets. Immediately remove and dispose of spillage on these surfaces.
 - N. Microtunneling shall be performed in a manner to prevent voids from developing outside the jacking pipe.
 - 1. Contractor to determine appropriate annular space between the outside of the jacking pipe and the excavated ground for the ground conditions, length of the drive, and to prevent surface settlement.
 - 2. Outside diameter of MTBM shall not exceed outside diameter of jacking pipe by more than 2 inches without Engineer Approval.
 - 3. All void space between the outside of the jacking pipe and excavated ground shall be filled with grout as specified herein.
 - 4. Restrict the excavation of the materials to the least clearance necessary to prevent binding in order to avoid loss of ground and consequent settlement or possible damage to overlying structures.
 - 5. Control advance rate and the volume of material excavated to avoid over-excavation and heave.
 - O. As a minimum, the thrust force, rate of advance, distance along the drive, deviation from line and grade, and steering jack adjustments shall be monitored and recorded in the Daily Activity Log at 1-foot intervals for each pipe installed.
 - P. In low cover areas restrict, as necessary, slurry pressures at the face of excavation to avoid migration to the surface causing a loss of pressure at the face, in the slurry pipes, and higher potential for ground heaving or subsidence.
- 3.09 SLURRY SPOIL TRANSPORT AND DISPOSAL
- A. Use slurry spoil transportation system. Monitor slurry pressure and adjust as required to adequately balance soil and groundwater pressures. Control slurry pressure and avoid excessive pumping pressures to prevent the discharge of slurry at the ground surface. Clean-up slurry discharges immediately. Wash any paved areas with water to avoid the tracking of slurry away from the discharge area.

- B. A separation plant shall be provided to remove the excavated soil/rock from the slurry for disposal and to return the slurry back to the machine. Use shakers, settlement tanks, vibrating screens, desanders, hydro-cyclones, and centrifuges as required for effective spoil removal.
- C. No additional compensation shall be considered for adding chemicals to the tunnel slurry to accelerate settling. No time extension shall be considered for slurry handling and problems that are direct result of an inadequate slurry separation system for ground conditions encountered.
- D. Transport and dispose of all excavated materials properly away from the construction site. Slurry and muck shall be disposed of at legal disposal facilities and proof of such disposal shall be provided to the Engineer.

3.10 VENTILATION

- A. Perform all tunneling operation by methods and with equipment which will positively control dust, fumes, vapors, gases, fibers, fogs, mists and other atmospheric impurities in accordance with specified OSHA safety requirements.
- B. All intermediate or booster fans required for tunnel ventilation shall be installed within the tunnel. No ventilation fans will be allowed outside of the tunnel except at the shaft sites.
- C. All ventilation fans not within the tunnel shall be placed within an enclosure to limit ambient noise.

3.11 CONTROL OF LINE AND GRADE

- A. Establish benchmarks and survey control points. Benchmarks and control points shall be established by a licensed surveyor registered in the State of Kentucky.
- B. Verify benchmarks prior to start of construction and report any errors or discrepancies to the Engineer.
- C. When satisfied that all benchmarks are correct, use these benchmarks to furnish and maintain all reference lines and grades for tunneling. Use these lines and grades to establish the location of the pipe using a laser guidance system. Submit to the Engineer copies of field notes used to establish all lines and grades and allow the Engineer to check laser set up prior to beginning microtunneling. The Contractor remains fully responsible for the accuracy of the work and the correction of it, as required.
- D. Microtunneling shall not commence until the Contractor's surveyor has verified in writing to the Engineer that the first pipe segment is at the correct location and elevation and is oriented at the correct horizontal and vertical direction. After the first segment has been installed, the Contractor's surveyor shall again verify in writing to the Engineer that alignment is correct. If alignment is not correct at this point, or any successive point, the microtunnel operation shall be stopped and shall not resume until the Contractor has modified the microtunnel operation as required to maintain proper alignment at no additional cost to the Owner.
- E. Laser shall be mounted independently from the thrust block and jacking frame to maintain the alignment of the laser. Stop microtunneling operations and reset laser, if laser alignment shifts or is moved off of design alignment and grade for any reason. Laser should only be reset, in accordance with approved procedures, and by qualified surveying personnel.
- F. Monitor line and grade continuously during microtunneling operations. Record deviation with respect to design line and grade at least once per foot and include in Daily Activity Log.

- G. Control line and grade of the pipe to within the specified tolerances. When the excavation is off line or grade, make the necessary corrections, and return to the plan alignment at a rate of not more than 1 inch per 25 feet.
- H. If alignment or elevations exceed the specified tolerances during the microtunneling operations as indicated by survey reports, the Contractor shall report the situation to the Engineer immediately. The microtunneling operation shall be stopped and shall not resume until the Contractor has submitted a modified microtunnel operation plan to the Engineer and it has been approved by the Engineer. The modified operations shall be implemented at no additional cost to the Owner.
- I. The line and grade may be checked by the Engineer and/or Owner. Provide access to allow representative to check line and grade as requested. Said checking shall not substitute for the Contractor's own line and grade control responsibilities.

3.12 OBSTRUCTIONS DURING MICROTUNNELING

- A. The Contractor shall notify the Engineer immediately and in writing within 10 hours of occurrence if tunneling forward progress is halted and Contractor believes an obstruction has been encountered. The Contractor shall submit a plan to remove the obstruction for approval. The Engineer shall investigate the event and review the plan promptly.
- B. Upon written authorization by the Engineer, the Contractor shall proceed with removal of the obstruction by means of an obstruction removal shaft, hand mining, removal of the microtunnel machine, or other means reviewed by the Engineer in accordance with the Contractor's reviewed submittal(s).
- C. The Contractor may propose alternate methods of removing, clearing or otherwise making it possible for the MTBM to advance past obstructions, however, any such method that does not allow visual observations of the nature of the obstruction to be made will not be considered for payment.
- D. Obstruction removal shafts shall be constructed and removed in accordance with Section 02222 – Excavation, or as designed by the Contractor's Engineer, and Section 02225 - Excavating, Backfilling and Compaction for Sewers.
- E. The Contractor shall remove, clear or otherwise make it possible for the MTBM and jacked pipe to advance past all obstructions encountered.
- F. The Contractor shall receive no additional compensation for removing, clearing or otherwise making it possible for the MTBM to advance past obstructions unless the obstructions meet the obstruction definition as specified herein.
- G. If an obstruction meeting the definition provided herein is identified, Contractor shall be paid for an obstruction removal shaft and for removal or repair of MTBM as required to continue installation. If following excavation, it is determined that there is not an impediment meeting the definition of an obstruction herein, there is no payment to Contractor.
- H. The Contractor shall include a unit price for Obstruction Standby Time in the bid to be used, if needed, for payment for standby time while an obstruction removal shaft is excavated to determine why forward motion is stopped.
- I. Time required to repair or replace damaged or worn cutters, improper operation, inadequate setup, and equipment failure that is not a direct result of an obstruction shall not be included in the obstruction removal time.

- J. Where removal of an obstruction leaves a void around the exterior of the jacking pipe, the Contractor shall be required to fill the void to the satisfaction of the Engineer, Owner and applicable agencies.

3.13 DAILY ACTIVITY LOG

- A. Maintain a daily activity log during jacking operations for casing and submit to the Engineer for record purposes. Submit the following on a daily basis:
 - 1. Start and finish time of jacking pipe advancement.
 - 2. Total length of jacking pipe installed.
 - 3. Thrust force, slurry face pressure in slurry shields, cutterhead torque, rate of advance, line and grade deviation, roll, inclination and steering shall be recorded at one foot intervals.
 - 4. Settlement monitoring readings.
 - 5. General description for each discernable ground condition mined.
- B. Where tunneling system utilizes an electronic data logger, set up so that the above information is recorded and can be readily identified, printed, and filed with Engineer. Identify known errors with recorded data and explain in daily log submittal.

3.14 GROUTING OF EXTERIOR ANNULAR SPACE FOR JACKING PIPE

- A. No grout shall be placed inside the tunnel installed by MTBM method.
- B. Promptly following the microtunneling drive completion, pressure grout to fill all voids existing outside of the jacking pipe to prevent surface settlement due to movement of soil into void space or loosened zone around pipe.
- C. Grouting shall be performed from the interior of the jacking pipe through grouting holes. Lubricant shall be displaced by the grout. Grouting shall be started in the lowest connections and shall proceed until grout begins to flow from upper connections. The void shall be completely filled. Displaced lubricant shall be disposed of off-site in accordance with applicable regulations and codes of all Federal, State, and local agencies.
- D. Grout shall be in accordance with Section 02431 – Tunnel Grout.
- E. Liquid grout pressure shall not exceed one-half of the existing overburden pressure.
- F. After grouting is complete, pressure shall be maintained by means of stopcocks or other suitable devices until the grout has set sufficiently in the judgment of the Engineer, or for a minimum of 24 hours, whichever is longer. If the tunnel is a two-pass tunnel, then after the grout is set the grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections. If the tunnel is a single pass tunnel the grout holes through the jacking pipe (carrier pipe) shall be plugged in accordance with pipe manufacturer's recommendations.

3.15 INSTALLATION OF CARRIER PIPE IN TWO PASS TUNNEL

- A. If jacking pipe was installed to be a casing with a separate carrier pipe, then install carrier pipe in casing in accordance with Section 02426 – Installation of Carrier Pipe in Tunnels.

3.16 SITE AND WORK SAFETY

- A. Comply with applicable regulations of Federal Government, OSHA 29CFR 1926, and applicable criteria of ANSI A 10.16 "Safety Requirements for Tunnels, Shafts, and Caissons", as amended to date.
 - B. Safety is the full responsibility of the Contractor.
- 3.17 SITE RESTORATION
- A. Site restoration shall be in accordance with the Drawings and applicable specifications.

-END OF SECTION-

SECTION 02446

TUNNEL BY GUIDED BORE AND JACK METHOD (GB&J)

PART 1 - GENERAL

1.01. SCOPE OF WORK

- A. The work described by this Section consists of furnishing all labor, equipment, materials, and incidentals required install casing pipe by trenchless hydraulic jacking within the limits of work as defined on the Contract Drawings and in the Tunneling Method Table in Project Specific Notes (PSN).
- B. The work shall be done in accordance with all Federal, State, and local laws, regulations and requirements as shown on the Drawings and as specified herein.
- C. All available and known geotechnical reports, logs, borings, and laboratory testing that have been performed within close proximity of the project corridor have been made available as "technical data" and not part of the Contract Documents. This provided as information only and solely for the convenience of Bidders. The Owner and/or the Consultant do not warrant or guarantee the accuracy or correctness of this material with respect to actual subsurface conditions. Subsurface conditions are considered unclassified and no expectation of quantity, specific location of ground conditions, or geotechnical baselines are provided or assumed herein.
- D. Contractor shall review all available geotechnical reports and data and perform any additional soil investigations he deems necessary at his own expense for the planning and the selection of tunneling techniques and methods in order to enable proper construction as shown on the Drawings and other requirements of Contract Documents.
- E. Dewatering shall be controlled such that the launching and exit shafts are free of water, but the surrounding ground water table is not substantially lowered such that settlement along the tunnel drive or nearby existing structures and foundations does not occur.
- F. For all excavations defined under this Section, Contractor shall install steel casing using techniques and methods selected by the Contractor that, based on past experience, will be capable of handling the various anticipated ground conditions and is capable of minimizing loss of soil ahead of and around the machine providing satisfactory support of the excavated face.
- G. The work, as detailed on the Drawings and described in these Specifications, shall include, but not be limited to, the following:
 - 1. Tunnel construction of casing and carrier pipe across State, Federal, Railroad, and Private Transportation Corridors or across other structures, utilities, waterways, or environmentally sensitive areas as indicated on the Drawings.
 - 2. Pipe jacking by track type boring machine or hydraulic jacking frame.
 - 3. Casing/tunnel excavation by mechanized cutting face appropriate for the prevailing subsurface conditions.
 - 4. The use of an advanced guidance method such as laser guidance, steerable cutting heads, or a pre-bore pilot tube to meet line and grade tolerance requirements.
 - 5. Removal of casing/tunnel spoil by helical spiral auger.
 - 6. Supplying and installing casing/jacking pipe as initial excavation support.
 - 7. Installation of carrier pipe and associated blocking and support.
 - 8. Bulkheads and concrete cradles.
 - 9. Filling of voids between casing/jacking pipe and earth.

10. Grouting of annular space outside the casing, if required.
 11. Design and construction of launch and receiving pits.
 12. Dewatering at the pits.
 13. Dewatering of the tunnel alignment (if allowed).
 14. Appropriate disposal of groundwater effluent.
 15. Location markers and miscellaneous appurtenances as required to complete the installation.
- H. The work shall include furnishing, installing and monitoring a settlement monitoring system.
 - I. Boring/tunneling activities shall not cause any damage to nearby structures, railroad tracks, utilities or pavement.
 - J. The Contractor shall be familiar with the conditions under which the work will be performed and with all necessary details as to the orderly prosecution of the work. Review and interpret available geotechnical reports and investigate work site soil conditions before bidding.
 - K. Contractor selected tunneling installation techniques and methods of construction shall include all equipment, all associated support systems and their operation, modified guidance systems required to meet line and grade tolerances, ground modification where needed, lubrication to reduce jacking forces as needed, cutting face tooling and sizing, face of excavation support, face access capabilities, and the use of engineered fluids, slurries, and soil conditioners as required to maintain face stability, reduce wear, advance heading within line and grade tolerances, transport spoils, and accomplish productivity assumed in Contractor's bid proposal.
 - L. Contractor may choose to increase the casing diameter, at no additional cost to the Owner, as needed to account for the Contractor's selected means and methods, operational procedures, and to provide adequate internal tolerance to account for the prevailing project site and subsurface conditions. If Contractor elects to modify casing diameter from size shown in the Contract Documents, the Contractor accepts all responsibility for acquiring approval for any modification or addenda to all right-of-way encroachment agreements, occupancy permits, or other established requirements and specifications of the entity being crossed.
 - M. Follow all OSHA regulations regarding confined space for casing installation and temporary pit/shaft excavations.
 - N. Conform with all Kentucky Transportation Cabinet (KYTC) and Federal Highway Administration requirements for work within their respective highway rights-of-way and any additional requirements of the contiguous property and utility owners.
 - O. Conform with all railroad agency occupancy and encroachment agreements and specifications.
 - P. The use of a rescue shaft requires approval from all parties impacted by its excavation, dewatering, traffic effects, and/or disturbance. It is the responsibility of the Contractor to acquire such permission.
 - Q. Direct jacking of carrier pipe without casing by the methods defined herein is prohibited.
 - R. The Contractor shall retain the service of a professional engineer registered in the State of Kentucky to prepare boring/tunneling design and submittals described herein.
 - S. If required by permit, boring/tunneling operations under roads or railroads will be on a continuous basis, 24 hours per day, 7 days a week until casing installation is complete.

1.02. RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02222 – Excavation
- B. Section 02225 – Excavating, Backfilling, and Compaction for Sewers
- C. Section 02426 – Installation of Carrier Pipe in Tunnels

- D. Section 02431 – Tunnel Grout
- E. Section 02432 – Low Density Cellular Concrete
- F. Tunneling Method Table in Project Specific Notes (PSN)

1.03. REFERENCE STANDARDS

- A. The tunnel crossing(s) shall comply with standards and best practices set forth in the following:
 1. All right-of-way encroachment agreements, pipeline occupancy permits, best practices, specifications, general and special conditions, nationwide permits and all other requirements of any and all Federal and State Departments of Transportation, Railroad Agencies, US Army Corp of Engineers' or any other pertinent authority or governing body to the location of the tunnel crossing.
 2. Kentucky Transportation Cabinet (KYTC) Permit Guidance Manual
 3. "Standard Specifications for Pipelines Conveying Flammable and Non-Flammable Substances" from the American Railway Engineering Association (Latest Revision).
 4. "Standard Specifications for Highway Bridges" from AASHTO (Latest Revision).
 5. Chapter 1 of the "AREMA Manual of Railway Design" from American Railway Engineering and Maintenance of Way Association (Latest Revision).
 6. "Trenchless Excavation Construction Equipment & Methods Manual" from National Utility Contractor's Association.
- B. The materials covered by these Specifications are intended to be standard materials of proven reliability and as manufactured by reputable manufacturers having experience in the production of such materials. The materials furnished shall be designed, constructed, and installed in accordance with the best practices and methods.

1.04. DEFINITIONS

- A. Unless otherwise stated or particular context otherwise requires, the definitions and provisions contained in this section shall govern the construction, meaning and application of words and phrases utilized in this specification. For purposes of this specification, the following terms are defined as follows:
 1. **Annular Space:** The void created between the outside of the initial support system being installed and the extreme outer excavation limits created by TBM. Also, the void space between the initial support and the carrier pipe when a 2-pass tunnel is installed.
 2. **Carrier Pipe:** A pipe used for conveyance of water or sewer. Carrier pipe shall be as specified in the Tunneling Method Table in Project Specific Notes (PSN).
 3. **Drive:** Section of jacking pipe installed by tunneling from launching shaft to exit shaft.
 4. **Entrance and Exit Seals:** Seals placed at the breakout into and out of the shafts. The seals are intended to prevent groundwater inflow and loss of ground into the shafts.
 5. **Exit Shaft or Retrieval Pit:** Shaft utilized for retrieval of the trenchless technology equipment.
 6. **Jacking Pipe:** A casing pipe used as the initial support in a two pass tunneling operation. The casing pipe is not a carrier pipe.

7. Launching Shaft: Excavation from which trenchless technology equipment is launched for the installation of initial support system. May incorporate a thrust block or wall to spread reaction loads to the ground.
8. Spoil: Excavated soil and bedrock material that has been generated by the tunneling process.
9. Thrust block: Concrete or steel wall at the back of the launching shaft providing a reaction for jacks pushing the pipe.
10. Tunneling Methodology: A written description, together with supporting documentation that defines Contractor's plans and procedures for the tunneling operations.
11. Two-Pass Tunneling: Tunneling where initial support is installed concurrent with the excavation process to stabilize the tunnel excavation and a carrier pipe is installed in a subsequent phase or the second pass.

1.05 DESIGN CRITERIA

- A. Tunneling equipment selected for the project shall be compatible with the geologic conditions described in all available geotechnical data provided as Technical Data, and not included in the Contract Documents, and any additional geologic testing performed the Contractor deems necessary to select appropriate equipment.
- B. Design of the jacking pipe, including pipe joints, reinforcement, stiffness, compressive strength, and determining acceptable pipe fabrication tolerances is the responsibility of the Contractor as it relates to all loading on the pipe due to installation. Maximum compressive stresses applied to the pipe shall not exceed the manufacturer's recommended allowable stresses.
- C. Contractor's Engineer shall design the launching and exit shafts meeting any minimum requirements provided in Section 02222 – Excavation.
- D. Design backstops, thrust block and concrete seal for all earth loads, and to prevent significant water intrusion. The thrust block shall be perpendicular to the proposed pipe alignment and shall be designed to withstand the maximum jacking pressure to be used, with a factor of safety of at least 2.0, without excessive deflection or displacement.
- E. All design calculations provided by the Contractor as part of the required submittals shall be sealed by a licensed Professional Engineer registered in the State of Kentucky.

1.06 SUBMITTALS

- A. In accordance with the procedures and requirements set forth in Section 01300 – Submittals
- B. Detailed Tunnel Methodology to sufficient to convey the following Guided Bore and Jack installation:
 1. Casing/Jacking pipe shop drawings and material data from casing pipe manufacturer.
 2. Bore pit excavation details including footprint drawing of bore pit, design and calculations for any sheeting or shoring utilized signed and sealed by a licensed Professional Engineer registered in the State of Kentucky.
 3. All thrust wall and floor reaction concrete designs shall be sealed and signed by a Professional Engineer licensed in the State of Kentucky. For conditions where the thrust reaction block in any way impacts or is in combination with pit/shaft temporary shoring, the

temporary shoring design and associated calculations shall take in to account these combined factors.

4. Construction sequence plan comprised of sketches, redline markups of Drawings or graphical representation, as well as a schedule or timeline and descriptions. The construction sequence plan shall include:
 - a. Pit/shaft excavation, dewatering, and shoring.
 - b. Assembly and setup of rail-type hydraulic jacking frame or auger boring machine including the layout and design of all thrust reaction and foundation concrete.
 - c. Tunnel excavation equipment and procedures including cutter heads and attachments.
 - d. Spoil removal.
 - e. Survey control and advanced guidance system setup.
 - f. Casing welding plan.
 - g. Casing lubrication system and engineered fluids.
 - h. Installation of carrier pipe including arrangement and manufacturer's information and shop drawings for casing spacers or blocking design.
 - i. Procedures for annular grouting and installation of end seals or bulk head.
5. Contractor shall submit a contingency plan describing the methods and procedures to be implemented to address the following:
 - a. If unusual or adverse soil conditions (i.e.: running sand, swelling ground, water, etc.) are encountered.
 - b. If surface settlement or heaving occurs.
 - c. If forward progress of casing should occur.
6. Settlement Monitoring Plan and Site Assessment:
 - a. Submit a settlement monitoring plan meeting the requirements outlined in section 3.08 for review prior to construction. The plan shall identify the location of settlement monitoring points, reference benchmarks, survey frequency and procedures, and reporting formats.

1.07 QUALIFICATIONS

A. Minimum Experience Requirements for Tunnel by Bore and Jack Method are as follows:

1. The contractor or subcontractor intending to perform Tunneling by Bore and Jack methods shall have a minimum of five (5) years' experience performing Bore and Jack steel casing installation of similar diameter and scope.
2. The contractor or subcontractor intending to perform Tunneling by Bore and Jack methods shall have installed a minimum of 5,000 linear feet of steel casing by Bore and Jack methods.
3. The contractor or subcontractor intending to perform Tunneling by Bore and Jack methods shall have installed a minimum of 2,000 linear feet of 36-inch or larger steel casing.
4. The contractor or subcontractor intending to perform Tunneling by Bore and Jack methods shall have experience including three (3) tunnel projects completed in the last 10-years

performed using Bore and Jack methods including laser guidance, steerable cutting heads, or pilot-tube pre-bore with individual, single drives of 200 linear feet or greater.

5. The contractor or subcontractor intending to perform Tunneling by Bore and Jack methods shall have experience including two (2) tunnel projects completed in the last 10-years performed in moderate strength or higher hard rock.
6. The contractor or subcontractor intending to perform Tunneling by Bore and Jack methods shall have successfully installed a carrier pipe and grouted without voids the annular space of a minimum of 2,000 linear feet of tunnel construction.
7. The contractor or subcontractor intending to perform Tunneling by Bore and Jack methods shall have experience including three (3) underground construction projects completed in the last ten (10) years that involved the design and construction of a temporary or permanent jacking pit excavated in soft ground below the groundwater table.

PART 2 -- MATERIALS

2.01 STEEL CASING PIPE

- A. The casing pipe shall be in accordance with Section 02425 – Initial Tunnel Support.

2.02 CARRIER PIPE

- A. The carrier pipe shall be in accordance with the Tunneling Method Table in Project Specific Notes (PSN).

2.03 GROUT

- A. Grout shall be in accordance with Section 02431 – Tunnel Grout or Section 02432 – Low Density Cellular Grout, but the annular space between the carrier pipe and tunnel walls is only grouted when ribs and lagging is utilized.

2.04 SLURRY LUBRICATION

- A. Slurry lubrication shall be an engineered fluid lubricant containing a finely ground (200-mesh), premium-grade, high-yielding Wyoming sodium bentonite in slurry suspension.
- B. Contractor shall provide a band on the leading edge of the casing, or other approved modification, as needed to provide a method to lubricate casing during installation with slurry lubricant appropriate for the prevailing ground conditions and length of the drive.

2.05 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 0.090-inches 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 spacer 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.

- C. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe with the casing pipe, within two (2) feet of each side of a pipe joint, and the rest evenly spaced. Each segment of pipe shall have a minimum of four (4) spacers installed on it. Manufacturer's recommendations may govern these requirements.

2.06 TUNNEL END SEALS

- A. The ends of the tunnel shall be filled with concrete brick or cap block and mortar with two (2) weep holes at the bottom. Weep holes shall use 1-inch PVC pipe.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

- A. Contractor shall follow the approved methods, sequence, and contingency plans submitted and approved.
- B. Prior to beginning boring operations, the Contractor shall install a settlement monitoring system in accordance with section 3.07 below.
- C. If a combination of casing and tunnel is required, details of the proposed junction shall be submitted to and approved by the Engineer and the governing permitting agency of the encroached property or crossing.
- D. The Contractor shall be prepared to bore through weathered or partially weathered rock, if encountered, with a specialized bit or hand-mine if necessary. Encountering rock or water will not entitle Contractor to additional compensation.
- E. When impossible to advance bore hole or pipe, discontinue operation, abandon completed portion in place, and fill with grout, unless otherwise directed by the Engineer or governing permitting agency of the encroached property or crossing. Grout shall be in accordance with Section 02431 – Tunnel Grout, unless otherwise approved by the governing agency.
- F. The recommended methods and details shown on the Drawings and specified herein, are intended to indicate the minimum acceptable standard of quality required for the casing/tunnel installation. Other methods of installation, based on acceptable industry standards and techniques, may be acceptable for the installation. Under no conditions shall jetting or wet boring of the casing/tunnel be allowed.
- G. All excavations and pits shall be well sheeted and braced as necessary for safe and adequate access for workmen, inspections, and materials and shall be of a size suitable to equipment and material handling requirements.
- H. Pit shoring shall be in accordance with plans and details provided by the Contractor's Engineer under section 1.04 above.
- I. Bore pits shall be excavated and backfilled in accordance with Section 02225 Excavating, Backfilling and Compacting for Sewers, Section 02222 Excavation and meet all federal and state OSHA requirements for a safe excavation.
- J. All pits required for the installation of the casing/tunnel and located within a transportation right-of-way, such as a roadway or railroad, shall be completely isolated from the roadway traffic with precast concrete barriers installed in accordance with the governing permitting agency of the encroached property or crossing standards for worker protection from traffic.
- K. If any surface movement, settlement, or heaving occurs which causes or might cause damage to an existing pavement, structure, utility, or railroad track over, along or adjacent to the work, Contractor

shall immediately stop all work except that which assists in making the work secure and in preventing further movement, settlement or damage. Resume boring/tunneling only after:

1. All necessary precautions have been taken to prevent further movement, settlement or damage, and all damage has been repaired at the Contractor's own cost and to the satisfaction of the Engineer.
2. That the Contractor selected method of tunnel excavation is appropriate and capable of further casing installation without expectation of similar unacceptable movement, settlement, or structural damage.

3.02 PIT/SHAFT DEWATERING

- A. When water is encountered, develop and maintain a dewatering system of sufficient capacity to remove water continuously, keeping excavations free of water until backfill operation is in progress.
- B. Keep removal of soils particles from dewatering to a minimum.
- C. Dewater into a sediment filter bag(s) or construct a sediment trap(s) in accordance with State and Local erosion, sediment, and stormwater controls.
- D. Observe surface facilities to verify there is no settlement or displacement occurring due to dewatering.
- E. Should settlement or displacement be detected, notify Engineer immediately and act to maintain safe conditions and prevent damage.

3.03 BORING AND JACKING

- A. As the boring operation progresses, each new section of the casing pipe shall be 360° butt-welded, using a full depth, single "V" groove weld, to the next section previously jacked into place unless special interlocking joints are allowed.
- B. The boring equipment to be used for installing the jacked casing shall be of such size and capacity to allow the boring to proceed in a safe and expeditious manner. The installation of the casing and boring of the hole shall be done as rapidly as possible and shall be done simultaneously to avoid voids, cave-ins or settlement and for safety of traffic above.
- C. Provide slurry lubricant as needed to facilitate movement or lessen the danger of the jacking pipe seizing.
- D. Maintain face of cutting head to preclude free flow of soft or poor soils material.
- E. Grout ports shall be installed in the top section of the casing pipe at 4-foot (maximum) centers and the voids filled by pressure grouting in accordance with Section 02431 – Tunnel Grout.
- F. Notify Engineer immediately if an obstruction stopping forward motion of operation is encountered during installation. If the casing pipe is at least 30-inches in diameter, the auger shall be withdrawn, and the obstruction removed. If a bolder is encountered and is removed by blasting or other approved method, the void shall be filled with grout, as previously specified. No blasting shall be permitted until a detailed blasting plan is submitted to and approved by the Engineer or governing permitting agency of the encroached property or crossing.

3.04 GROUTING OF EXTERIOR ANNULAR SPACE FOR CASING PIPE

- A. Promptly following completion of the casing installation, pressure grout to fill all voids existing outside of the casing pipe for all casings 36-inches and larger in outside diameter. If the outside diameter is less than 36-inches, then the annular space outside the casing is to be grouted if the excavated diameter is more that 1-inch larger than the outside diameter of the casing.
- B. For casings 36-inches and larger in outside diameter, grouting shall be performed from the interior of the casing pipe through grouting holes. Lubricant shall be displaced by the grout. Grouting shall be started in the lowest connections and shall proceed until grout begins to flow from upper connections.

The void shall be completely filled. Displaced lubricant shall be disposed of off-site in accordance with applicable regulations and codes of all Federal, State, and local agencies.

- C. Grout shall be in accordance with Section 02431 – Tunnel Grout.
- D. Liquid grout pressure shall not exceed one-half of the existing overburden pressure.
- E. After grouting is complete, pressure shall be maintained by means of stopcocks or other suitable devices until the grout has set sufficiently in the judgment of the Engineer, or for a minimum of 24 hours, whichever is longer. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.

3.05 CASING/TUNNEL ALIGNMENT

- A. Contractor shall select and use proper equipment and operational procedures including advanced line and grade control systems to meet the horizontal and vertical alignment requirements of the project as identified on the Drawings within the acceptance criteria listed below. Contractor shall determine the need for and select systems and methods for achieving the adequate line and grade control appropriate for the ground conditions and constraints of the project including:
 - 1. Water-level grade monitoring or laser-level line and grade monitoring systems.
 - 2. Methods for tracking location of cutter head such as sonde receivers, or other systems.
 - 3. Pilot tube pre-drilling to set and maintain alignment as necessary to meet Contract Documents.
 - 4. Articulated, steerable cutterhead or other hydraulically actuated steering system.
- B. The Contractor shall check the vertical and horizontal alignment of the casing by survey instrument in spacing intervals as deemed appropriate by the Contractor to meet the line and grade requirements and subsurface conditions of the project. At no time, shall intervals between vertical and horizontal alignment checks exceed the minimum one horizontal and one vertical check for each four feet of advance.
- C. If excavated alignment is found to be off line or grade and the tunnel progresses, make alignment corrections to the installation of the casing as needed to meet required carrier pipe tolerances.
- D. Following completion of tunnel, a professional land surveyor licensed in the State of Kentucky shall transfer the line and grade control into the casing/tunnel for the Contractor to set the line and grade modifications and spacer settings as needed to install the carrier pipe within the contract tolerances.

3.06 CARRIER PIPE INSTALLATION

- A. Contractor shall install carrier pipe in casing in accordance with Section 02426 – Installation of Carrier Pipe in Tunnel.

3.07 ACCEPTANCE CRITERIA FOR LINE AND GRADE

- A. Prior to installing the carrier pipe, Contractor shall verify that the casing has been installed so that the carrier pipe may be placed in conformance with the line and grade specified on the Drawings.
- B. If the carrier pipe cannot be installed to the invert elevation shown on the Drawings, notify the Engineer and establish a plan for adjusting the grade of the pipeline to meet slope requirements.
- C. Pipe installed and subsequently abandoned shall be fully grouted in accordance with either Section 02431 – Tunnel Grout or Section 02432 – Low Density Cellular Concrete.

3.08 SETTLEMENT MONITORING:

- A. The Contractor will be held solely responsible for damages to highway or street surfaces, railroads or damage to pavements, structures, structural embankments, sidewalks, curbing, or public utilities resulting from subsidence, failure of initial support system, or ground losses into the initial support

system and for the refilling of voids with grout. Where such ground losses are so severe that they result in damage to underground or surface pavement, existing utilities or structures, the Contractor shall be solely responsible for remedying such damage. Where the filling of voids cannot be effectively carried out from below, the Engineer reserves the right to order the Contractor, at no additional cost to the Owner, to make openings from the surface for the purpose of backfilling the voids.

- B. As a minimum, surface monitoring points shall be established consisting of settlement markers to detect surface movement of roadway and pavement.
- C. Survey the site showing locations and elevations of existing ground, pavement, and other permanent features to establish a baseline for existing conditions along the centerline of the proposed pipe/tunnel, and along two parallel lines 20-feet on either side of the centerline. All surveying performed for settlement monitoring to be performed by a surveyor licensed in the Commonwealth of Kentucky.
- D. Surface settlement marks:
 - 1. Surface settlement markers shall be located at 25-foot centers along three horizontal lines parallel to the tunnel center line.
 - 2. Markers shall be located at three (3) lines;
 - 3. One along tunnel centerline.
 - 4. Two lines parallel to the tunnel centerline, offset 20-feet on each side.
 - 5. One (1) subsurface settlement marker, located along the tunnel centerline can be used in place of three (3) surface settlement markers as described in Section 3.03.D.2.B described above.
- E. All markers/points shall be surveyed as follows:
 - 1. Prior to beginning any work.
 - 2. Every 24 hours by the licensed surveyor during tunneling operation.
 - 3. At the completion of the tunnel.
 - 4. The same points shall also be surveyed 90 days after the work is completed and both shafts have been backfilled.
- F. Ground Surface Movement:
 - 1. The tunneling machine shall be operated so as to prevent both surface heave and loss of ground during tunneling.
 - 2. Unless more stringent requirements are set forth by third party agencies, settlement or heave of the ground surface along the alignment shall not exceed 0.25 inch.
 - 3. If the ground subsidence or heave exceeds 0.25 inch the tunneling operations shall stop and remedial measures approved by the Engineer shall be implemented.
 - 4. If any movement or settlement occurs which causes or might cause damage to an existing structure over, along or adjacent to the work, immediately stop any or all work except that which assists in making the work secure and in preventing further movement, settlement or damage. Resume tunneling only after all necessary precautions have been taken to prevent further movement, settlement or damage; and repair the damage at the Contractor's own cost and to the satisfaction of the Engineer.
 - 5. Restrict the excavation of the materials to only those materials that are physically displaced by the shield itself in order to prevent loss of ground and settlement of possible damage to overlying

structures. Control the advance rate and monitor the volume of material excavated and adjust operations as required to avoid loss of ground, over-excavation or surface heave.

- G. Lateral Displacements: Unless more stringent requirements are set forth by third party agencies, lateral movement or deflection of pit/shaft excavation support system shall be limited to 0.5 inch.
- H. Report any settlement or movement immediately to the Engineer and applicable agency and take immediate remedial action.

3.09 SITE AND WORK SAFETY:

- A. Comply with applicable regulations of Federal Government, OSHA 29CFR 1926, and applicable criteria of ANSI A 10.16 "Safety Requirements for Tunnels, Shafts, and Caissons", as amended to date.
- B. Safety is the full responsibility of the Contractor.

3.10 SITE RESTORATION:

- A. Site restoration shall be in accordance with the Drawings and applicable Sections of Division 2 of these Specifications.

- END OF SECTION -

SECTION 02532 – SEWAGE COLLECTION LINES

PART 1 – GENERAL

1.01 SUMMARY

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

PART 2 – PRODUCTS

2.01 DUCTILE IRON (DI) PIPE

- A. Ductile iron pipe shall be furnished cement lined in accordance with ANSI/AWWA C104/A21.4 with bituminous seal coat unless otherwise noted on the drawings or in Bid Form. Ductile iron pipe shall be furnished with rubber gasket push-on joints except as may otherwise be noted on the drawings or in difficult working areas and with approval of the Engineer. All pipe inside of casing pipe shall have restraining gaskets as specified in this Section. **All DI pipe and fittings within 2,000 LF downstream or to nearest manhole beyond 2,000 LF of a force main discharge shall be lined with Protecto 401 coating, or approved equal as specified hereinafter.**
- B. Pressure class shall be 150 psi minimum for mechanical and push-on joint pipe.
- C. Thickness design of ductile iron shall conform in all aspects to the requirements of ANSI/AWWA C150/A 21.50 latest revision.
- D. Manufacture and testing of ductile iron pipe shall conform in all aspects to the requirements of ANSI/AWWA C151/A 21.51 latest revision.
- E. Pipe Coatings
 - 1. Interior Lining
 - a. Condition of Ductile Iron Prior to Surface Preparation

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

- b. Lining Material

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

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

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

- (a) ASTM B-117 Salt Spray (scribed panel) – Results to equal 0.0 undercutting after two years.
- (b) ASTM G-95 Cathodic Disbondment 1.5 volts @ 77°F. Results to equal no more than 0.5 mm undercutting after 30 days.
- (c) Immersion Testing rated using ASTM D-714-87.
 - i. 20% Sulfuric Acid – No effect after two years.
 - ii. 25% Sodium Hydroxide – No effect after two years.
 - iii. 160°F Distilled Water – No effect after two years.
 - iv. 120°F Tap Water (scribed panel) – 0.0 undercutting after two years with no effect.

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

c. Application

(1) Applicator

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

(2) Surface Preparation

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

(3) Lining

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

(4) Coating of Bell Sockets and Spigot Ends

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

(5) Number of Coats

The number of coats of lining material applied shall be as recommended by the

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

(6) Touch-Up and Repair

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

d. Inspection and Certification

(1) Inspection

- (a) All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 Film Thickness Rating.
- (b) The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500-volt test. Any defects found shall be repaired prior to shipment.
- (c) Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

(2) Certification

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

e. Handling

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

2. Exterior Coating

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

- F. Fittings and gaskets for mechanical and push-on joint ductile and cast iron pipe shall conform to the latest revisions of ANSI/AWWA C110/A 21.10 for mechanical and push-on joint fittings, ANSI/AWWA C111/A 21.11 for gaskets, and ANSI/AWWA C153/A 21.53 for mechanical and push-on joint compact fittings.
- G. All ductile and cast iron fittings shall be ductile iron grade 80-60-03 in accordance with ASTM A339-55.
- H. Restrained joint pipe and fittings shall be a boltless system equal to "Field-Lok" restraining gaskets or "TRFLEX Joint" as manufactured by U.S. Pipe & Foundry Company.
- I. Pipe shall be as manufactured by U.S. Pipe & Foundry Company, Clow, American Pipe Company, or equal.

- J. Pipe or fitting shall have the ANSI/AWWA standard, pressure (or thickness) class, diameter, DI or ductile noted, manufacturer, and country and year where cast on the outside of the body.

2.02 POLYVINYL CHLORIDE (PVC) PIPE (SOLID WALL)

- A. PVC pipe and fittings less than 15 inches in diameter shall conform to the requirements of ASTM Standard Specifications for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, Designation D 3034. Pipe and fittings shall have a minimum cell classification of 12454B or 12454C as defined in ASTM D-1784. For depths 10 feet and less, pipe shall have a pipe diameter to wall thickness ratio (SDR) of 35. For depths greater than 10 feet up to 20 feet maximum, pipe shall be SDR 26. If the PVC pipe is encased in a steel pipe, PVC pipe shall be SDR 35 regardless of buried depth.
- B. PVC pipe and fitting with diameters 18-inch and larger shall conform to the requirements of ASTM D-17845 and ASTM F-679. Pipe and fittings shall have a minimum cell classification of 14545C. The minimum wall thickness shall conform to T-1 as specified in ASTM F-679. For depths 10 feet and less, pipe shall have pipe stiffness 46 (SDR 35). For depths greater than 10 feet up to 20 feet maximum, pipe shall have pipe stiffness of 115 (SDR 26). If the PVC pipe is encased in a steel pipe, PVC pipe shall be SDR 35 regardless of buried depth.
- 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 at least 12 feet. The centerline of each pipe section shall not deviate from a straight line drawn between the centers of the openings at the ends by more than 1/16 inch per foot of length.
- E. PVC pipe shall not have a filler content greater than ten percent (10%) by weight relative to PVC resin in the compound.
- F. PVC pipe shall be clearly marked at intervals of 5 feet or less with the manufacturer's name or trademark, nominal pipe size, PVC cell classification, the legend "Type PSM SDR 35 PVC Sewer Pipe" and the designation "ASTM D 3034", or "ASTM F-679". Fittings shall be clearly marked with the manufacturer's name or trademark, nominal size, the material designation "PVC", "PSM" and the designation "ASTM D 3034", or "ASTM F-679".
- G. PVC pipe shall have minimum pipe stiffness of 46 psi (SDR 35) or 115 psi (SDR 26) for each diameter when measured at 5 percent vertical ring deflection and tested in accordance with ASTM D 2412.
- H. PVC pipe installation shall conform to ASTM D-2321 latest revision.
- I. Pipe shall be as manufactured by JM Eagle, H & W Pipe Company, or equal.

2.03 FIBERGLASS REINFORCED POLYMER MORTAR PIPE (FRPM)

- A. References
 - 1. ASTM D3262 – Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
 - 2. ASTM D4161 – Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.

3. ASTM D2412 – Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
4. ASTM D3681 – Standard Test Method for Chemical Resistance of "Fiberglass" Pipe in a Deflected Condition.
5. ASTM D638 – Test Method for Tensile Properties of Plastics.

B. Materials

1. Pipe Class: Pipe shall be stiffness class 46 (SN) for depths 30 feet or less; SN 72 for depths greater than 30 feet.
2. Resin Systems: The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.
3. Glass Reinforcements: The reinforcing glass fibers used to manufacture the components shall be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.
4. Silica Sand: Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.
5. Additives: Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally effect the performance of the product.
6. Elastomeric Gaskets: Gaskets shall meet ASTM F477 and be supplied by qualified gasket manufactures and be suitable for the service intended.

C. Manufacture and Construction

1. Pipes: Manufacture pipe to result in a dense, nonporous, corrosion-resistant, consistent composite structure. The interior surface of the pipes exposed to sewer flow shall be manufactured using a resin & glass reinforced liner or resin with a 50% elongation (minimum) when tested in accordance with D638. The interior surface shall provide crack resistance and abrasion resistance. The exterior surface of the pipes shall be comprised of a glass reinforced resin or sand and resin layer which provides UV protection to the exterior. Pipes shall be Type 1, Liner 1, Grade 1 or Type 1, Liner 2, Grade 3 per ASTM D362.
2. Joints: Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilized elastomeric sealing gaskets as the sole means to maintain joint watertightness. The joints must meet the performance requirements of ASTM D4161. Joints at tie-ins, when needed, may utilize gasket-sealed closure couplings.
3. Fittings: Flanges, Elbows, reducers, tees, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays. Fittings shall be FRPM. Tees with 6 inch stub for laterals may have stubs constructed of FRPM or PVC SDR 35. Ductile iron (DI) fittings may be substituted for FRPM fittings. The DI fittings shall be lined with Protecto 401 coating, or approved equal, and in accordance with DI pipe specification in this Section 02531.
4. Acceptable Manufacturer: HOBAS Pipe USA or Flowtite.

D. Dimensions

1. **Diameters:** The actual outside diameter (18 inches to 48 inches) of the pipes shall be in accordance with ASTM D3262 and be in cast iron pipe sizes. For other diameters, OD's shall be per manufacturer's literature.
2. **Lengths:** Pipe shall be supplied in nominal lengths of 20 to 40 feet. Actual laying length shall be nominal +1, -4 inches. At least 90% of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.
3. **Wall Thickness:** The minimum wall thickness shall be the stated design thickness.
4. **End Squareness:** Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/8".

E. Testing

1. **Pipes:** Pipes shall be manufactured and tested in accordance with ASTM D3262.
2. **Joints:** Coupling joints shall meet the requirements of ASTM D4161.
3. **Stiffness:** Minimum pipe stiffness when tested in accordance with ASTM D2412 shall normally be 36 psi.
4. **Strain Corrosion:** The extrapolated 50-year strain corrosion value meets the requirements of Table 4 in ASTM D3262 when tested in accordance with ASTM 3681.

F. Installation

1. **Burial:** The bedding and burial of pipe and fittings shall be in accordance with the project plans and specifications and the manufacturer's requirements.
2. **Pipe Handling:** Use textile slings, other suitable materials or a forklift. Use of chains or cables is not allowed.
3. **Jointing:**
 - a. Clean ends of pipe and coupling components
 - b. Apply joint lubricant to pipe ends and elastomeric seals of coupling. Use only lubricants approved by the pipe manufacturer.
 - c. Use suitable equipment and end protection to push or pull the pipes together.
 - d. Do not exceed forces recommended by the manufacturer for coupling pipe.
 - e. Join pipes in straight alignment then deflect to required angle. Do not allow the deflection angle to exceed the deflection permitted by the manufacturer.
4. **Field Tests:**
 - a. Testing shall be in accordance with specification hereinafter in this Section 02531.

2.04 PRESTRESSED CONCRETE CYLINDER PIPE (PCCP)

- A. Unless otherwise specified, the design materials and workmanship for pipe shall conform to the requirements of AWWA C301. Core and coating thickness for pipe shall be as specified in AWWA C301.
- B. Prestressed concrete cylinder pipe and fittings shall be manufactured by Hanson Pressure

Pipe, Grand Prairie, TX or equal.

C. Design Conditions

1. Pipe shall be designed in accordance with the AWWA C304 Standard, using the following design conditions; these conditions shall also be used in designing fittings that include a Portland cement mortar interior and exterior coating of the steel cylinder:

a. External Loading

(1) The earth load shall be taken as the greater of the following:

- (a) Depth from existing ground level to top of pipe as shown on plans, or
- (b) Five feet minimum in all cases.

(2) Earth loads shall be computed using the following parameters:

- (a) Unit Soil Weight = 120 pounds per cubic foot
- (b) TYPE R3 Bedding
- (c) Bedding angle = ___°

(3) Live loads shall be calculated as:

- (a) Pipe in streets and other paved areas: AASHTO HS-20 for two trucks passing
- (b) Pipe within railroad right-of-way: AREA Cooper E-80
- (c) Both HS-20 and E-80 live loads shall be computed in accordance with the American Concrete Pipe Association "Concrete Pipe Design Manual" or "Concrete Pipe Handbook".

D. Fittings

- 1. Steel thickness of all fittings shall be designed in accordance with Chapter 8 of the AWWA M9 Manual. Fittings shall be designed for the same conditions as the adjacent pipe.
- 2. Fabrication of the fittings shall be as per AWWA M9 Manual and C301.
- 3. Interior and exterior concrete/mortar coating shall be as per AWWA C301.

E. The date of manufacture or a serial number traceable to the date of manufacture and the design strength classification shall be clearly marked by stencil with waterproof paint at the end of the pipe barrel. Unsatisfactory or damaged pipe will be permanently rejected, repaired in the field if permitted by the Engineer and the pipe manufacturer, or returned to the pipe plant for repairs. Pits, blisters, rough spots, minor concrete or mortar breakage, and other imperfections may be repaired unless prohibited by the Engineer. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 3,000 psi at the end of 7 days and 4,500 psi at the end of 28 days, when tested in cylinders stored in the standard manner. Major breakage or spalling from interior of pipe may be reason for the rejection of pipe. Pipe may be repaired under unloaded conditions (removal of prestressing wire). Cement mortar used for repair shall have a minimum compressive strength of 3,000 psi at 7 days and 4,500 psi at 28 days when tested as standard cylinders. New prestressing wire may be applied when the compressive strength as determined by cylinder testing equals or exceeds the strength required for prestressing as

stated in AWWA C301.

- F. Cement shall be Type II and shall be in accordance with ASTM C150.
- G. The pipe core shall be produced by the centrifugal method or the vertical casting method.
- H. Wire shall be a minimum of No.6 gauge and shall meet the requirements of ASTM A648, Class III. Wire of a class strength greater than Class III will not be permitted.
- I. Steel cylinders shall be No. 16 gauge minimum thickness and shall be hot rolled.
- J. Mortar coating shall consist of one part cement to a maximum of three parts fine aggregate by weight. Rebound not to exceed one fourth of the total mix weight may be used provided the rebound is treated as fine aggregate.
- K. Bell and spigot joint rings shall be steel, self-centering type, and otherwise specified in AWWA C301. Surfaces of the joint rings that will be exposed after fabrication is complete shall receive a zinc metalized coating of 4 mils thickness (0.004").

Joints must be encased in grout after the joint has been completed and before the line is testing using special grout bands supplied by the pipe manufacturer.

- L. The rubber gaskets shall be in accordance with AWWA C301 and shall be designed and manufactured so that the completed joint will withstand an internal water pressure in excess of the highest pressure to which the pipe will be subjected without showing any leakage by the gasket or displacement of it.
- M. Bell and spigot wall fittings shall be the manufacturer's standard design. Wall fittings shall be supplied with adequate bracing to keep them round and true during transportation and installation.
- N. All Prestressed Concrete Cylinder Pipe shall include full thickness internal protection to prevent microbiologically induced corrosion with concrete admixture ConShield Technologies, Inc. or approved equal.
- O. Pipe Manufacturer's Field Service Representative:
 - 1. Pipe manufacturer shall provide a qualified Field Service Representative, who shall be available to be on the project site, with proper notice, from the Contractor's, Engineer's, or Owner's representative.
 - 2. The Field Service Representative, who shall be an employee of the pipe manufacturer, must have experience as a representative of the pipe manufacturer in the area of providing such services. The individual may be a Registered Professional Engineer possessing a minimum of 2 years of experience in the area of manufacture of pipe, sales and service representation.
 - 3. It is the intent of the Owner to be assured that the installation of this pipeline is performed in accordance with the specified standards and manufacturer's recommendations. Good installation procedures will assure integrity of the pipeline with the minimum amount of pipe joints required for completion of the main. Therefore, the Contractor shall include in his Bid as a minimum that the pipe manufacturer's Field Service Representative will be on-site for the following periods:
 - a. Initial construction training and monitoring.
 - b. Provide problem-solving assistance during construction.

2.05 CONNECTION TO EXISTING GRAVITY PIPE

- A. Connections between new and existing gravity pipe shall use a Fernco Strong Back, Straub-Flex coupling, Arpol or approved equal.
- B. Connections between ductile iron and ductile iron, a Maxifit Mechanical Ductile Iron coupling as manufactured by Viking Johnson, or approved equal, may be used.
- C. For pipes 12 inches in diameter and larger, concrete cradle shall be poured under each coupling. The length of the cradle (longitudinally along the pipe) shall be at least one pipe diameter and centered on the coupling. The depth of the cradle shall be half a pipe diameter (measured from the bottom of the cradle to the invert of the pipe). Cradles shall be formed and poured in place and reach from springline to springline.

PART 3 – EXECUTION

3.01 PIPE LAYING

- A. Excavation, trenching, backfilling, and bedding requirements are set forth in Section 02225.
- B. All pipe shall be laid with ends abutting and true to the lines and grades indicated on the Drawings. The pipe shall be laid straight between changes in alignment and at uniform grade between changes in grade. Pipe shall be fitted and matched so that when laid in the trench, it will provide a smooth and uniform invert.
- C. Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to insure its being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe and beveled to match the factory bevel for insertion into gasketed joints. Bevel can be made with hand or power tools.
- D. The interior of the pipe, as work progresses, shall be cleaned of dirt, jointing materials, and superfluous materials of every description. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted into the pipe bell so as to exclude earth or other material and precautions taken to prevent flotation of pipe by runoff into trench.
- E. All pipe shall be laid starting at the lowest point and installed so that the spigot ends point in the direction of flow.

3.02 JOINTING

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

3.03 INSTALLATION OF PCCP AND FITTINGS

- A. Prestressed concrete cylinder pipe and fittings shall be installed in accordance with requirements of AWWA M9, except as otherwise provided herein. A firm, even bearing throughout the length of the pipe shall be provided by tamping select fill in the haunch area

and at the side of the pipe to achieve the required bedding support angle. BLOCKING WILL NOT BE PERMITTED.

- B. Gasket, gasket groove, and bell sealing surfaces shall be cleaned and lubricated with a lubricant furnished by the pipe manufacturer. The lubricant shall be approved for use in potable water and shall be harmless to the rubber gasket. Use only lubricant supplied by the pipe manufacturer. Pipe shall be laid with bell ends looking ahead in the direction of laying. As soon as the spigot ring is centered in the bell of the previously laid pipe, it shall be forced home with approved equipment. After the gasket is compressed, verify the position of the gasket in the spigot ring groove with a feeler gage provided by the pipe manufacturer.
- C. The grout diaper for PCCP shall consist of a Tyvar synthetic fabric layer (gray in color) and a layer of closed cell foam. These layers are sewn together along with a pair of 5/8" wide steel bands at each edge which are used to secure the diaper to the pipe exterior. Use only grout diapers supplied by the pipe manufacturer. A stretching tool is used to tighten the steel bands. Once the bands are pulled tight, a steel clip is crimped around the bands to hold them in position. It is important that the diaper be carefully placed against the exterior surface of the pipe to insure that it is flush with no gaps or gathers. The closed cell foam surface is to be placed against the pipe exterior.

The wet grout will flow down to the bottom of the diaper and begin to bulge it out. It is often helpful to place some bedding material (or sandbags) directly under the diaper at the bottom to support the weight of the wet grout. Take care to not push excessive amounts of bedding material under the diaper such that the diaper is pushed up into the joint recess impeding the flow of wet grout.

Mix the grout using one part ASTM C150 Type 1 or Type 2 portland cement to not more than three parts clean sand with sufficient water to achieve a pourable consistency. The grout should look and pour like a thick cream. Carefully pour the mixed grout into the gap at the top of the diaper. As the pouring proceeds, the workers must inspect the diaper around the joint periphery to insure that the grout is flowing all around. Once the diaper is full and wet grout is puddling at the gap at the top, apply a stiffer mix the consistency of wet brick mortar over the joint insuring that all steel components of the joint are covered.

3.04 UTILITY CROSSING CONCRETE ENCASEMENT

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

3.05 TESTING OF GRAVITY SEWER LINES

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

be turned into the system in such quantities to carry off the dirt, debris, and trash.

- B. During the final inspection the Engineer will require all flexible sanitary sewer pipe (PVC and FRP) to be mandrel deflection tested after installation.
1. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with nine (9) evenly spaced arms of prongs. The mandrel dimension shall be 95 percent of the flexible pipe's published ASTM average inside diameter. Allowances for pipe wall thickness tolerances of ovality (from shipment, heat, shipping loads, poor production, etc.) shall not be deducted from the ASTM average inside diameter, but shall be counted as part of the 5 percent allowance. The contact length of the mandrel's arms shall equal or exceed the nominal diameter of the sewer to be inspected. Critical mandrel dimensions shall carry a tolerance ± 0.001 inch.
 2. The mandrel inspection shall be conducted no earlier than 30 days after reaching final trench backfill grade provided; in the opinion of the Engineer, sufficient water densification or rainfall has occurred to thoroughly settle the soil throughout the entire trench depth. Short-term (tested 30 days after installation) deflection shall not exceed 5 percent of the pipe's average inside diameter. The mandrel shall be hand pulled by the contractor through all sewer lines. Any sections of the sewer not passing the mandrel test shall be uncovered and the Contractor shall replace and recompact the embedment backfill material to the satisfaction of the Engineer. These repaired sections shall be retested with the go/no-go mandrel until passing.
 3. The Engineer shall be responsible for approving the mandrel. Proving rings may be used to assist in this. Drawings of the mandrel with complete dimensioning shall be furnished by the Contractor to the Engineer for each diameter and type of flexible pipe.
- C. Low-pressure air tests shall be performed on all gravity sanitary sewers to verify water tightness of pipe joints and connections. The Contractor shall perform testing on each manhole-to-manhole section of sewer line after placement of backfill.
1. Testing of Polyvinyl Chloride (PVC), Fiberglass Reinforced Polymer Mortar (FRPM), and Ductile Iron (DI) pipe sewer lines shall be performed in accordance with the current editions of ASTM F1417, "Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air," and UNI-B-6, "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe," respectively. ~~Testing of reinforced concrete pipe sewer lines shall be performed in accordance with the current edition of ASTM C 924, "Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method" and ASTM C 1103-03 Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.~~
 2. All testing equipment shall be inspected by the Engineer to ensure that equipment is functioning properly.
 3. The rate of air loss in the section under test shall be determined by the time-pressure drop method. The time required in minutes for the pressure in the section under test to decrease from 3.5 to 2.5 psig shall be not less than that indicated in the referenced standards.
 4. Immediately following the low-pressure air test, the Contractor shall notify the Engineer of the test results. A Low-Pressure Air Test Report shall be completed by the Contractor during testing. The report shall be completed according to the procedures outlined in LFUCG's Construction Inspection Manual, current edition. A copy of the completed Low-Pressure Air Test Report shall be provided to the Engineer and LFUCG-Division of Water Quality for each test.
 5. Pipes failing the pressure test will not be accepted and shall be repaired or replaced until a successful test is achieved.

6. When conducting a low-pressure air test, the Contractor shall securely install and brace all plugs prior to pressurizing the pipe. Personnel shall not be permitted to enter manholes when the sewer pipe is pressurized.
- D. TV Survey
1. TV survey and cleaning shall be performed on all gravity sewers.
 2. Hydraulic cleaning and vacuum must be done prior to TV survey.
 3. TV survey must be of dry pipe.
 4. TV survey shall be Pipe Assessment Certification Program (PACP) level of quality and TV equipment must include a slope-inclinometer.
 5. Acceptance of TV survey, completed sewers, and the repairs needed are to be determined at sole discretion of LFUCG.
 6. TV survey shall include:
 - a. Video file and shall be re-named to LFUCG's assets.
 - b. PACP database must be in Microsoft Access format, version 4.4.2 which includes photos embedded in database.
 - c. Report shall be provided in electronic version in PDF format.
- E. 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.
- F. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing the leaks and retesting as the Engineer may require without additional compensation.

END OF SECTION

SECTION 02540 – PIPE ABANDONMENT

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. This Section covers pipe abandonment procedures. The Contractor shall furnish all labor, materials and equipment to abandon pipe as described here or as shown on the Drawings.
- B. Unless otherwise indicated, pipes 18-inches and larger which are located under pavement with public access shall be safeloaded. All other abandoned sewer pipe shall be plugged.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02225 – Excavating, Backfilling, and Compacting
- B. Section 02240 - Dewatering

PART 2 – PRODUCTS

2.01 LEAN CONCRETE

- A. Fill shall be a flowable, lean mix of concrete and sand, by the mix given as follows, per cubic yard batch:

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

PART 3 - EXECUTION

3.01 SAFELOAD

- A. The Contractor shall safeload the pipe by utilizing the lean concrete mix as described in paragraph 2.01 of this specification.

3.02 PLUG

- A. The Contractor shall expose and cut the pipeline where shown or directed and construct a minimum 9-inch thick 3,000 psi concrete plug at the pipe openings. Approved mechanical plug may be used in lieu of the concrete plug.

END OF SECTION

SECTION 02608 – MANHOLES

PART 1 - GENERAL

1.01 SUMMARY

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

1.02 DEFINITIONS

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

PART 2 - PRODUCTS

2.01 CONCRETE MANHOLES - GENERAL

- A. Manholes shall conform in shape, size, dimensions, materials, and other respects as shown on the Drawings or specified herein.
- B. All concrete manholes shall have precast reinforced concrete developed bases. No other type of base will be allowed. Invert channels shall be factory constructed when the base is made. Sloping invert channels shall be constructed whenever the difference between the inlet and outlet elevation is 2 feet or less.
- C. The concrete manhole walls (barrels and cones) and base shall be precast concrete sections manufactured with **cementitious crystalline admixture at dosage of 3.5% by weight of cement**. The cementitious crystalline admixture shall be **Xypex C-1000 RED, KIM K-301, or Crystal-X Admix-R**. The top of the cone shall be built of reinforced concrete to allow adjustment rings to be added for adjustment of the frame to meet the finished surface. Minimum strength of the concrete for the precast sections shall be 4,000 psi at the time of shipment.
- D. **Manholes that receive sewage from a force main discharge, and within 2,000 LF downstream or to the nearest manhole beyond the 2,000 LF, shall have concrete admixture ConShield, or approved equal, as specified in Section 02532 for reinforced concrete pipe.**
- E. Manholes located in the 100-year floodplain shall have a concrete base that includes an anti-flotation collar. The collar shall have a radius 6-inches larger than the exterior wall of the base section.
- F. For concrete manholes, the inverts of the developed bases shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerlines of adjoining pipelines.
- G. For concrete manholes, the cast iron frames and covers shall be the standard frame and cover as indicated on the LFUCG Standard Drawings.

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

2.02 PRECAST CONCRETE SECTIONS

- A. Precast concrete sections and appurtenances shall conform to the ASTM Standard Specifications for Precast Reinforced Concrete Manhole Sections, Designation C478, latest revision, with the following exceptions and additional requirements.
- B. The base section shall be monolithic for 4-foot and 5-foot diameter manholes. Manholes with diameter of 6 feet or larger shall have a monolithic base or base slab.
- C. The wall sections shall be not less than 5 inches thick.
- D. Type II or type III cement shall be used except as otherwise permitted.

2.03 CONCRETE MANHOLE - FRAMES AND COVERS

- A. The Contractor shall furnish all cast iron manhole frames and covers as shown in LFUCG Standard Drawings.
- B. Castings shall be designed for H-20 traffic loading.
- C. The castings shall be of good quality, strong, tough, evengrained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.
- D. Frames shall be set in mastic and bolted down in non-traffic areas with four ¾" SS Hilti anchor bolts and washers. Hilti anchor bolts shall be embedded a minimum of 4-inches into precast concrete cone section. In traffic areas, the frame shall be set in mastic and Class A concrete donut poured around frame to the top of concrete cone section. The concrete donut shall be 12-inches in width and in depth up to within 1 ½-inches of surface for bituminous asphalt pavement.
- E. All casting shall be thoroughly cleaned and subject to a careful hammer inspection.
- F. Castings shall be at least Class 25 conforming to the ASTM Standard Specifications for Gray Iron Casting, Designation A48, latest revision.
- G. Unless otherwise specified, manhole covers shall be 22-3/4 inches in diameter, weighing not less than 305 pounds per frame and cover. Manhole covers shall set neatly in the rings, with contact edges machined for even bearings and tops flush with ring edge. They shall have sufficient corrugations to prevent slipperiness. The covers shall have two (2) pick holes about 1-1/4 inches wide and 1/2 inch deep with 3/8-inch undercut all around. Covers shall not be perforated. Frames and covers shall be J.R. Hoe and Sons Mc-350, or approved equal.
- H. Watertight lids shall have neoprene T-gasket and concealed pickhole.
- I. All covers shall be marked in large letters "LEXINGTON KENTUCKY SANITARY SEWER" as shown in LFUCG Standard Drawings.

2.04 MANHOLE STEPS (CONCRETE MANHOLES)

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

2.05 PREMOLDED ELASTOMERIC-SEALED JOINTS

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

2.06 MANHOLE DIAPHRAGM (FOR WATERTIGHT LID APPLICATIONS)

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

2.07 CLEANOUTS

- A. Cleanouts shall be cast iron and extend to the finish grade and capped with a clean-out plug in accordance with details and at locations shown on the Drawings. Pipe shall be the same

size as the gravity sewer line in which the cleanout is located. A 4-inch thick concrete pad, with 6" x 6", 1.9 x 1.9 wire mesh, 24 inches square, with the valve box lid section, shall be provided around each cleanout.

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

2.08 DROP CONNECTIONS

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

PART 3 - EXECUTION

3.01 FABRICATION - PRECAST SECTIONS

- A. Manhole sections shall contain manhole steps accurately positioned and embedded in the concrete when the section is cast.
- B. All precast concrete manhole sections shall be cured in a manner to assure the highest quality:
 - 1. Results of initial set tests (per ASTM C 403) shall be provided upon request. New test will be run in the event of change of cement supplier, mix design, or as otherwise necessary to maintain a quality product.
 - 2. Forms on wet-cast concrete shall not be removed until the concrete attains compressive strength equal to 2500 psi based upon field-cured cylinders, cured under conditions which equal the most severe conditions to which the product is exposed.
 - 3. Test cylinders for determining "shipping strength" shall be cured with similar methods as the product that they represent. In lieu of actual curing with the product, cylinders may be cured in curing chambers correlated in temperature and humidity with the product conditions.
 - 4. Any precast concrete manhole section which freezes before attaining 500 psi compressive strength will be rejected.
- C. No more than two (2) lifting hooks may be cast or drilled in each section.
- D. Flat slab tops shall have a minimum thickness of 6 inches and reinforcement in accordance with ASTM C478.
- E. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the precast sections.
- F. Acceptance of the sections will be on the basis of material tests and inspection of the completed product and test cylinders if requested by the Engineer.
- G. Cones shall be precast sections of similar construction.
- H. It shall be the responsibility of the precast manufacturer to handle all materials in such a manner as to avoid all damage to the product before and during delivery. This damage is defined as, but is not limited to, structural or spiderweb cracking, chips, spalls, pop-outs, or other damage.
- I. All precast concrete manhole sections shall be stored in a manner that will maintain product quality, as well as provide damage protection from yard traffic. All concrete pipe greater than 36" in diameter shall be "studded" with a minimum of two each, 4" x 4" wood posts providing

- vertical support during storage. This requirement shall apply both at the manufacturer's storage yard and on the jobsite.
- J. No precast concrete manhole sections shall be delivered to a jobsite or transported from the facility of origin until adequate quality and maturity has been attained, as described in these specifications.
 1. All precast concrete manhole sections shall be a minimum age of 7 days.
 2. All precast concrete manhole sections shall attain compressive strength equal to 4000 psi.
 3. No precast concrete manhole sections shall be delivered without Certification. Any product delivered without acceptable Certification will be subject to rejection.

3.02 SETTING PRECAST MANHOLE SECTIONS

- A. Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.
- B. Butyl mastic sealant shall be installed in all manhole joints in accordance with the manufacturer's recommendations and as shown in LFUCG Standard Drawings. Butyl mastic sealant shall meet Federal Spec SS-S-210A, AASHTO M-19875I, and ASTM C990. Butyl mastic sealant shall be NPC Bidco C-56 as manufactured by Trelleborg Engineered Systems, or approved equal. Sealant shall be a minimum bead of 1 inch in rope configuration.
- C. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose.

3.03 ADJUSTING MANHOLE FRAMES AND COVERS TO GRADE

- A. Except where shown on the Drawings, the top of the precast concrete eccentric cone of a standard manhole or the top of the flat slab of a shallow manhole shall terminate 6 inches below existing grade in an unpaved non-traffic area except in a residential yard and 13 inches below existing grade in a paved or unpaved traffic area and in a residential yard. The remainder of the manhole shall be adjusted to the required grade.
- B. When a manhole is located in an unpaved non-traffic area other than in a residential yard, the frame and cover shall be adjusted to an elevation 1 inch above the existing grade at the center of the cover. If field changes have resulted in the installed manhole invert elevation to be lower than the invert elevation shown on the Drawings, the adjustment to an elevation of 1 inch above existing grade shall be accomplished by the use of precast concrete or cast iron adjusting rings. The area around the adjusted frame and cover shall be filled with the required material, sloping it away from the cover at a grade of 1 inch per foot.
- C. When a manhole is located in a bituminous, concrete, or crushed stone traffic area, or in a residential yard, the frame and cover shall be adjusted to the grade of the surrounding area by the use of precast concrete or cast iron adjusting rings. The adjusted cover shall conform to the elevation and slope of the surrounding area.
 1. The Contractor shall coordinate elevations of manhole covers in paved streets with the local public works department. If resurfacing of the street in which sewers are laid is expected within twelve (12) months, covers shall be set 1-1/2 inches above the existing pavement surface in anticipation of the resurfacing operations.

3.04 ADJUSTING SECTIONS

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

3.05 SETTING MANHOLE FRAMES AND COVERS

- A. Manhole frames shall be set with the tops conforming to the required elevations set forth hereinbefore. Frames shall be set concentric with the top of the concrete and in a full bead (1") of butyl mastic sealant so that the space between the top of the masonry and the bottom flange of the frame shall be completely watertight.
- B. Manhole covers shall be left in place in the frames on completion of other work at the manholes.

3.06 VACUUM TESTING (ASTM C1244)

A. Scope

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

B. References, ASTM Standards:

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

C. Summary of Practice

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

D. Significance and Use

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

E. Preparation of the Manhole

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

F. Procedure

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

2. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury.
3. The manhole shall pass if the **minimum time** for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury **exceeds 60 seconds (one minute)**.
4. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.
5. Use or failure of this vacuum test shall not preclude acceptance by appropriate water infiltration or exfiltration testing, (see Practice C 969), or other means.

G. Precision and Bias

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

END OF SECTION

SECTION 02650 - SEWER LINE CLEANING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to clean all sewer pipe, laterals and fittings installed and/or rehabilitated, as specified herein.
- B. Cleaning shall include the proper high pressure water jetting, rodding, snaking, bucketing, brushing and flushing of sewers, laterals, and manholes prior to inspection by closed circuit television, pipeline rehabilitation or replacement, point repairs, manhole preparation, and testing operations.
- C. Cleaning shall dislodge, transport and remove all sludge, mud, sand, gravel, rocks, bricks, grease, roots, sticks, and all other debris from the interior of the sewer pipe and manholes as required for pipeline rehabilitation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Hydraulically propelled Sewer Cleaning Equipment
 - 1. Hydraulically propelled sewer cleaning equipment shall be the movable dam type constructed such that a portion of the dam may be collapsed during cleaning to prevent flooding of the sewer.
 - 2. The movable dam shall be the same diameter as the pipe being cleaned and shall provide a flexible scraper around the outer periphery to ensure total removal of grease.
 - 3. Contractor shall take precautions against flooding prior to using sewer cleaning balls or other such equipment that cannot be collapsed instantly.
- B. High Velocity Hydro-Cleaning Equipment shall have the following:
 - 1. A minimum of 500-ft of high pressure hose.
 - 2. Two or more high velocity nozzles capable of producing a scouring action from 15 to 45 degrees in all size lines to be cleaned.
 - 3. A high velocity gun for washing and scouring manhole walls and floor.
 - 4. Capability of producing flows from a fine spray to a long distance solid stream.
 - 5. A water tank, auxiliary engines and pumps and a hydraulically driven hose reel.
 - 6. Equipment operating controls located above ground.
- C. Mechanical cleaning equipment for sewer mains shall be either power buckets or power rodders by the Sewer Equipment Company of America or equal.
 - 1. Bucket machines
 - a. Be furnished with buckets in pairs
 - b. Use V-belts for power transmission or have an overload device. No direct drive

machines will be permitted.

- c. Be equipped with a take up drum and a minimum of 500-ft of cable.
 - d. Have sufficient dragging power to perform the work efficiently.
2. Power rodding machine
 - a. Either sectional or continuous.
 - b. Hold a minimum of 750-ft of rod.
 - c. The machine shall have a positive rod drive to produce 2000 pounds of rod pull.

PART 3 - EXECUTION

3.01 PERFORMANCE

- A. Selection of cleaning equipment shall be based on the conditions of the manholes and lines at the time the work commences based on the pre-construction CCTV inspection to be conducted by the Contractor under this Contract.
- B. Use properly selected equipment to remove all dirt, grease, rock and other deleterious materials and obstructions.
- C. Protect existing sewer lines from damage caused by improper use of cleaning equipment.
- D. Take precautions to avoid damage or flooding to public or private property being served by the line being cleaned.
- E. Use sewage flow in the sewer lines to provide necessary pressures for hydraulic cleaning devices whenever possible.
- F. Removal of Materials
 1. Remove all solids and semi-solids at the downstream manhole of the section being cleaned.
 2. Passing material from one section of a line to another will not be permitted.
- G. Remove from the site and properly dispose of all solids or semi-solids recovered during the cleaning operation.
- H. No sewer cleaning shall take place in a particular sewer segment until all upstream pipe segments have been cleaned. If cleaning is done in a downstream pipe segment in order to facilitate overall cleaning operations, the segment shall be re-cleaned at no additional cost, after all pipes upstream of that segment have been cleaned.

3.02 FIELD QUALITY CONTROL

- A. Acceptance of this portion of the work shall be dependent upon the results of the television inspection. Lines not acceptably clean as to permit television inspection and rehabilitation shall be re-cleaned and re-inspected at no additional cost to the Owner.

3.03 FINAL SEWER CLEANING

- A. Prior to final inspection and acceptance of each manhole-to-manhole section of the sewer system by the Engineer, the sewer shall be cleaned. Remove all accumulated construction debris, rocks, gravel, sand, silt and other foreign material from the sewer system. Once the large debris is removed, the sewer shall be flushed.
- B. Following final cleaning, the Contractor shall inspect each manhole-to-manhole section in accordance with Specifications Section 2651 – Television Inspection.
- C. Upon the Engineer's final manhole-to-manhole inspection of the sewer system, if any foreign matter is still present in the system, clean the sections and portions of the lines as required.
- D. Place the new line in service as soon as is practical after acceptance by the Engineer.

END OF SECTION

SECTION 02651 - TELEVISION INSPECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all necessary labor, materials, equipment, services and incidentals required to visually inspect by means of closed-circuit television (CCTV) designated sewer line sections and sewer laterals, including, but not limited to, recording and playback equipment, materials and supplies.
- B. The inspection shall be performed on one sewer line section (i.e. manhole to manhole) or one sewer lateral (i.e. sewer main toward property) at a time. The section being inspected shall be suitably isolated from the remainder of the sewer system.
- C. Video recordings shall be made of the television inspections and copies of both the recordings and printed inspection logs shall be supplied to the Owner.
- D. Contractor may have to perform point repairs, remove obstructions or remove protruding service connections to complete pre-rehabilitation TV inspection.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. The television camera used for sewer main inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera, television monitor and other components of the video system shall be capable of producing a minimum 500-line resolution color video picture. Picture quality and definition shall be to the satisfaction of the Engineer and if unsatisfactory, inspection shall be performed again with the appropriate changes made as designated by the Engineer at no additional cost to the Owner. The television inspection equipment shall have an accurate footage counter that shall display on the monitor, the exact distance of the camera from the centerline of the starting manhole.

PART 3 - EXECUTION

3.01 PROCEDURE

- A. The camera shall be moved through the sewer main in either direction at a uniform rate, stopping when necessary to ensure proper documentation of the sewer's condition but in no case will the television camera be pulled at a speed greater than 30 fpm. Manual winches, power winches, TV cable and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire sewer line section, the equipment shall be removed and repositioned in a manner so that the inspection can be performed from the opposite manhole. All set-up costs for the inspection shall be included in the unit prices bid. If, again, the camera fails to pass through the entire section, the Contractor shall perform point repairs as required on the Drawings, remove or cut protruding service connections, or re-clean or further remove roots or blockage at no additional cost to the Owner.
- B. Whenever non-remote powered and controlled winches are used to pull the television camera through the line, telephones, radios, or other suitable means of communication shall be set up between the two manholes of the sewer line being inspected to ensure that good communications exist between members of the crew.

- C. Measurement for location of defects shall be above ground by means of a meter device. Marking on cable, or the like, which would require interpolation for depth of manhole, shall not be allowed. Measurement meters shall be accurate to two-tenths of a foot over the length of the sewer line section being inspected. Accuracy of the measurement meters shall be checked daily by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the Owner's representative.
- D. The camera height shall be adjusted such that the camera lens is always centered (1/2 I.D. or higher) in the pipe being televised. Flow shall be controlled such that depth of flow shall not exceed 20% of pipe's diameter.
- E. Lighting system shall be adequate for quality pictures.

3.02 RECORDING OF FIELD OBSERVATIONS

A. Television Inspection logs

1. Printed location records shall be kept which shall clearly show the location, in relation to adjacent manholes, of each source of infiltration discovered. In addition, other data of significance including the locations of building and house service connections, along with an estimation of infiltration from such services, joints, unusual conditions, roots, storm sewer connections, cracked or collapsed sections, presence of scale and corrosion, sewer line sections that the camera failed to pass through and reasons for the failure and other discernible features shall be recorded and annotated using the PACP system and a copy of such records shall be supplied to both the Owner and the Engineer.

B. Digital Recordings

1. The purpose of digital recording shall be to supply a visual and audio record of areas of interests of the pipe segments that may be replayed by the Owner. Digital recording playback shall be at the same speed that it was recorded and shall be made in color. The Contractor shall be required to have all digital media and necessary playback equipment readily accessible for review by the Owner/Engineer during the project.
2. The Contractor shall perform CCTV inspection of each newly installed or rehabilitated pipe segment (manhole to manhole) after testing and before re-introducing any sewage flow into the pipe. Each test shall be witnessed by the Engineer and/or Owner.
3. The Contractor shall record each CCTV inspection on a DVD and submit such recordings to the Engineer as a prerequisite for Partial Utilization/Substantial Completion.
4. CCTV inspections shall be performed after all backfill has been placed and final grades have been established, and after all manhole and pipe testing has been performed and approved by the Engineer.
5. CCTV inspections shall be performed by a PACP certified and trained person.
6. Inspections shall include narration that notes the location and type of defects, if any.
7. At the completion of the project, the Contractor shall furnish all of the original digital recordings to the Owner. Each disc shall be labeled as to its contents. Labels shall include the disc number, date televised, sewer segment reach designation, street location, and manhole numbers on the disc. The Contractor shall keep a copy of the discs for 30 days after the final payment for the project, at which time the discs may be erased at the Contractor's option.

END OF SECTION

SECTION 02700 - ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. The general provisions of the Contract apply to the Work specified in this Section.
- B. Section 02225 – Excavating, Backfilling and Compacting for Sewers

PART 2 - PRODUCTS

2.01 MATERIALS

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

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

2.02 SUBGRADE

- A. The subgrade shall be free from ruts, large stones, and excessive dust. The subgrade shall be subjected to a subgrade proof-roll test so that soft, wet, or pumping areas may be identified. The minimum total weight of the loaded dump truck shall be 37 tons. The truck shall be operated at walking speed over the entire subgrade. Any excessive deflections such as rutting or pumping shall be stabilized as directed by the Engineer.
- B. Typical treatments of soft or wet areas of the pavement subgrade include removal and replacement (undercutting), "working-in" No. 2 stone, or installation of a geogrid/geotextile system and crushed stone. The extent and performance requirements of such improvements shall be set forth in the Contract Documents or as directed by the Engineer. Other means to stabilize the subgrade such as lime stabilization or cement modification as described in KTC Section 304, may be necessary.

- C. The pavement subgrade shall be compacted to a uniform density throughout according to the requirements of the Contract Documents. If the density of the subgrade has been diminished by exposure or weather, after having been previously compacted, it shall be recompacted to the required density and moisture content.
- D. Subgrade drainage systems or perforated pipe underdrains shall be installed in accordance with LFUCG Standard Drawings where indicated on the Improvement Plans.

2.03 GRANULAR BASE COURSE

- A. The granular base course shall consist of compacted dense-graded aggregate (DGA) meeting the requirements set forth in Kentucky Transportation Cabinet's (KTC) Standard Specifications for Road and Bridge Construction. The Contractor shall submit to the Engineer the results of physical tests performed on the material to verify that it meets the requirements referenced above.
- B. The DGA shall be applied in thicknesses of no less than 3 inches and no more than 6 inches in thickness. Each lift of DGA shall be compacted to a density no less than 84 percent of the solid volume density based on the oven-dry bulk specific gravity as determined by KM 64-607. A field density test of DGA placement may be required if deemed necessary by Engineer. The tests shall be conducted at a frequency of one test per 2,000 square feet with a minimum of one test per shift during which DGA is placed. The DGA shall be compacted using a vibratory roller or vibratory plate. The DGA shall be placed to achieve a moisture content less than 5%, and shall be stable with no rutting or pumping.
- C. Before arriving at the site, the DGA shall be adequately mixed with water in a pugmill. During transportation and storage on site, the DGA shall be covered to prevent loss of moisture. If drying of the DGA occurs, the Contractor shall add water to the DGA and shall thoroughly mix the material before its placement.

2.04 ASPHALT BASE AND SURFACE COURSES

- A. The materials and methods for construction for the asphalt base course and surface course shall meet the requirement of Kentucky Transportation Cabinet's (KTC) Standard Specifications for Road and Bridge Construction. The Contractor shall submit test results of the aggregate gradation and asphalt content to the Engineer.
- B. The pavement course thicknesses and construction tolerances shall be specified in the Contract Documents. The surface of each course shall be checked with templates, straightedges, and/or stringlines for uniformity. All irregularities exceeding the allowable tolerances must be repaired as required by the Contract Documents or as directed by the Engineer.

2.05 TACK COAT

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

· END OF SECTION

SECTION 02775 - SIDEWALKS

PART 1 - GENERAL

1.01 SCOPE OF WORK

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

PART 2 - PRODUCTS

2.01 GENERAL

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

2.02 CRUSHED STONE

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

2.03 CONCRETE

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

2.04 PREMOLDED EXPANSION JOINT FILLER

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

2.05 CURING COMPOUND

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

PART 3 - EXECUTION

3.01 BASE

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

3.02 SURFACE

- A. Concrete shall be in thickness shown on LFUCG Standard Drawings, struck off and worked with a float until mortar appears on the top. After surface has been thoroughly floated, it shall be brushed to leave markings of a uniform type, providing non-slip finish. No dusting or plastering will be allowed. Water shall not be added to the surface of the concrete at any time during the finishing procedure.

3.03 FINISHING

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

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. Provide all labor, equipment, materials and services necessary for the manufacture, transportation and placement of all plain and reinforced concrete work, as shown on the Drawings or as ordered by the Engineer.
- B. Concrete shall be in accordance with the latest edition of Standard Specifications for Road and Bridge Construction issued by the Kentucky Transportation Cabinet.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03600 - Grout

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of the Specifications, all work herein shall conform to or exceed the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 - 1. Kentucky Dept. of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition.
 - 2. Kentucky Building Code
 - 3. ACI 214 Recommended Practice for Evaluation of Strength Test Results of Concrete
 - 4. ACI 304 Guide for Measuring, Mixing, Transporting, and Placing Concrete
 - 5. ACI 305 Hot Weather Concreting
 - 6. ACI 306 Cold Weather Concreting
 - 7. ACI 318 Building Code Requirements for Structural Concrete
 - 8. ACI 350 Code Requirements for Environmental Engineering Concrete Structures
 - 9. ASTM C 31 Standard Methods of Making and Curing Concrete Test Specimens in the Field
 - 10. ASTM C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 11. ASTM C 42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - 12. ASTM C 94 Standard Specification for Ready-Mixed Concrete
 - 13. ASTM C 143 Standard Test Method for Slump of Portland Cement Concrete
 - 14. ASTM C 172 Standard Method of Sampling Fresh Concrete
 - 15. ASTM C 260 Standard Specification for Air-Entraining Admixtures for Concrete

16. ASTM C 457 Standard Recommended Practice for Microscopical Determination of Air-Void Content and Parameters of the Air-Void System in Hardened Concrete
17. ASTM C 1567 Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01300, Submittals.
 1. Sources of all materials and certifications of compliance with specifications for all materials.
 2. Certified current (less than 1 year old) chemical analysis of the Portland Cement or Blended Cement to be used.
 3. Certified current (less than 1 year old) chemical analysis of fly ash or ground granulated blast furnace slag to be used.
 4. Aggregate test results showing compliance with required standards, i.e., sieve analysis, aggregate soundness tests, petrographic analysis, mortar bar expansion testing per ASTM C 1567, etc.
 5. Manufacturer's data on all admixtures stating compliance with required standards.
 6. Concrete mix design for each class of concrete specified herein.
 7. Field experience records and/or trial mix data for the proposed concrete mixes for each class of concrete specified herein.

PART 2 - PRODUCTS

2.01 CONCRETE

- A. Sidewalks, entrance pavements, concrete pavement subbase for asphaltic surface course, concrete pavement, curb gutter, and thrust blocking shall be Class A.
- B. Concrete shall be as specified in the following table excerpted from Standard Specifications for Road and Bridge Construction, Edition of 2012, Kentucky Transportation Cabinet:

CONCRETE PROPORTIONING AND REQUIREMENTS KYDOT 601.03.03

INGREDIENT PROPORTIONS AND REQUIREMENTS FOR VARIOUS CLASSES OF CONCRETE

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

- (1) The Department may direct non-payment, additional construction, or removal and replacement for concrete which test cylinders indicate low compressive strength and follow-up investigations indicate inadequate strength. The Department may require some classes to attain the required compressive strength in less than 28 hours.
- (2) When the ambient air temperature while placing slab concrete is 71°F or more, add to the concrete a water-reducing and retarding admixture. The Engineer may require or allow, water-reducing and retarding admixture in slab concrete for ambient air temperatures of less than 71°F. Only use one type of admixture for concrete placed during any individual contiguous pour.
- (3) The Department will require a compressive strength of 5,000 psi or greater when specified in the Contract, at or before 28 days of prestressed members.
- (4) The Engineer will allow slumps less than the minimum provided concrete is workable.
- (5) The Department will allow the use of JPC pavement mixture for non-structural construction.
- (6) At the option of the prestressed product fabricator, the Department will allow the slump of Class D or Class D Modified concrete to be increased to a maximum of 8 inches for all items, except products with voids. For products with voids, the slump may be increased to 7 inches. Provide a high range water reducer (Type F or G) in an amount not to exceed the following water/cement ratios:
 - Summer mix designs – 0.39
 - Spring and Fall mix designs – 0.37
 - Winter mix designs – 0.34
- (7) The precast fabricator may increase the slump of Class A concrete to a maximum of 7 inches provided the fabricator uses a high range water reducer (Type F or G) and maximum water/cement ratio of 0.46.
- (8) Use a high range water reducer (Type F or G).
- (9) The Department will require 3,000 psi compressive strength before opening to traffic and 4,000 psi at 28 days.
- (10) 611 lb/yd³ when using coarse aggregate sizes No. 8, 78, or 9-M.
- (11) 7 ± 2% when using coarse aggregate sizes No. 8, 78 or 9-M.
- (12) The Department may allow the slump of AA concrete to be increased up to a 6 inch maximum, provided the W/C ratio does not exceed 0.40 and a high range water reducer (Type F or G) is used. Trial Batches will be required if producer has not previously supplied.
- (13) The Department does not have slump requirements for Class P concrete mixes except for the edge slump requirements of Section 501.03.19.

2.02 FLOWABLE FILL

- A. Flowable fill shall conform to Section 601 of the Standard Specifications for Road and Bridge Construction, Edition of 2012.
- B. Flowable fill shall consist of a mixture of cement, sand, fly ash, and water. The loss on ignition for Class F fly ash shall not exceed 12 percent. Ensure that the concrete producer certifies mix proportions for flowable fill as follows:

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

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

- C. Flowable fill shall obtain an average compressive strength of 50 to 100 psi at 28 days for application as pipe backfill. For applications requiring early opening to traffic or placement of pavement as soon as possible, the mixture shall conform to the following general guidelines:
 - 1. Mixture bleeds freely within 10 minutes
 - 2. Mixture supports a 150-pound person within three hours.

PART 3 – EXECUTION

3.01 PRODUCTION OF CONCRETE

- A. All concrete shall be machine mixed. Hand mixing of concrete will not be permitted. The Contractor shall supply concrete from a ready mix plant. In selecting the source for concrete production the Contractor shall carefully consider its capability for providing quality concrete at a rate commensurate with the requirements of the placements so that well bonded, homogenous concrete, free of cold joints, is assured. Ready mixed concrete shall be in accordance with ASTM C94.
- B. Each and every concrete delivery shall be accompanied by a delivery ticket containing at least the following information:
 - 1. Date and truck number
 - 2. Ticket number
 - 3. Mix designation of concrete
 - 4. Cubic yards of concrete
 - 5. Cement brand, type and weight in pounds
 - 6. Weight in pounds of fine aggregate (sand)
 - 7. Weight in pounds of coarse aggregate (stone)
 - 8. Air entraining agent, brand, and weight in pounds and ounces
 - 9. Other admixtures, brand, and weight in pounds and ounces
 - 10. Water, in gallons, stored in attached tank
 - 11. Water, in gallons, maximum that can be added without exceeding design water/cement ratio
 - 12. Water, in gallons, actually used (by truck driver)
 - 13. Time of loading
 - 14. Time of delivery to job (by truck driver)
- C. Any truck delivering concrete to the job site, which is not accompanied by a delivery ticket showing the above information will be rejected and such truck shall immediately depart from the job site.

3.02 CONCRETE PLACEMENT

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

3.03 CONCRETE WORK IN COLD WEATHER

- A. Cold weather concreting procedures shall conform to the requirements of ACI 306.
- B. The Engineer may prohibit the placing of concrete at any time when air temperature is 40°F. or lower. If concrete work is permitted, the concrete shall have a minimum temperature, as placed, of 55°F. for placements less than 12" thick, 50°F. for placements 12" to 36" thick, and 45°F. for placements greater than 36" thick. The temperature of the concrete as placed shall not exceed the aforementioned minimum values by more than 20°F, unless otherwise approved by the Engineer.
- C. The addition of admixtures to the concrete to prevent freezing is not permitted. All reinforcement, forms, and concrete accessories with which the concrete is to come in contact shall be defrosted by an approved method. No concrete shall be placed on frozen ground.

3.04 CONCRETE WORK IN HOT WEATHER

- A. Hot weather concreting procedures shall conform to the requirements of ACI 305.
- B. When air temperatures exceed 85°F, or when extremely dry conditions exist even at lower temperatures, particularly if accompanied by high winds, the Contractor and his concrete supplier shall exercise special and precautionary measures in preparing, delivering, placing, finishing, curing and protecting the concrete mix. The Contractor shall consult with the Engineer regarding such measures prior to each day's placing operation and the Engineer reserves the right to modify the proposed measures consistent with the requirements of this Section of the Specifications. All necessary materials and equipment shall be on hand in position prior to each placing operation.
- C. Preparatory work at the job site shall include thorough wetting of all forms, reinforcing steel and, in the case of slab pours on ground or subgrade, spraying the ground surface on the preceding evening and again just prior to placing. No standing puddles of water shall be permitted in those areas which are to receive the concrete.
- D. The temperature of the concrete mix when placed shall not exceed 90°F.
- E. Delivery schedules shall be carefully planned in advance so that concrete is placed as soon as practical after it is properly mixed. For hot weather concrete work (air temperature greater than 85°F), discharge of the concrete to its point of deposit shall be completed within 60 minutes from the time the concrete is batched.
- F. The Contractor shall arrange for an ample work force to be on hand to accomplish transporting, vibrating, finishing, and covering of the fresh concrete as rapidly as possible.

3.05 QUALITY CONTROL

- A. Field Testing of Concrete
 - 1. The Contractor shall coordinate with the Owner's testing firm personnel as required for concrete testing.

2. Concrete for testing shall be supplied by the Contractor at no additional cost to the Owner, and the Contractor shall provide assistance to the testing laboratory in obtaining samples. The Contractor shall dispose of and clean up all excess material.
3. For every placement of concrete that is 10 cubic yards or less, the following tests shall be performed (as described in paragraphs B through E below):
 - a. Consistency
 - b. Unit Weight
 - c. Air content
 - d. Compressive Strength
 - e. Temperature
4. For every placement of concrete that is larger than 10 cubic yards, the following tests shall be performed for every 50 cubic yards (as described in paragraphs B through E below):
 - a. Consistency – test the first truck and one additional truck randomly selected by the Owner's Resident Project Representative (RPR).
 - b. Unit Weight – test one truck randomly selected by the RPR
 - c. Air content - test the first truck and one additional truck randomly selected by the RPR.
 - d. Compressive Strength - test one truck randomly selected by the RPR
 - e. Temperature - test one truck randomly selected by the RPR

The sampling of concrete is approved at the truck discharge. If a concrete pump is employed, the Contractor is advised that 1.5-3.0% air is lost in pumping and such should be accounted for at the point of testing. Therefore, the air content should be adjusted to ensure that the air content meets the specification at the point of placement.

The first truck is defined as the first truck as accepted by the RPR. The RPR shall have the authority of the Owner to accept or reject all concrete.

1. Sampling is at the discretion of the RPR.
2. Additional testing may be required as deemed necessary by the Owner.

B. Consistency

1. The consistency of the concrete will be checked by the Owner's testing firm by standard slump cone tests. The Contractor shall make any necessary adjustments in the mix as the Owner or Engineer may direct and shall upon written order suspend all placing operations in the event the consistency does not meet the intent of the specifications. No payment shall be made for any delays, material or labor costs due to such eventualities.
2. Slump tests shall be made in accordance with ASTM C 143.
3. Concrete with a specified nominal slump shall be placed having a slump within 1" (higher or lower) of the specified slump. Concrete with a specified maximum slump shall be placed having a slump less than the specified slump.

C. Unit Weight

1. Samples of freshly mixed concrete shall be tested for unit weight by the Owner's testing firm in accordance with ASTM C 138.

D. Air Content

1. Samples of freshly mixed concrete will be tested for entrained air content by the Owner's testing firm in accordance with ASTM C 231.
2. In the event test results are outside the limits specified, additional testing shall occur. Upon discovery of incorrect air entrainment, the concrete shall be removed from the jobsite.

E. Compressive Strength

1. Samples of freshly mixed concrete will be taken by the Owner's testing firm and tested for compressive strength in accordance with ASTM C 172, C 31 and C 39, except as modified herein.
2. Each sampling shall consist of at least five (5) 6x12 cylinders or (8) 4x8 cylinders. Each cylinder shall be identified by a tag, which shall be hooked or wired to the side of the container. The Owner's testing firm will fill out the required information on the tag, and the Contractor shall satisfy himself that such information shown is correct.
3. The Contractor shall be required to furnish labor to the Owner for assisting in preparing test cylinders for testing. The Contractor shall provide approved curing boxes for storage of cylinders on site. The insulated curing box shall be of sufficient size and strength to contain all the specimens made in any four consecutive working days and to protect the specimens from falling over, being jarred or otherwise disturbed during the period of initial curing. The box shall be erected, furnished and maintained by the Contractor. Such box shall be equipped to provide the moisture and to regulate the temperature necessary to maintain the proper curing conditions required by ASTM C 31. Such box shall be located in an area free from vibration such as pile driving and traffic of all kinds and such that all specimen are shielded from direct sunlight and/or radiant heating sources. No concrete requiring inspection shall be delivered to the site until such storage curing box has been provided. Specimens shall remain undisturbed in the curing box until ready for delivery to the testing laboratory but not less than sixteen hours.
4. The Contractor shall be responsible for maintaining the temperatures of the curing box during the initial curing of test specimens with the temperature preserved between 60°F and 80°F as measured by a maximum-minimum thermometer. The Contractor shall maintain a written record of curing box temperatures for each day curing box contains test specimens. Temperature shall be recorded a minimum of three times a day with one recording at the start of the work day and one recording at the end of the work day.
5. When transported, the cylinders shall not be thrown, dropped, allowed to roll, or be damaged in any way.

F. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 214, ACI 318, and ACI 350.
2. The strength level of concrete will be considered satisfactory if all of the following conditions are satisfied.
 - a. Every arithmetic average of any three consecutive strength tests equals or exceeds the minimum specified 28-day compressive strength for the mix (see Article 2.07).
 - b. No individual compressive strength test results falls below the minimum specified strength by more than 500 psi.
 - c. No more than 10% of the compressive tests have strengths greater than the maximum strength specified.

3. In the event any of the conditions listed above are not met, the mix proportions shall be corrected for the next concrete placing operation.
4. In the event that condition 2B is not met, additional tests in accordance with Article 3.10, paragraph H shall be performed.
5. When a ratio between 7-day and 28-day strengths has been established by these tests, the 7-day strengths shall subsequently be taken as a preliminary indication of the 28-day strengths. Should the 7-day test strength from any sampling be more than 10% below the established minimum strength, the Contractor shall:
 - a. Immediately provide additional periods of curing in the affected area from which the deficient test cylinders were taken.
 - b. Maintain or add temporary structural support as required.
 - c. Correct the mix for the next concrete placement operation, if required to remedy the situation.
6. All concrete which fails to meet the ACI requirements and these specifications is subject to removal and replacement at no additional cost to the Owner.

H. Additional Tests

1. In the event the 28-day test cylinders fail to meet the minimum strength requirements as outlined in Article 3.10, paragraph F, the Contractor shall have concrete core specimens obtained and tested from the affected area immediately.
 - a. Three cores shall be taken by the Owner's testing firm for each sample in which the strength requirements were not met.
 - b. The concrete in question will be considered acceptable if the average compressive strength of a minimum of three test core specimens taken from a given area equal or exceed 85% of the specified 28-day strength and if the lowest core strength is greater than 75% of the specified 28-day strength.
2. Concrete placed with compressive strengths greater than the maximum strength specified shall be removed and replaced or repaired as deemed necessary by the Engineer.

3.06 CARE AND REPAIR OF CONCRETE

- A. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Care shall be exercised to avoid jarring forms or placing any strain on the ends of projecting reinforcing bars. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at no additional cost to the Owner.
- B. Areas of honeycomb shall be chipped back to sound concrete and repaired as directed by the Engineer.
- C. Concrete formwork blowouts or unacceptable deviations in tolerances for formed surfaces due to improperly constructed or misaligned formwork shall be repaired as directed by the

Engineer. Bulging or protruding areas, which result from slipping or deflecting forms shall be ground flush or chipped out and redressed as directed by the Engineer.

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

END OF SECTION

SECTION 03600 - GROUT

PART 1 - GENERAL

1.01 THE REQUIREMENT

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

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

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

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

1.03 SUBMITTALS

- A. Submit the following in accordance with Section 01300 - Submittals.
1. Certified test results verifying the compressive strength and shrinkage and expansion requirements specified herein.
 2. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

1.04 QUALITY ASSURANCE

- A. Field Tests (required for pump station and storage tank projects)
1. Compression test specimens will be taken during construction from the first placement of each type of grout and at intervals thereafter as selected by the Engineer to insure continued compliance with these Specifications. The specimens will be made by the Contractor and observed by Engineer.

- a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days, 28 days and any additional time period as appropriate.
 - b. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days and any other time period as appropriate.
2. The cost of all laboratory tests on grout will be borne by the Owner, but the Contractor shall assist the Engineer in obtaining specimens for testing. The Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The Contractor shall supply all materials necessary for fabricating the test specimens, at no additional cost to the Owner.
 3. All grout, already placed, which fails to meet the requirements of these Specifications, is subject to removal and replacement at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

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

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

B. Epoxy Grout (Applicable for projects with Structures)

1. Epoxy grout shall be "Sikadur 32 Hi-Mod" by Sika Corporation, "Duralcrete LV" by Tamms Industries, or "Euco #452 Series" by Euclid Chemical, Concsive 1090 by BASF Construction Chemicals.
2. Epoxy grout shall be modified as required for each particular application with aggregate per manufacturer's instructions.

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

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

PART 3 - EXECUTION

3.01 GENERAL

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

- B. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.
- C. The Contractor, through the manufacturer of a non-shrink grout and epoxy grout, shall provide on-site technical assistance upon request, at no additional cost to the Owner.

3.02 CONSISTENCY

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

3.03 MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

3.04 GROUT INSTALLATION

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

END OF SECTION

MAYOR JIM GRAY



LEXINGTON

DOUG BURTON, P.E.
DIRECTOR
ENGINEERING

September 22, 2017

Users of Lexington – Fayette Urban County Engineering Standard Drawings

Re: Standard Drawings 2017

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

These drawings become effective as of September 22, 2017 and any projects dedicated to public use after the above date must comply with or contain references to these Standard Drawings or revisions thereof where applicable.

Questions or comments should be directed to:

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

Sincerely,

A handwritten signature in black ink, appearing to read "W. Douglas Burton".

W. Douglas Burton, P.E.
Urban County Engineer

WDB;MHF





LEXINGTON

LEXINGTON - FAYETTE URBAN COUNTY GOVERNMENT STANDARD DRAWINGS 2017 TABLE OF CONTENTS

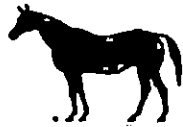
Drawing No.	Drawing Title
Manholes-Storm Drainage:	
100	Storm Sewer Manhole Type "A" - Circular Walls
101	Storm Sewer Manhole Type "B" - Non-Circular Walls
102	Storm Sewer Manhole Details
103	Manhole Frames, Covers and Steps
104	Storm Sewer Manhole Circular Slabs 4'-0" and 5'-0" Diameter
105	Storm Sewer Manhole Circular Slabs 6'-0" Diameter
106	Storm Sewer Manhole Circular Slabs 7'-0" Diameter
107	Storm Sewer Manhole Circular Slabs 8'-0" Diameter
108	Reinforcement Detail 5' Non-Circular M.H. Less Than 10' Depth, 8" Walls, 10" Slab
109	Reinforcement Detail 5' Non-Circular M.H. 7'-6" to 20' Depth, 8" Walls, 12" Slab
110	Reinforcement Detail 6' Non-Circular M.H. Less Than 10' Depth, 8" Walls, 10" Slab
111	Reinforcement Detail 6' Non-Circular M.H. 8' to 15' Depth, 8" Walls, 12" Slab
112	Reinforcement Detail 6' Non-Circular M.H. 15' to 20' Depth, 10" Walls, 12" Slab
113	Reinforcement Detail 7' Non-Circular M.H. Less Than 10' Depth, 8" Walls, 10" Slab
114	Reinforcement Detail 7' Non-Circular M.H. 8' to 10' Depth, 8" Walls, 12" Slab
115	Reinforcement Detail 7' Non-Circular M.H. 10' to 20' Depth, 10" Walls, 12" Slab
116-119	(Future)
Surface Inlets & Catch Basins:	
120	Surface Inlet Type "A"
121	Surface Inlet Type "B"
122-1	Curb Box Inlet Type "A" 4' x 4' Box 15" - 18" Pipes
122-2	Curb Box Inlet Type "A" 4' x 4' Box 15" - 18" Pipes
123-1	Curb Box Inlet Type "B" 5' x 5' Box 15" - 24" Pipes
123-2	Curb Box Inlet Type "B" 5' x 5' Box 15" - 24" Pipes
124-1	Curb Box Inlet Type "C" 4' x 3' Box Single Pipe 15" or Less
124-2	Curb Box Inlet Type "C" 4' x 3' Box Single Pipe 15" or Less
125	Curb Box Inlet Type "D"
126	Spring Box Inlet Type "A"
127	Spring Box Inlet Type "B"



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LEXINGTON - FAYETTE URBAN COUNTY GOVERNMENT STANDARD DRAWINGS 2017 TABLE OF CONTENTS

Drawing No.	Drawing Title
128	Security Devices for Frames and Grates
129	(Future)
Channels & Ditches:	
130-1	Aggregate Channel Lining
130-2	Aggregate Channel Lining
131	Mattress Channel Lining
132	Paved Ditch
133-139	(Future)
Roadway Drainage:	
140-149	(Future)
Headwalls:	
150	Straight Headwalls
151	ELL Headwalls
152	U-Type Headwalls
153	Pipe Culvert Headwalls 0° Skew 15" - 27" Circular Pipe
154-1	Pipe Culvert Headwalls 0° Skew 30" - 108" Pipe
154-2	Dimensions and Quantities 30" - 108" Headwalls Circular Pipe 0° Skew
154-3	Bill of Reinforcement 30" - 90" Diameter Circular Pipe Headwalls 0° Skew
154-4	Bill of Reinforcement 96" - 108" Diameter Circular Pipe Headwalls 0° Skew
158	18" - 24" Double & Triple Pipe Culvert Headwalls at 0° Skew
159-1	Double and Triple Pipe Culvert Headwalls 0° Skew
159-2	Dimensions and Quantities 30" - 48" Double and Triple Headwalls - Circular Pipe 0° Skew
159-3	Bill of Reinforcement 30" - 48" Double and Triple Headwalls - Circular Pipe 0° Skew
162	Sloped and Flared Box Inlet - Outlet 18" - 24" - 30" - 36" All Skews
163	Grates for Sloped and Flared Box Inlet - Outlet
164	Impact Stilling Basin 15" - 24" Pipes
165	Impact Stilling Basin 27" - 48" Pipes
166-169	(Future)
Silt & Erosion Control:	
	See Chapter 11 of <i>LFUCG Stormwater Manual</i> for Approved Design Details



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Drawing No.	Drawing Title
Retaining Structures:	
180	Retaining Wall Gravity Type
181-189	(Future)
Trenching:	
200	Trenching, Laying, Backfilling and Bedding Outside RW Limits
201-1	Trenching, Laying, Backfilling and Bedding Under Street Pavement
201-2	Trenching, Laying, Backfilling and Bedding Under Street Pavement Using Flowable Fill
201-3	Utility Trench Restoration Beneath Existing Paved Roads (Section View)
201-4	Utility Trench Restoration Beneath Existing Paved Roads (Plan View)
204	Sanitary Sewer Pipe: Types and Maximum Allowable Fill Heights
206-209	(Future)
Manholes-Sanitary:	
210	Typical Precast Concrete Shallow Manhole Pipes 24" and Larger
211	Typical Standard Precast Concrete Manhole Pipes Up To 24"
212	Typical Precast Concrete Drop Manhole Pipes Up To 36"
213	Standard Manhole Junction and Water Stop Details
214	Sewer Manhole Adjustment Grade Rings
216	Manhole Size Standards and General Notes for Deep Manholes
217	Deflection Angle Criteria for Sanitary Manholes
220	Standard Circular Manhole Frame and Cover
222	Standard Watertight Manhole Frame and Cover
223-229	(Future)
Connections:	
230	House Lateral for Greater than 6' Deep Sewer in Soil and Rock Excavation
231	House Lateral for Greater than 6' Deep Sewer in Soil
232	House Lateral for Shallow Sewer in Soil or Rock
233	Lateral Cleanout in Non-Paved Areas and Yards
234	Right-Of-Way Easement Lateral Cleanout in Non-Paved Areas and Yards
240	Sanitary Sewer Stream Crossing and Stream Bed Restoration Detail
250	Grease Interceptor Typical Configuration



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LEXINGTON - FAYETTE URBAN COUNTY GOVERNMENT STANDARD DRAWINGS 2017 TABLE OF CONTENTS

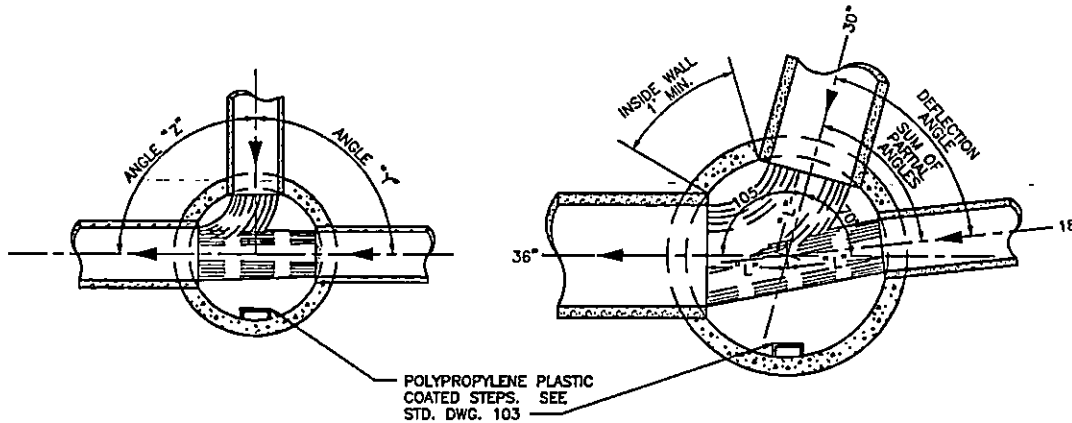
Drawing No.	Drawing Title
260	Sewer Connection to Existing Concrete Manhole
261-269	(Future)
Streets & Roads:	
300	Typical Street Sections
301	Curb and Gutter
302	Integral Curb, Header Curb, Monolithic Curb and Sidewalk
303	Sidewalk Construction Specifications
304	Sidewalk Ramp Type 1
305	(Future)
306	(Future)
307-1	Residential Entrance Details
307-2	Commercial Entrance Details
308	Chain Link Fence 3' - 6'
309	Chain Link Fence 8' - 12'
310	Chain Link Gate
311	Plank Fence
312	Woven Wire Right-of-Way Fence Type 1
313	Woven Wire Right-of-Way Fence Type 2
314	Woven Wire Gates
315	Concrete Steps
316	Top Rail for Retaining Walls Handrail for Steps
317	County Road Typical Shoulder Sections (Minimum Requirements)
318	Edge Key
319	Typical Edge Key for Minimum Overlays, Short Projects, Low Speed
320-1	Perforated Pipe Subgrade Drainage Along Roadway
320-2	Perforated Pipe Subgrade Drainage For Raised Non-Paved Medians
321	Perforated Pipe for Subgrade Drainage
322	Perforated Pipe Underdrains
323	Public Improvement Sign
324-330	(Future)

TABLE I
OF
MINIMUM PARTIAL ANGLE

PIPE SIZE	MANHOLE SIZE									
	4'-0"		5'-0"		6'-0"		7'-0"		8'-0"	
	P. ANGLE	L. DIST.	P. ANGLE	L. DIST.	P. ANGLE	L. DIST.	P. ANGLE	L. DIST.	P. ANGLE	L. DIST.
15"	36°	1'-10"	30°	2'-4"	25°	2'-11"	22°	3'-5"	19°	3'-11"
18"	43°	1'-9"	34°	2'-4"	28°	2'-10"	24°	3'-4"	21°	3'-11"
24"	53°	1'-7"	41°	2'-2"	34°	2'-9"	29°	3'-3"	25°	3'-10"
27"	—	—	45°	2'-1"	37°	2'-8"	32°	3'-3"	26°	3'-9"
30"	—	—	49°	2'-0"	40°	2'-7"	34°	3'-2"	30°	3'-8"
33"	—	—	54°	1'-10"	44°	2'-6"	37°	3'-1"	37°	3'-8"
36"	—	—	—	—	47°	2'-4"	40°	3'-0"	34°	3'-7"
42"	—	—	—	—	55°	2'-1"	46°	2'-9"	39°	3'-5"
48"	—	—	—	—	63°	1'-9"	52°	2'-6"	44°	3'-2"
54"	—	—	—	—	—	—	59°	2'-3"	50°	2'-11"
60"	—	—	—	—	—	—	67°	1'-10"	56°	2'-8"

GENERAL NOTES:

- ALL DIMENSIONS ARE BASED ON SIZE OF LARGEST PIPE IN MANHOLE.
- MANHOLES FOR PIPE LARGER THAN 60" SHALL BE SPECIALLY DESIGNED.
- IN CASES WHERE DEFLECTION ANGLES EXCEED MAXIMUM SHOWN IN TABLES, MANHOLE SHALL BE INCREASED IN SIZE OR SPECIALLY DESIGNED.
- BOTTOM SLAB OF MANHOLES SHALL BE SPECIALLY DESIGNED WITH REGARD TO AREA, THICKNESS, AND REINFORCING IN SITUATIONS WHERE HIGH WATER TABLE OR UNSTABLE SOIL CONDITIONS EXIST.
- MANHOLE BENCH SHALL SLOPE AT LEAST 1" PER FT. FROM WALLS TO CHANNELS AND SHALL HAVE SMOOTH FLOAT AND BRUSH FINISH.
- ELEVATIONS OF PIPES IN MANHOLES SHALL BE SUCH THAT THE TOP OF ALL INFLUENT PIPES WILL BE AT AN ELEVATION EQUAL TO OR GREATER THAN THE TOP OF THE EFFLUENT PIPE.
- INFLUENT PIPES MAY ENTER MANHOLES AT AN ELEVATION ABOVE THE CHANNELS AS REQUIRED TO AVOID CONFLICT WITH LARGER PIPES IN THE MANHOLE.



TYPE "A" MANHOLE - CIRCULAR WALLS
CAST-IN-PLACE OR PRECAST CONCRETE

NOTES:

- PRECAST CONCRETE MANHOLE BARREL SHALL BE ASTM C-478, CLASS II PIPE TO 12' DEPTH AND C-76 CLASS III GREATER THAN 12' DEPTH.
- BASE SECTION OF CIRCULAR MANHOLES MAY BE CAST-IN-PLACE CONCRETE, OR CUSTOM PRECAST CONCRETE WITH OPENINGS FOR PIPE.
- BASE SECTIONS MAY BE SIMILAR TO SANITARY SEWER MANHOLE.
- PROVIDE STEPS WITHIN 18" OF BENCH.

CIRCULAR MANHOLE NOTES:

- THE ANGLE BETWEEN ANY TWO PIPES (e.g. ANGLE "Y" OR "Z") MUST BE GREATER THAN THE SUM OF THE PARTIAL ANGLES FROM TABLE I FOR THE MANHOLE SIZE SELECTED. FOR SMALLER ANGLES BETWEEN PIPES, LARGE MANHOLES MUST BE SELECTED. (SEE EXAMPLE BELOW)
- THE MAXIMUM DEFLECTION ANGLE BETWEEN ANY INCOMING PIPE AND THE DISCHARGE PIPE SHALL BE NO MORE THAN 90° FOR PIPES UP TO 24" IN DIAMETER. THE MAXIMUM DEFLECTION ANGLE FOR 27" TO 42" PIPES SHALL BE 75° AND FOR PIPES LARGER THAN 42" THE MAXIMUM DEFLECTION ANGLE SHALL BE 60°.

EXAMPLE FOR MANHOLE SIZE SELECTION:

FOR MANHOLE SHOWN ABOVE, THE ANGLE BETWEEN 18" AND 30" PIPE IS 70° AND THE ANGLE BETWEEN 30" AND 36" PIPE IS 110°. THE TABLE INDICATES THAT FOR A 6'-0" DIAMETER MANHOLE THE MINIMUM PARTIAL ANGLE FOR AN 18" PIPE IS 28° AND FOR A 30" PIPE IS 40°. THE SUM OF THE PARTIAL ANGLES IS 68° THIS SUM IS LESS THAN THE 70°. THEREFORE, A 6'-0" MANHOLE DIAMETER IS ACCEPTABLE.

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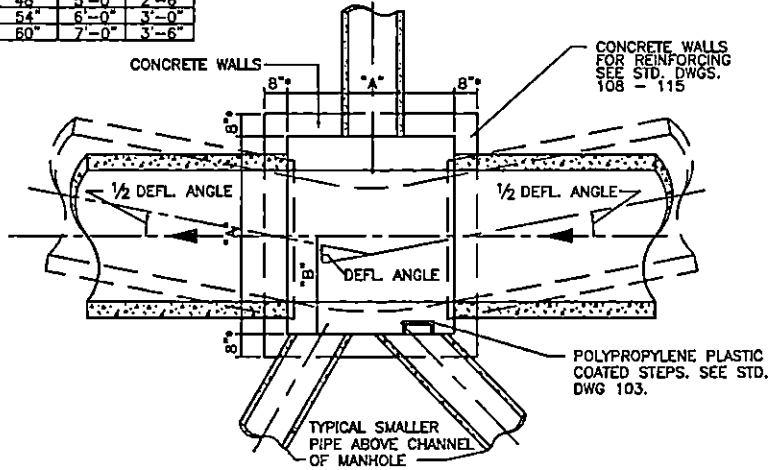
DIVISION OF ENGINEERING

STORM SEWER
MANHOLE TYPE "A"—
CIRCULAR WALLS

STANDARD DRAWING NO. 100

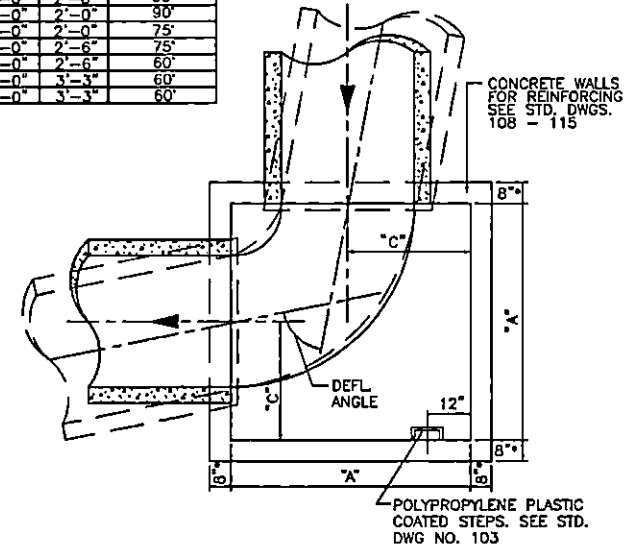
APPROVAL: 9/22/17
URBAN COUNTY ENGINEER
COMMISSIONER 9/22/17
DATE

PIPE SIZE	DIM. "A"	DIM. "B"
12"	5'-0"	2'-6"
15"-33"	5'-0"	2'-6"
48"	5'-0"	2'-6"
54"	6'-0"	3'-0"
60"	7'-0"	3'-6"



0°-22° DEFLECTION ANGLE

PIPE SIZE	DIM. "A"	DIM. "C"	MAXIMUM DEFL. ANGLE
12"	5'-0"	2'-0"	90°
15"-33"	5'-0"	2'-0"	90°
36"	5'-0"	2'-0"	75°
42"	6'-0"	2'-6"	75°
48"	6'-0"	2'-6"	60°
54"	7'-0"	3'-3"	60°
60"	7'-0"	3'-3"	60°

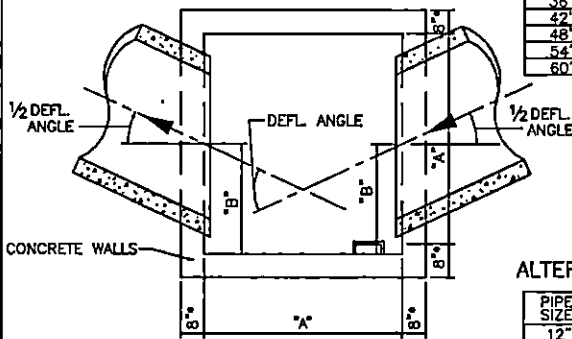


GREATER THAN 68° DEFLECTION ANGLE

TYPE "B" MANHOLE - NON-CIRCULAR WALLS, CAST-IN-PLACE CONCRETE

ALTERNATE-22°-50°

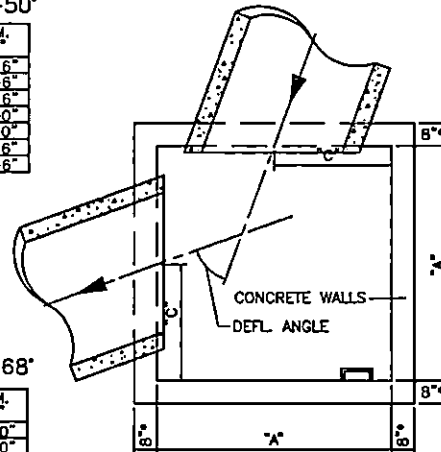
PIPE SIZE	DIM. "A"	DIM. "B"
12"	5'-0"	2'-6"
15"-33"	5'-0"	2'-6"
36"	5'-0"	2'-6"
42"	6'-0"	3'-0"
48"	6'-0"	3'-0"
54"	7'-0"	3'-6"
60"	7'-0"	3'-6"



22°-50° DEFLECTION ANGLE

ALTERNATE-50°-68°

PIPE SIZE	DIM. "A"	DIM. "C"
12"	5'-0"	2'-0"
15"-33"	5'-0"	2'-0"
36"	5'-0"	2'-0"
42"	6'-0"	2'-6"
48"	6'-0"	2'-6"
54"	7'-0"	3'-3"
60"	7'-0"	3'-3"




50°-90° DEFLECTION ANGLE

NOTES:

1. ALL DIMENSIONS ARE BASED ON SIZE OF LARGEST PIPE IN MANHOLE.
2. MANHOLES FOR PIPE LARGER THAN 60" SHALL BE SPECIALLY DESIGNED.
3. PIPES SHALL ENTER MANHOLE WALLS, NOT CORNERS. ALLOW 2" MINIMUM TO INSIDE CORNER FOR WALL CUT.
4. IN CASES WHERE DEFLECTION ANGLES EXCEED MAXIMUM SHOWN IN TABLES, MANHOLE SHALL BE SPECIALLY DESIGNED.
5. BOTTOM SLAB OF MANHOLES SHALL BE SPECIALLY DESIGNED WITH REGARD TO AREA, THICKNESS, AND REINFORCING IN SITUATIONS WHERE HIGH WATER TABLE OR UNSTABLE SOIL CONDITIONS EXIST.
6. MANHOLE BENCH SHALL SLOPE AT LEAST 1" PER FT. FROM WALLS TO CHANNELS AND SHALL HAVE SMOOTH FLOAT AND BRUSH FINISH.
7. THE TOP OF ALL INFLUENT PIPES WILL BE AT AN ELEVATION EQUAL TO THE TOP OF THE EFFLUENT PIPE.
8. INFLUENT PIPES MAY ENTER MANHOLES AT AN ELEVATION ABOVE THE CHANNELS AS REQUIRED TO AVOID CONFLICT WITH LARGER PIPES IN THE MANHOLE.
9. THE MAXIMUM DEFLECTION ANGLE BETWEEN ANY INCOMING PIPE AND OUT GOING PIPE SHALL BE NO MORE THAN 90° FOR PIPES UP TO 24" IN DIAMETER. THE MAXIMUM DEFLECTION ANGLE FOR 27" TO 42" PIPES SHALL BE 75° AND FOR PIPES LARGER THAN 42" THE MAX. DEFLECTION ANGLE SHALL BE 60°.
10. FOR REINFORCING SEE STD. DWGS. 108 - 115.

TYPE "B" MANHOLE FOR DEFLECTION ANGLES BETWEEN 22° & 90°

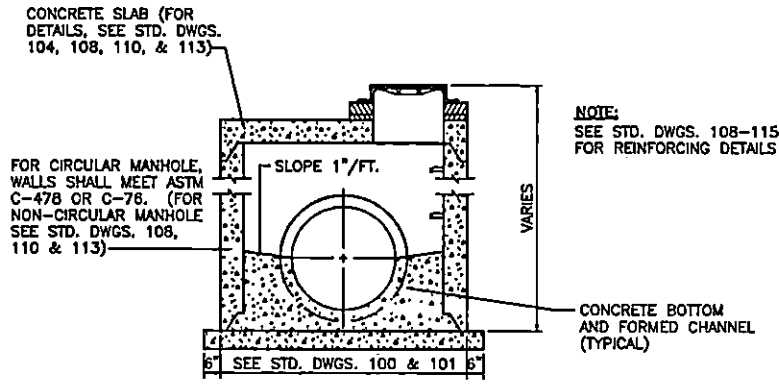


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DIVISION OF ENGINEERING

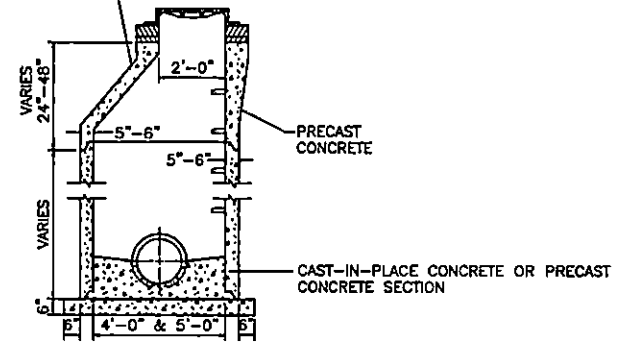
STORM SEWER
MANHOLE TYPE "B"-
NON-CIRCULAR WALLS

STANDARD DRAWING NO.	101
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

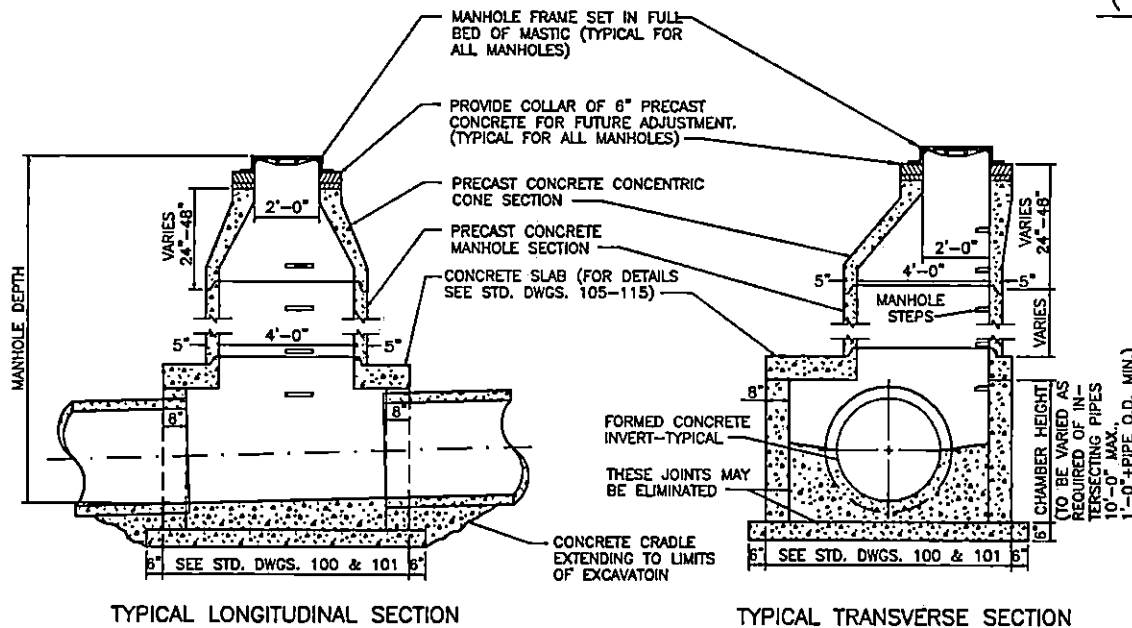


CIRCULAR AND NON-CIRCULAR WALLS
(TYPE "A" & TYPE "B")

NOTE:
VERTICAL WALLS AND FLAT SLAB
MAY BE SUBSTITUTED FOR CONE
SECTION OF MANHOLE.



STANDARD 4'-0" DIA. & 5'-0"
CIRCULAR WALLS
(TYPE "A")



TYPICAL LONGITUDINAL SECTION

TYPICAL TRANSVERSE SECTION

STANDARD CIRCULAR MANHOLE - 6'-0" DIAMETER & LARGER TYPE "A"
AND NON-CIRCULAR WALL MANHOLE - ALL SIZES TYPE "B"

NOTES:

1. BASE SECTION OF CIRCULAR MANHOLES MAY BE CAST-IN-PLACE CONCRETE OR CUSTOM PRECAST CONCRETE WITH OPENINGS FOR PIPE.
2. 6" OVERHANG IN BOTTOM SLAB IS NOT REQUIRED IF PRECAST MANHOLES ARE USED.
3. FLAT SLABS IN PAVED AREAS SHALL BE USED ONLY AS APPROVED BY ENGINEER.

NO.	DATE	REVISION DESCRIPTION	BY
01	04/13/18	UPDATE MANHOLE FRAME NOTE	TAL

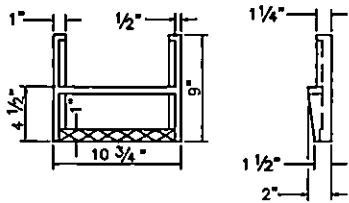


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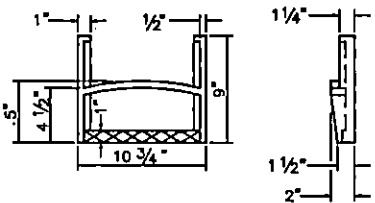
DIVISION OF ENGINEERING

STORM SEWER
MANHOLE DETAILS

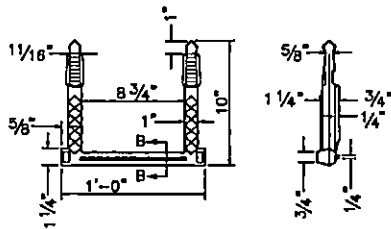
STANDARD DRAWING NO.	102
APPROVAL	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



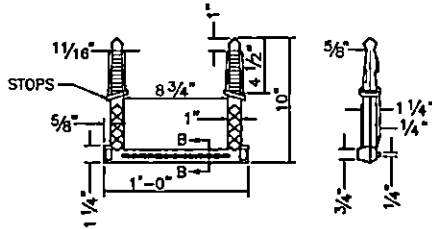
STEP TYPE NO. 1



STEP TYPE NO. 2

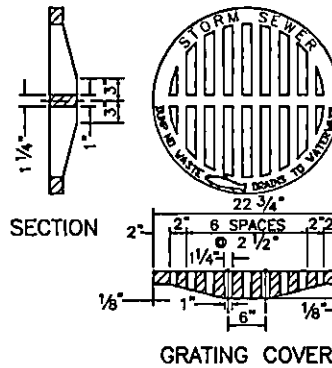
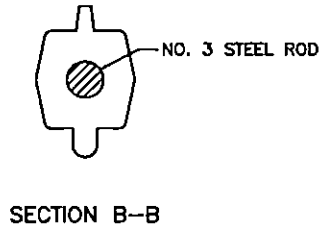


STEP TYPE NO. 3

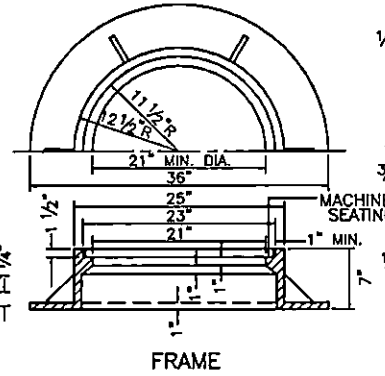


STEP TYPE NO. 4

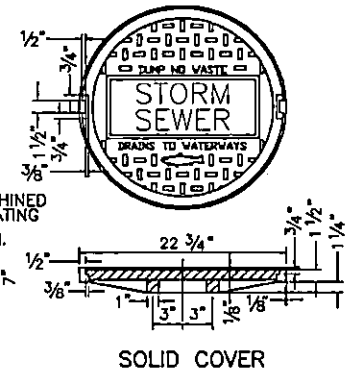
MANHOLE STEPS



GRATING COVER



FRAME



SOLID COVER

MANHOLE FRAME AND COVERS

NOTES:

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

NOTES:

1. STEPS SHALL BE POLYPROPYLENE PLASTIC COATED STEEL ROD OR OF A TYPE AND SIZE APPROVED BY THE ENGINEER.
2. STEPS SHALL BE SPACED 12" TO 16" O.C. VERTICALLY SO AS TO FORM A CONTINUOUS LADDER.
3. STEPS SHALL BE REQUIRED IN MANHOLES WHEN THE STRUCTURE IS 4 FEET AND GREATER IN DEPTH. (MEASURE FROM FLOWLINE OF LOWEST PIPE TO TOP OF STRUCTURE.)
4. THE TREADS OF ALL STEPS SHALL HAVE ANTI-SKID PROPERTIES FOR HAND AND FOOT GRIPS.
5. MANHOLE STEPS SHALL BE INSTALLED IN A VERTICAL LINE AND SHALL COMPLY WITH OSHA STANDARDS IN ALL RESPECTS.
6. FOR CAST-IN-PLACE OR PRECAST CIRCULAR AND NON-CIRCULAR MANHOLES.
7. FIRST STEP SHALL BE 12" - 18" FROM TOP OF PRECAST CONE SECTION, AND SHALL BE VERTICALLY LOCATED TO MAXIMIZE THE DISTANCE OF ANY STEP FROM THE JOINT OF A MANHOLE SECTION.

NO.	DATE	REVISION DESCRIPTION	BY
01	04/13/18	UPDATE NOTE 2	TAL

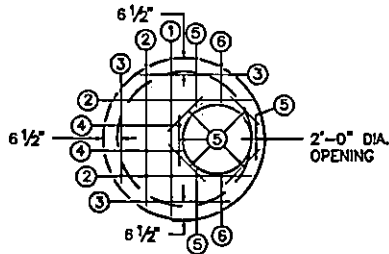


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DIVISION OF ENGINEERING

MANHOLE FRAMES,
COVERS, & STEPS

STANDARD DRAWING NO.	103
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

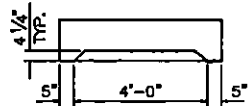


MARK	NO.	SIZE	LENGTH	TYPE
1	1	4	4'-5"	STR.
2	3	"	4'-0"	"
3	3	"	2'-8"	"
4	2	"	2'-0"	"
5	8	"	1'-6"	"
6	2	"	1'-0"	"

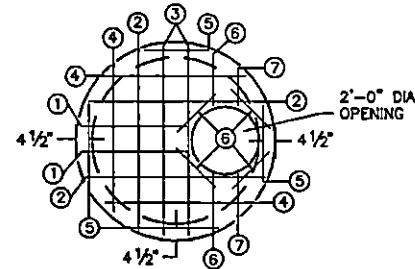
4'-0" DIA.
SHALLOW MANHOLES

NOTES:

- FOR PIPE SIZES 15" TO 24".
- 9" O.C. SPACING EACH WAY.
- 8" THICK SLAB.
- 4'-10" O.D.
- 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
- CIRCULAR REBAR MAY BE USED, OR MARK 5 BARS AS SHOWN.



SIDE VIEW

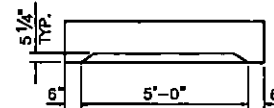


MARK	NO.	SIZE	LENGTH	TYPE
1	2	4	3'-2"	STR.
2	3	"	5'-3"	"
3	2	"	5'-8"	"
4	3	"	4'-2"	"
5	4	"	2'-2"	"
6	6	"	1'-6"	"
7	2	"	1'-0"	"

5'-0" DIA.
SHALLOW MANHOLES

NOTES:

- FOR PIPE SIZES 21" TO 33".
- 9" O.C. SPACING EACH WAY.
- 8" THICK SLAB.
- 6'-0" O.D.
- 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
- CIRCULAR REBAR MAY BE USED, OR MARK 6 BARS AS SHOWN.



SIDE VIEW

NOTE:

SLAB OUTER DIAMETER TO VARY WITH MANHOLE WALL THICKNESS, TO COMPLETELY COVER MANHOLE WALLS.

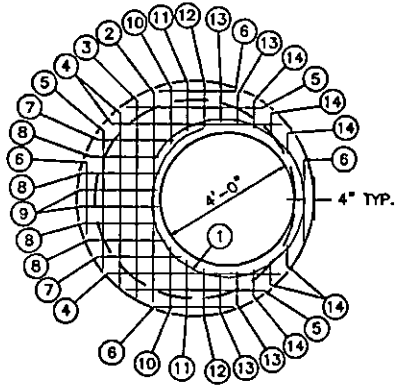


LEXINGTON

DIVISION OF ENGINEERING

STORM SEWER
MANHOLE CIRCULAR SLABS
4'-0" & 5'-0" DIAMETER

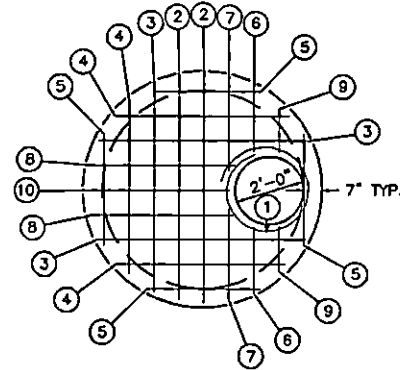
STANDARD DRAWING NO.	104
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	15'-10"	A
2	1	6	6'-6"	STR.
3	1	"	5'-11"	"
4	3	"	5'-3"	"
5	3	"	4'-3"	"
6	4	"	2'-6"	"
7	2	"	2'-7"	"
8	4	"	2'-3"	"
9	2	"	2'-2"	"
10	2	"	1'-10"	"
11	2	"	1'-6"	"
12	2	"	1'-3"	"
13	4	"	1'-0"	"
14	6	"	0'-10"	"

6'-0" DIA.

STANDARD MANHOLES



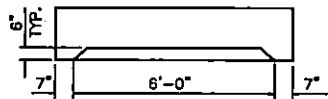
MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	9'-6"	A ₁
2	2	5	6'-9"	STR.
3	3	"	6'-3"	"
4	3	"	5'-3"	"
5	4	"	3'-3"	"
6	2	"	1'-10"	"
7	2	"	2'-9"	"
8	2	"	4'-4"	"
9	2	"	1'-5"	"
10	1	"	4'-3"	"

6'-0" DIA.

SHALLOW MANHOLES

NOTES:

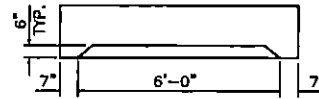
- FOR PIPE SIZES 15" TO 48".
- 6" O.C. SPACING EACH WAY.
- 12" THICK SLAB.
- 7'-2" O.D.
- 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.



SIDE VIEW

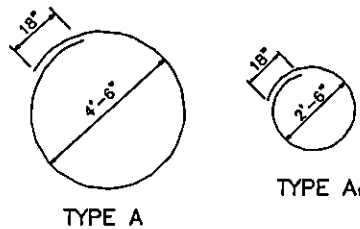
NOTES:

- FOR PIPE SIZES 15" TO 36".
- 9" O.C. SPACING EACH WAY.
- 8" THICK SLAB.
- 7'-2" O.D.
- 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.



SIDE VIEW

SPECIAL BAR BENDS



NOTE:

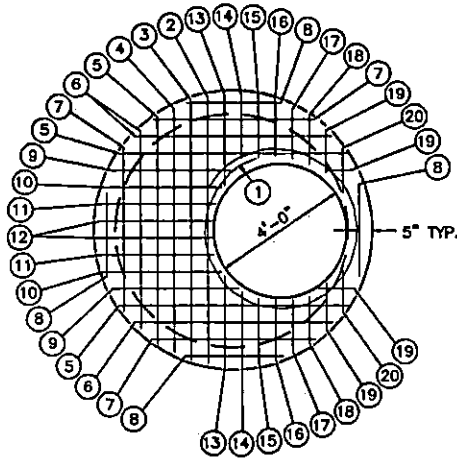
SLAB OUTER DIAMETER TO VARY WITH MANHOLE WALL THICKNESS, TO COMPLETELY COVER MANHOLE WALLS.



DIVISION OF ENGINEERING

STORM SEWER
MANHOLE CIRCULAR SLABS
6'-0" DIAMETER

STANDARD DRAWING NO.	105
APPROVAL	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE

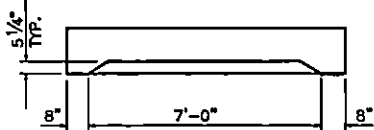


7'-0" DIA.
STANDARD MANHOLES

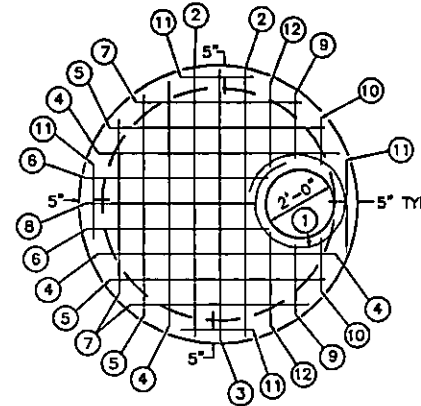
MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	15'-10"	A
2	1	6	7'-10"	STR.
3	1	"	7'-7"	"
4	1	"	7'-2"	"
5	3	"	6'-8"	"
6	3	"	5'-11"	"
7	3	"	4'-11"	"
8	4	"	3'-0"	"
9	2	"	3'-9"	"
10	2	"	3'-7"	"
11	2	"	3'-5"	"
12	2	"	3'-4"	"
13	2	"	2'-10"	"
14	2	"	2'-3"	"
15	2	"	1'-11"	"
16	2	"	1'-8"	"
17	2	"	1'-6"	"
18	2	"	1'-4"	"
19	4	"	1'-3"	"
20	2	"	1'-0"	"

NOTES:

- FOR PIPE SIZES 15" TO 60".
- 6" O.C. SPACING EACH WAY.
- 12" THICK SLAB.
- 8'-4" O.D.
- 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.



SIDE VIEW

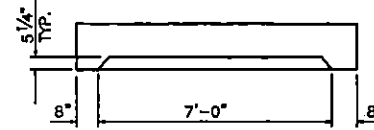


7'-0" DIA.
SHALLOW MANHOLES

MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	9'-6"	A ₁
2	2	5	7'-10"	STR.
3	1	"	8'-0"	"
4	3	"	7'-6"	"
5	3	"	6'-8"	"
6	2	"	5'-7"	"
7	3	"	5'-3"	"
8	1	"	5'-4"	"
9	2	"	2'-2"	"
10	2	"	1'-8"	"
11	4	"	2'-6"	"
12	2	"	3'-0"	"

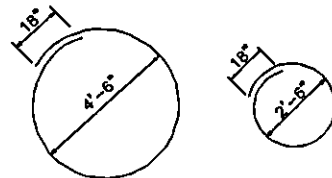
NOTES:

- FOR PIPE SIZES 15" TO 36".
- 9" O.C. SPACING EACH WAY.
- 10" THICK SLAB.
- 8'-4" O.D.
- 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.



SIDE VIEW

SPECIAL BAR BENDS



TYPE A

TYPE A₁

NOTE:
SLAB OUTER DIAMETER TO VARY WITH MANHOLE WALL THICKNESS, TO COMPLETELY COVER MANHOLE WALLS.

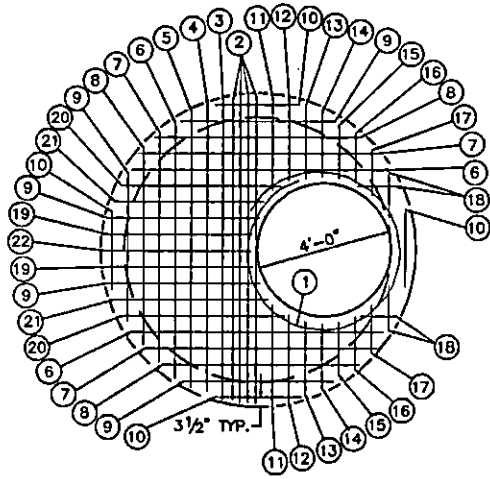
LEXINGTON

DIVISION OF ENGINEERING

STORM SEWER
MANHOLE CIRCULAR SLABS
7'-0" DIAMETER

STANDARD DRAWING NO. 105

APPROVAL: 9/22/17
URBAN COUNTY ENGINEER DATE
COMMISSIONER 9/22/17 DATE

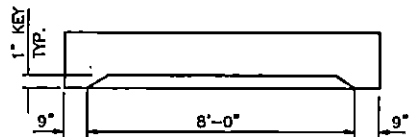


8'-0" DIA.
STANDARD MANHOLE

MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	15'-10"	A
2	4	6	9'-0"	STR.
3	1	"	8'-10"	"
4	1	"	8'-8"	"
5	1	"	8'-3"	"
6	3	"	7'-9"	"
7	3	"	7'-0"	"
8	3	"	6'-0"	"
9	5	"	4'-6"	"
10	4	"	3'-0"	"
11	2	"	3'-0"	"
12	2	"	2'-9"	"
13	2	"	2'-4"	"
14	2	"	2'-0"	"
15	2	"	1'-9"	"
16	2	"	1'-7"	"
17	2	"	1'-6"	"
18	4	"	1'-0"	"
19	2	"	4'-5"	"
20	2	"	5'-0"	"
21	2	"	4'-8"	"
22	1	"	4'-4"	"

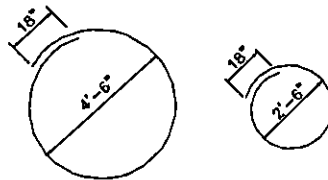
NOTES:

- FOR PIPE SIZES
15" TO 60".
- 6" O.C. SPACING
EACH WAY.
- 12" THICK SLAB.
- 9'-6" O.D.
- 2" MIN. STEEL REINFORCEMENT
COVER ALL FACES.



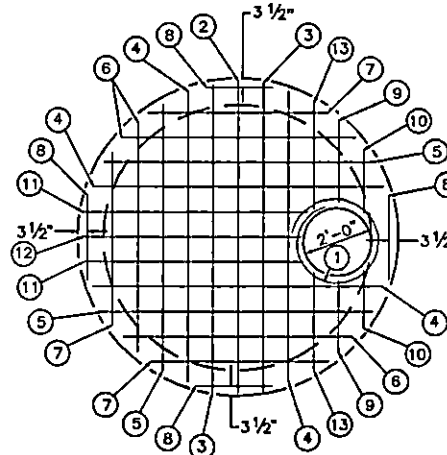
SIDE VIEW

SPECIAL BAR BENDS



TYPE A

TYPE A1

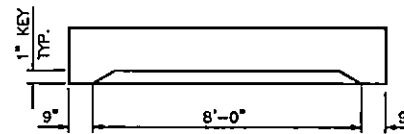


8'-0" DIA.
SHALLOW MANHOLE

MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	9'-6"	A
2	1	5	9'-3"	STR.
3	2	"	9'-0"	"
4	4	"	8'-9"	"
5	3	"	8'-0"	"
6	3	"	7'-0"	"
7	3	"	5'-5"	"
8	4	"	2'-9"	"
9	2	"	2'-3"	"
10	2	"	1'-9"	"
11	2	"	6'-6"	"
12	1	"	6'-2"	"
13	2	"	3'-3"	"

NOTES:

- FOR PIPE SIZES
15" TO 60".
- 9" O.C. SPACING
EACH WAY.
- 10" THICK SLAB.
- 9'-6" O.D.
- 2" MIN. STEEL REINFORCEMENT
COVER ALL FACES.



SIDE VIEW

NOTE:

SLAB OUTER DIAMETER TO VARY WITH
MANHOLE WALL THICKNESS, TO COMPLETELY
COVER MANHOLE WALLS.



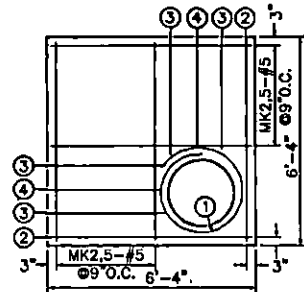
LEXINGTON

DIVISION OF ENGINEERING

STORM SEWER
MANHOLE CIRCULAR SLABS
8'-0" DIAMETER

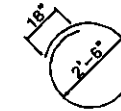
STANDARD DRAWING NO.	107
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

SPECIAL BAR BENDS

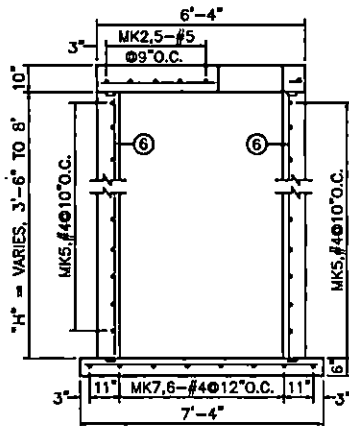


TOP SLAB
2'-0" OPENING

MARK NO.	SIZE	LENGTH	TYPE
1	1	6	9'-6" A ₁
2	12	5	6'-0" STR.
3	4	5	3'-8" "
4	2	5	3'-4" "



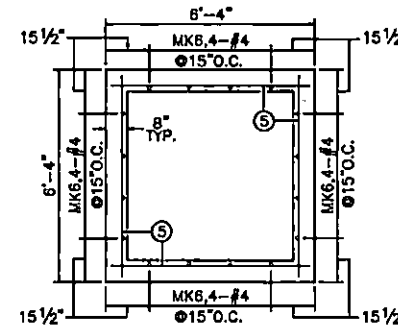
TYPE A₁



VERT. SECTION

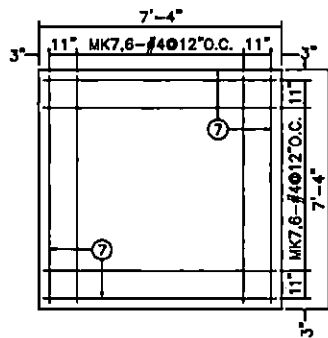
MARK NO.	SIZE	LENGTH	TYPE
5	*	4	6'-0" STR.

* 4 X (HEIGHT OF WALL (INCH)/10)
(ROUNDED UP TO THE NEXT WHOLE NUMBER)



HORIZ. SECTION

MARK NO.	SIZE	LENGTH	TYPE
-6 -	16	4	DIM. "H"-2" STR.



BOTTOM SLAB

MARK NO.	SIZE	LENGTH	TYPE
7	16	4	7'-0" STR.

NOTES:

1. PROVIDE 2" x 4" KEY FOR ALL CONSTRUCTION JOINTS WHEN MANHOLE IS CAST IN PLACE.
2. 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
3. THIS MANHOLE IS INTENDED FOR PIPE AS INDICATED ON STD. DWG. 101, FOR MANHOLE STEPS AND OTHER DETAILS NOT SHOWN ON THIS SHEET, SEE STD. DWGS. 102 & 103.
4. DEPTHS INDICATED IN TITLE ARE MEASURED FROM SURFACE TO M.H. INVERT.

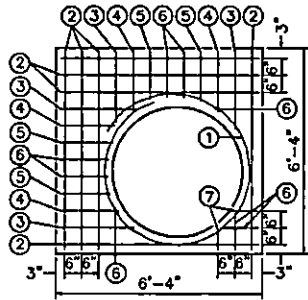


LEXINGTON

DIVISION OF ENGINEERING

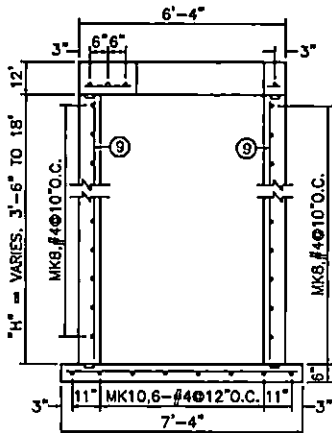
REINFORCEMENT DETAIL
5' NON-CIRCULAR M.H.
LESS THAN 10' DEPTH,
8" WALLS, 10" SLAB

STANDARD DRAWING NO.	108
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE



TOP SLAB
4'-0" OPENING

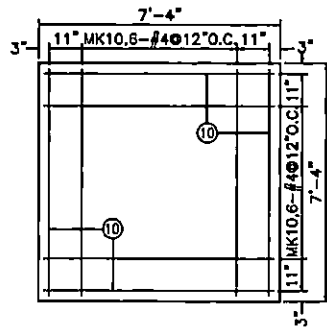
MARK NO.	SIZE	LENGTH	TYPE
1	6	15'-10"	A
2	8	5	STR.
3	4	5	"
4	4	5	"
5	4	5	"
6	8	5	"
7	2	5	"



VERT. SECTION

MARK NO.	SIZE	LENGTH	TYPE
8	4	6'-0"	STR.

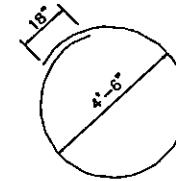
* 4 X (HEIGHT OF WALL (INCH)/10)
(ROUNDED UP TO THE NEXT
WHOLE NUMBER)



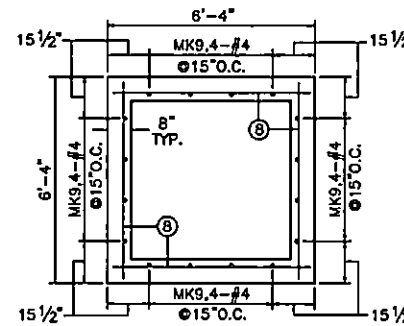
BOTTOM SLAB

MARK NO.	SIZE	LENGTH	TYPE
10	16	4	STR.

SPECIAL BAR BENDS



TYPE A



MARK NO.	SIZE	LENGTH	TYPE
9	16	4	DIM. "H"-2" STR.

HORIZ. SECTION

NOTES:

1. PROVIDE 2" x 4" KEY FOR ALL CONSTRUCTION JOINTS WHEN MANHOLE IS CAST IN PLACE.
2. 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
3. THIS MANHOLE IS INTENDED FOR PIPE AS INDICATED ON STD. DWG. 101, FOR MANHOLE STEPS AND OTHER DETAILS NOT SHOWN ON THIS SHEET, SEE STD. DWGS. 102 & 103.
4. DEPTHS INDICATED IN THE TITLE ARE MEASURED FROM SURFACE TO M.H. INVERT.



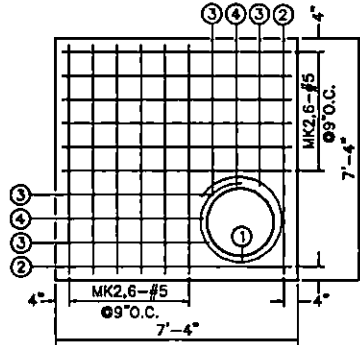
LEXINGTON

DIVISION OF ENGINEERING

REINFORCEMENT DETAIL
5' NON-CIRCULAR M.H.
7'-6" TO 20' DEPTH,
8" WALLS, 12" SLAB

STANDARD DRAWING NO.	109
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

SPECIAL BAR BENDS

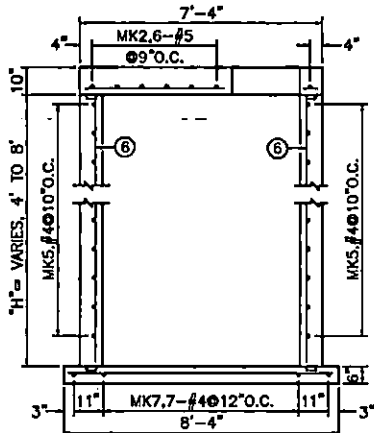


TOP SLAB
2'-0" OPENING

MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	9'-6"	A ₁
2	14	5	7'-0"	STR.
3	4	5	4'-8"	"
4	2	5	4'-4"	"



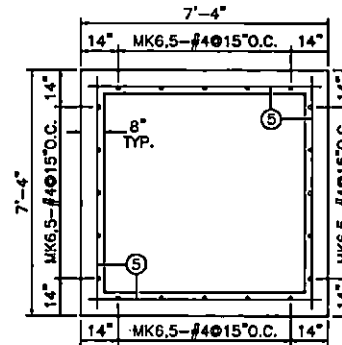
TYPE A₁



VERT. SECTION

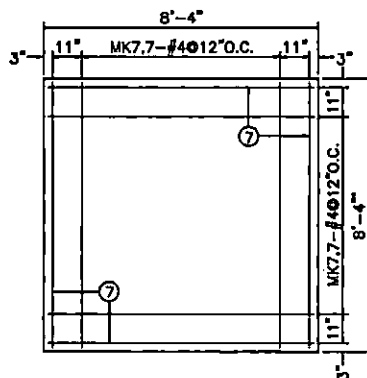
MARK	NO.	SIZE	LENGTH	TYPE
5	*	4	7'-0"	STR.

* 4 X (HEIGHT OF WALL (INCH)/10)
(ROUNDED UP THE NEXT WHOLE NUMBER)



HORIZ. SECTION

MARK	NO.	SIZE	LENGTH	TYPE
6	20	4	DIM. "H"-2"	STR.



BOTTOM SLAB

MARK	NO.	SIZE	LENGTH	TYPE
7	18	4	8'-0"	STR.

NOTES:

1. PROVIDE 2" x 4" KEY FOR ALL CONSTRUCTION JOINTS WHEN MANHOLE IS CAST IN PLACE.
2. 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
3. THIS MANHOLE IS INTENDED FOR PIPE AS INDICATED ON STD. DWG. 101, FOR MANHOLE STEPS AND OTHER DETAILS NOT SHOWN ON THIS SHEET, SEE STD. DWGS. 102 & 103.
4. DEPTHS INDICATED IN TITLE ARE MEASURED FROM SURFACE TO M.H. INVERT.

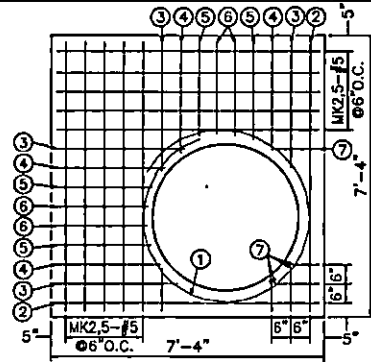


LEXINGTON

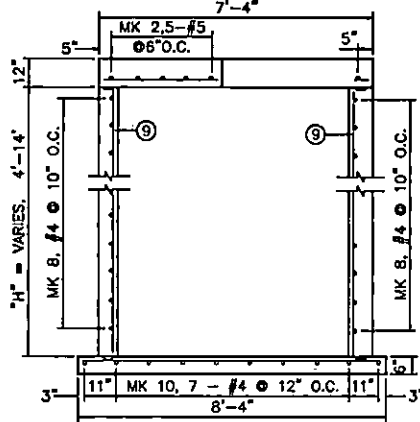
DIVISION OF ENGINEERING

REINFORCEMENT DETAIL
6' NON-CIRCULAR M.H.
LESS THAN 10' DEPTH,
8" WALLS, 10" SLAB

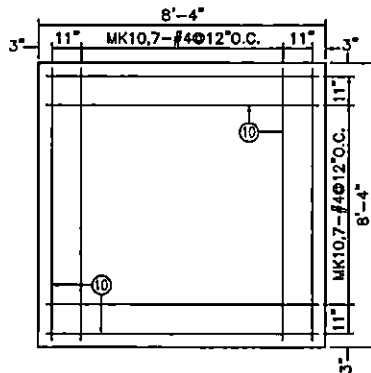
STANDARD DRAWING NO.	110
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



TOP SLAB
4'-0" OPENING



VERT. SECTION



BOTTOM SLAB

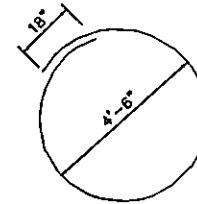
MARK NO.	SIZE	LENGTH	TYPE
1	1	6	15'-10" A
2	12	5	7'-10" STR.
3	4	5	3'-4" "
4	4	5	2'-9" "
5	4	5	2'-5" "
6	4	5	2'-4" "
7	6	5	0'-10" "

MARK NO.	SIZE	LENGTH	TYPE
8	*	4	7'-0" STR.

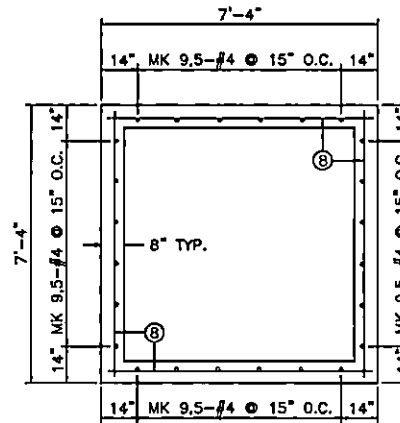
* 4 X (HEIGHT OF WALL (INCH)/10)
(ROUNDED UP TO THE NEXT WHOLE NUMBER)

MARK NO.	SIZE	LENGTH	TYPE
10	18	4	8'-0" STR.

SPECIAL BAR BENDS



TYPE A



HORIZ. SECTION

MARK NO.	SIZE	LENGTH	TYPE
9	20	4	DIM. "H"-2" STR.

NOTES:

1. PROVIDE 2" x 4" KEY FOR ALL CONSTRUCTION JOINTS WHEN MANHOLE IS CAST IN PLACE.
2. 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
3. THIS MANHOLE IS INTENDED FOR PIPE AS INDICATED ON STD. DWG. 101, FOR MANHOLE STEPS AND OTHER DETAILS NOT SHOWN ON THIS SHEET, SEE STD. DWGS. 102 & 103.
4. DEPTHS INDICATED IN TITLE ARE MEASURED FROM SURFACE TO M.H. INVERT.

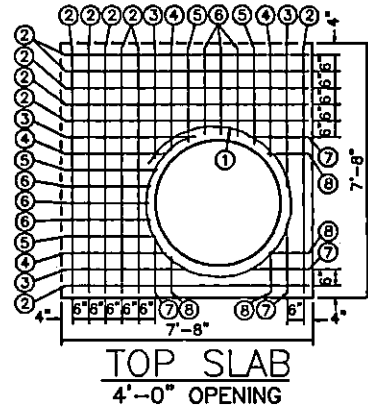


LEXINGTON

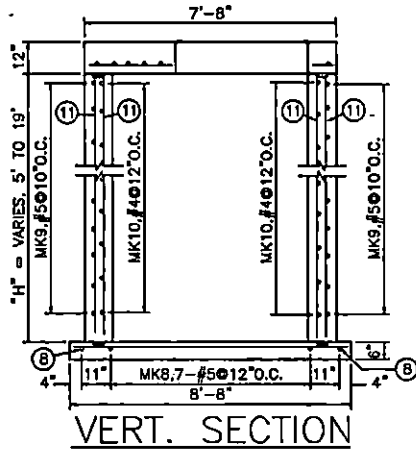
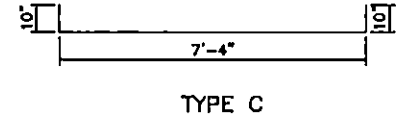
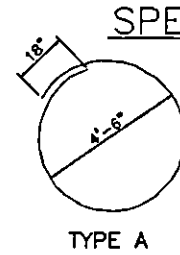
DIVISION OF ENGINEERING

REINFORCEMENT DETAIL
6' NON-CIRCULAR M.H.
8' TO 15' DEPTH,
8" WALLS, 12" SLAB

STANDARD DRAWING NO.	111
APPROVAL:	
URBAN COUNTY ENGINEER	9/22/17
COMMISSIONER	DATE

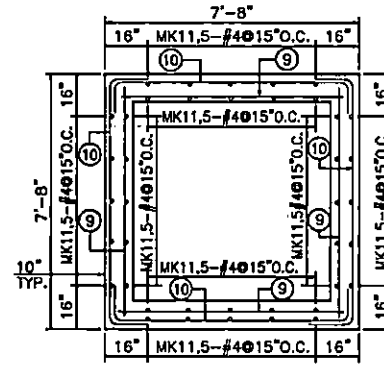


MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	15'-10"	A
2	12	5	7'-4"	STR.
3	4	5	3'-3"	"
4	4	5	2'-9"	"
5	4	5	2'-7"	"
6	6	5	2'-6"	"
7	4	5	1'-2"	"
8	4	5	0'-10"	"

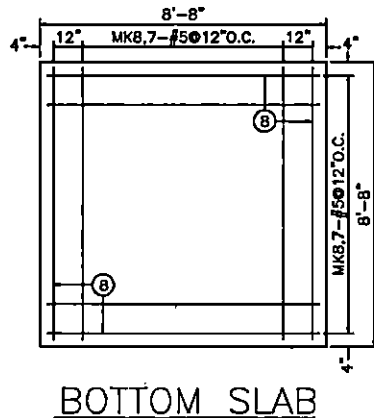


MARK	NO.	SIZE	LENGTH	TYPE
9	*1	5	7'-4"	STR.
10	*2	4	9'-0"	C

*1 4 X (WALL HEIGHT (INCH)/10)
*2 4 X (WALL HEIGHT (INCH)/12)
(ROUNDED UP TO THE NEXT WHOLE NUMBER)



MARK	NO.	SIZE	LENGTH	TYPE
11	40	4	DIM. "H"-2"	STR.



MARK	NO.	SIZE	LENGTH	TYPE
8	18	5	8'-4"	STR.

NOTES:

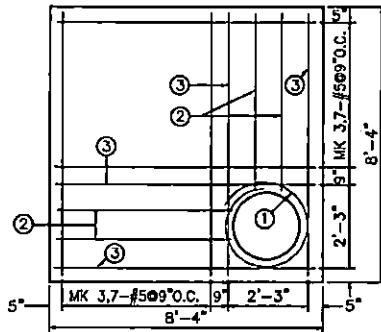
1. PROVIDE 2" x 4" KEY FOR ALL CONSTRUCTION JOINTS WHEN MANHOLE IS CAST IN PLACE.
2. 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
3. THIS MANHOLE IS INTENDED FOR PIPE AS INDICATED ON STD. DWG. 101, FOR MANHOLE STEPS AND OTHER DETAILS NOT SHOWN ON THIS SHEET, SEE STD. DWGS. 102 & 103.
4. DEPTHS INDICATED IN TITLE ARE MEASURED FROM SURFACE TO M.H. INVERT.



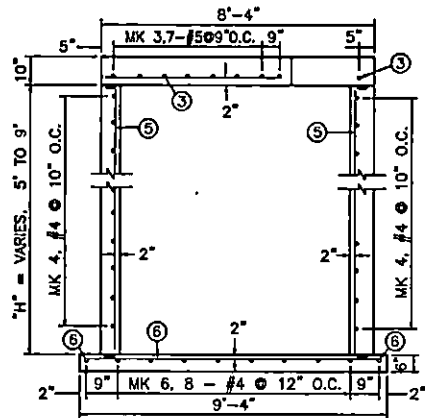
DIVISION OF ENGINEERING

REINFORCEMENT DETAIL
6' NON-CIRCULAR M.H.
15' TO 20' DEPTH,
10" WALLS, 12" SLAB

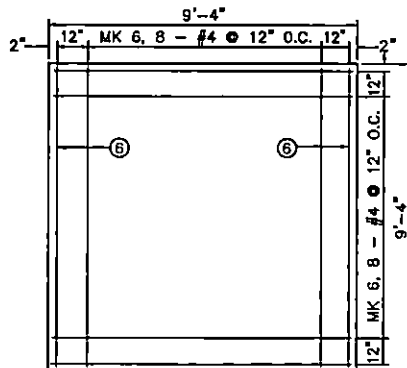
STANDARD DRAWING NO.	112
APPROVAL	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



TOP SLAB
2'-0" OPENING



VERT. SECTION



BOTTOM SLAB

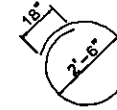
MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	9'-6"	A ₁
2	4	5	5'-5"	STR.
3	18	5	8'-0"	"

MARK	NO.	SIZE	LENGTH	TYPE
4	*	4	8'-0"	STR.

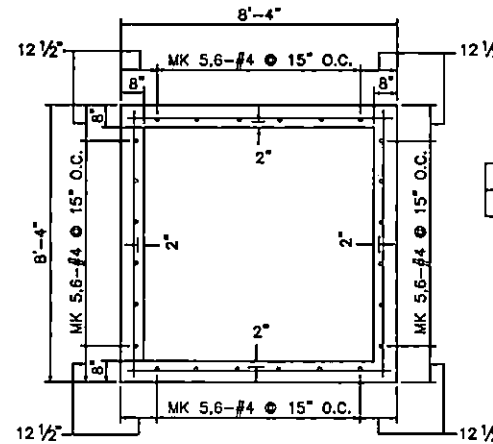
* 4 X (HEIGHT OF WALL)
(INCH)/10 (ROUNDED
TO THE NEXT WHOLE NUMBER.)

MARK	NO.	SIZE	LENGTH	TYPE
6	20	4	9'-0"	STR.

SPECIAL BAR BENDS



TYPE A₁



HORIZ. SECTION

MARK	NO.	SIZE	LENGTH	TYPE
5	24	4	DIM. "H"-2"	STR.

NOTES:

1. PROVIDE 2" X 4" KEYS FOR ALL CONSTRUCTION JOINTS WHEN MANHOLE IS CAST IN PLACE.
2. 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
3. THIS MANHOLE IS INTENDED FOR PIPE AS INDICATED ON STD. DWG. 101, FOR MANHOLE STEPS AND OTHER DETAILS NOT SHOWN ON THIS SHEET, SEE STD. DWGS. 102 & 103.
4. DEPTHS INDICATED IN TITLE ARE MEASURED FROM SURFACE TO M.H. INVERT.

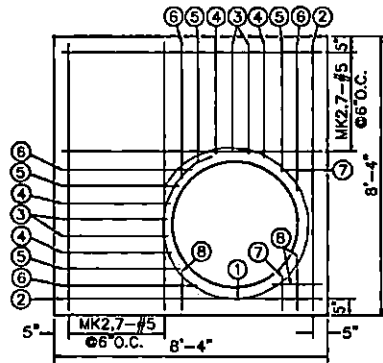


LEXINGTON

DIVISION OF ENGINEERING

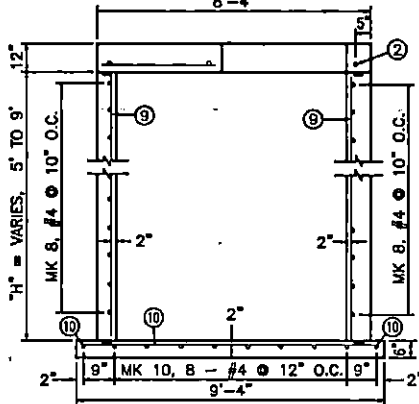
REINFORCEMENT DETAIL
7' NON-CIRCULAR M.H.
LESS THAN 10' DEPTH,
8" WALLS, 10" SLAB

STANDARD DRAWING NO.	113
APPROVAL	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

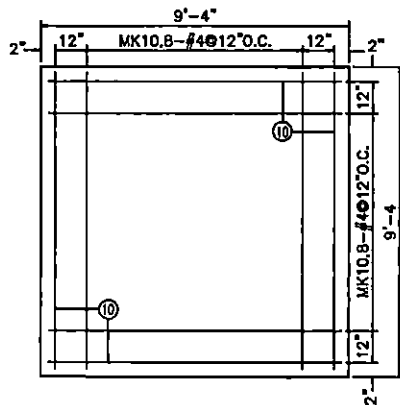


TOP SLAB
4'-0" OPENING

MARK NO.	SIZE	LENGTH	TYPE
1	6	15'-10"	A
2	16	5	STR.
3	4	5	3'-4"
4	4	5	3'-5"
5	4	5	3'-9"
6	4	5	4'-4"
7	2	5	0'-10"
8	3	5	1'-4"



VERT. SECTION



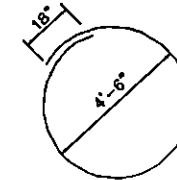
BOTTOM SLAB

MARK NO.	SIZE	LENGTH	TYPE
8	* 4	8'-0"	STR.

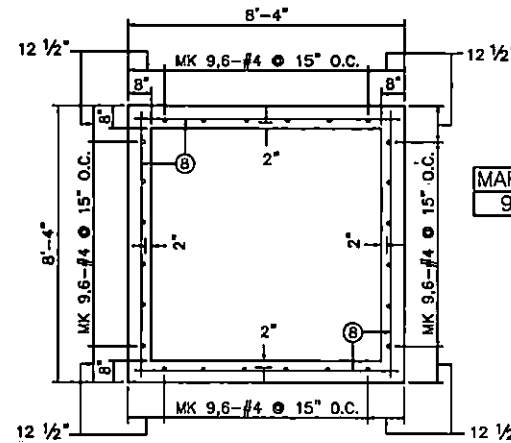
* 4 X (HEIGHT OF WALL (INCH)/10)
(ROUNDED UP TO THE NEXT WHOLE NUMBER)

MARK	NO.	SIZE	LENGTH	TYPE
10	20	4	9'-0"	STR.

SPECIAL BAR BENDS



TYPE A



HORIZ. SECTION

MARK NO.	SIZE	LENGTH	TYPE
9	24	4	DIM, "H"-2" STR.

NOTES:

1. PROVIDE 2" x 4" KEY FOR ALL CONSTRUCTION JOINTS WHEN MANHOLE IS CAST IN PLACE.
2. 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
3. THIS MANHOLE IS INTENDED FOR PIPE AS INDICATED ON STD. DWG. 101, FOR MANHOLE STEPS AND OTHER DETAILS NOT SHOWN ON THIS SHEET, SEE STD. DWGS. 102 & 103.
4. DEPTHS INDICATED IN TITLE ARE MEASURED FROM SURFACE TO M.H. INVERT.

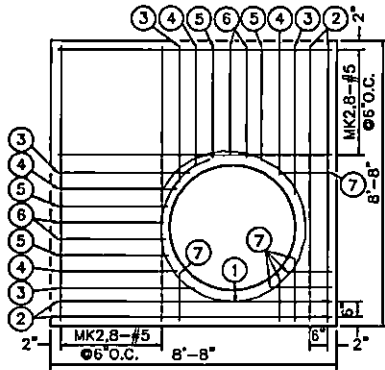


LEXINGTON

DIVISION OF ENGINEERING

REINFORCEMENT DETAIL
7' NON-CIRCULAR M.H.
8' TO 10' DEPTH,
8" WALLS, 12" SLAB

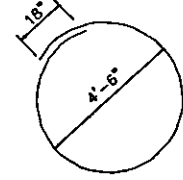
STANDARD DRAWING NO.	114
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



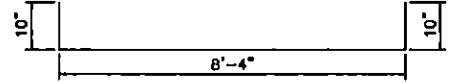
TOP SLAB
4'-0" OPENING

MARK	NO.	SIZE	LENGTH	TYPE
1	1	6	15'-10"	A
2	20	5	8'-4"	STR.
3	4	5	4'-3"	"
4	4	5	3'-9"	"
5	4	5	3'-7"	"
6	4	5	3'-6"	"
7	6	5	1'-2"	"

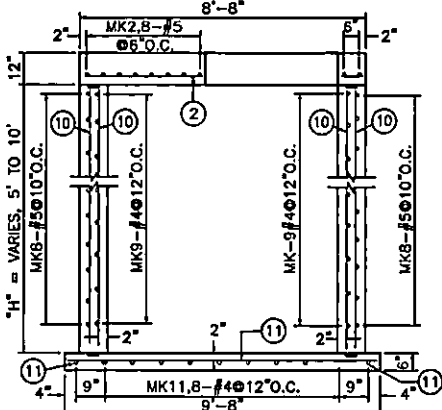
SPECIAL BAR BENDS



TYPE A



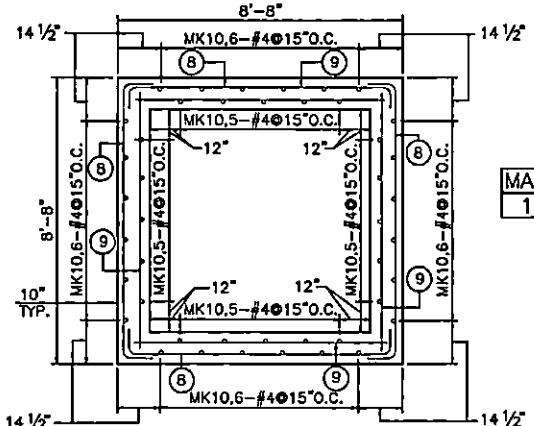
TYPE C



VERT. SECTION

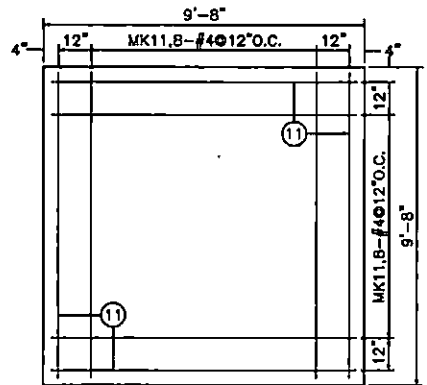
MARK	NO.	SIZE	LENGTH	TYPE
8	*1	5	10'-0"	C
9	*2	4	8'-4"	STR.

*1 4 X (WALL HEIGHT (INCH)/10)
*2 4 X (WALL HEIGHT (INCH)/12)
(ROUNDED UP TO THE NEXT WHOLE NUMBER)



HORIZ. SECTION

MARK	NO.	SIZE	LENGTH	TYPE
10	44	4	DIM. "H"-2"	STR.



BOTTOM SLAB

MARK	NO.	SIZE	LENGTH	TYPE
11	20	4	9'-4"	STR.

NOTES:

1. PROVIDE 2" x 4" KEY FOR ALL CONSTRUCTION JOINTS WHEN MANHOLE IS CAST IN PLACE.
2. 2" MIN. STEEL REINFORCEMENT COVER ALL FACES.
3. THIS MANHOLE IS INTENDED FOR PIPE AS INDICATED ON STD. DWG. 101, FOR MANHOLE STEPS AND OTHER DETAILS NOT SHOWN ON THIS SHEET, SEE STD. DWGS. 102 & 103.
4. DEPTHS INDICATED IN TITLE ARE MEASURED FROM SURFACE TO M.H. INVERT.

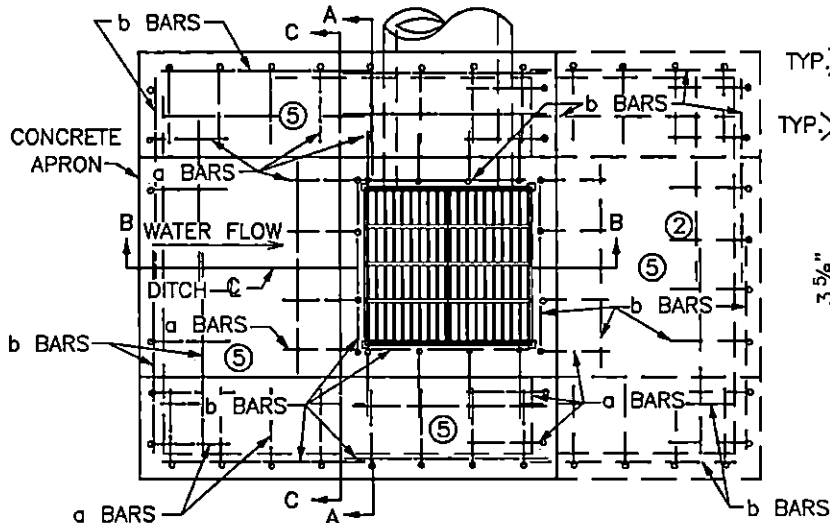


LEXINGTON

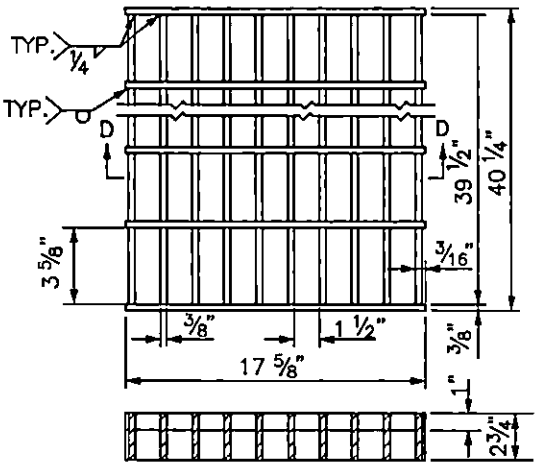
DIVISION OF ENGINEERING

REINFORCEMENT DETAIL
7' NON-CIRCULAR M.H.
10' TO 20' DEPTH,
10" WALLS, 12" SLAB

STANDARD DRAWING NO.	115
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

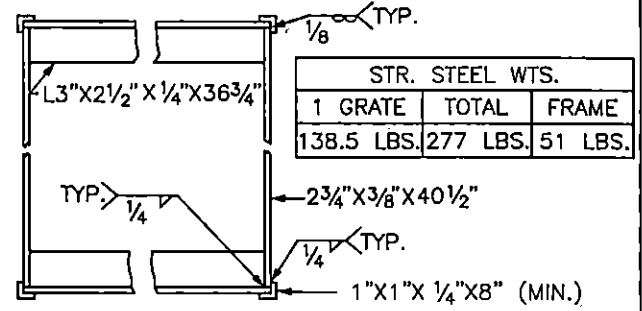


PLAN



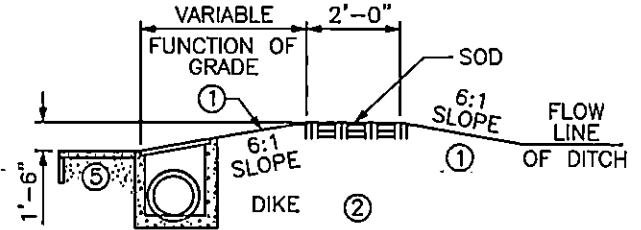
SECTION D-D

DETAIL OF GRATE (TWO REQUIRED)

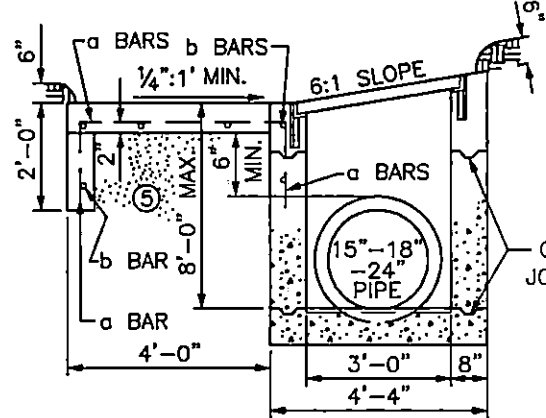


DETAIL OF FRAME

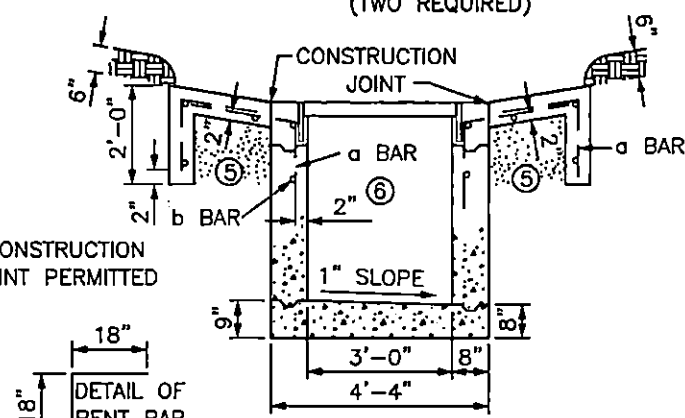
STR. STEEL WTS.		
1 GRATE	TOTAL	FRAME
138.5 LBS.	277 LBS.	51 LBS.



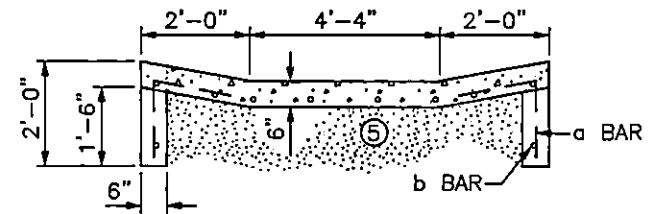
SECTION OF DIKE



SECTION B-B



SECTION A-A



SECTION C-C

- 6 : 1 Slopes are with reference to ditch grade.
- When a box inlet is placed in a sag, omit the earth dike and longitudinal slope of the grate, and provide a concrete apron on each side of the inlet.
- Rate of increase or decrease 0.36 cu. yd. per foot in height.
- Deduct approximately 0.1 cu. yd. of concrete per pipe.
- Compact this volume with D.G.A. base or equivalent.
- Steps are required for depths greater than 4' refer to Std. Dwg. 103.

APPROX. QUANTITIES

TYPE	CONCRETE	REINF. STEEL
3'-9" BOX	③	
SAG	4.4 CU. YD. ④	282 LBS.
GRADE	3.4 CU. YD. ④	192 LBS.

BILL OF REINFORCEMENT

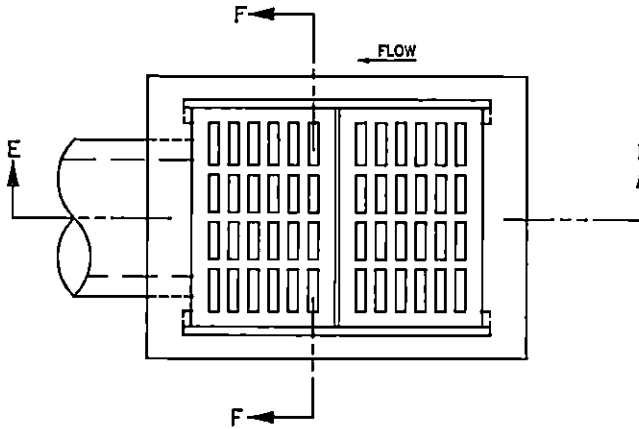
BAR	NO.	SIZE	LENGTH	APPROX. SPACING
a	40 OR 56	#5	3'-0"	12" C TO C
b	25 OR 40	#4	4'-0"	AS SHOWN

LEXINGTON
DIVISION OF ENGINEERING

SURFACE INLET TYPE "A"

STANDARD DRAWING NO. 120

APPROVAL: *[Signature]* 9/22/17
URBAN COUNTY ENGINEER DATE
COMMISSIONER *[Signature]* 9/22/17 DATE

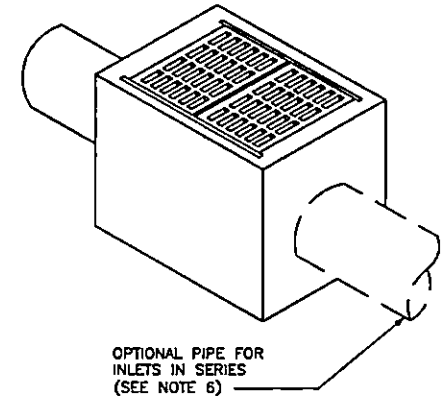


PLAN VIEW

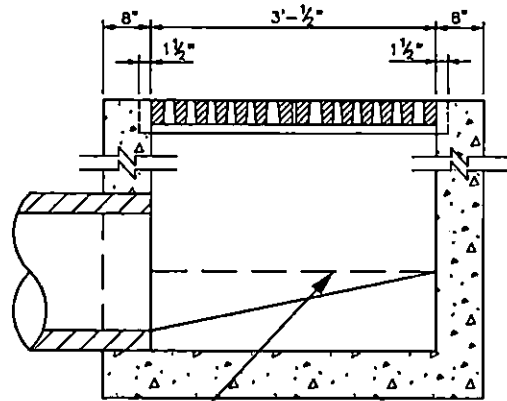
NOTES:

1. NO. 5 STEEL SHALL BE USED THROUGHOUT ON 12" CENTERS.
2. ALL STEEL SHALL HAVE A 2" MINIMUM CLEARANCE TO ANY CONCRETE FACE.
3. NO STEEL IS REQUIRED IN THE BOTTOM SLAB.
4. ALL VERTICAL STEEL SHALL EXTEND 4" INTO BOTTOM SLAB.
5. FOR USE IN PAVED AREAS ONLY.
6. PROVIDE MINIMUM 0.1% SLOPE THROUGH STRUCTURE FOR PIPES IN SERIES. CARRY TROUGH THROUGH. ONLY STRAIGHT THROUGH CONNECTIONS ARE ALLOWED.

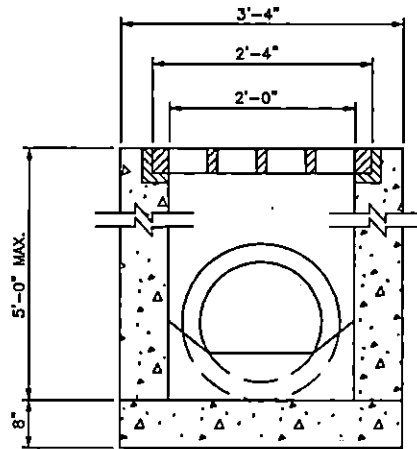
ISOMETRIC VIEW



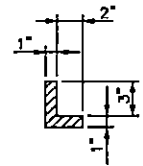
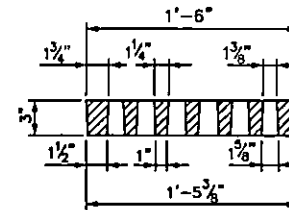
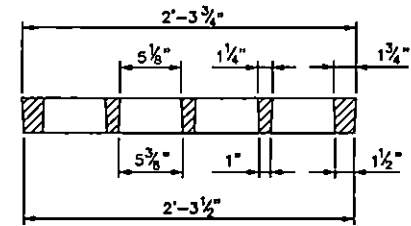
OPTIONAL PIPE FOR INLETS IN SERIES (SEE NOTE 6)



SECTION E-E




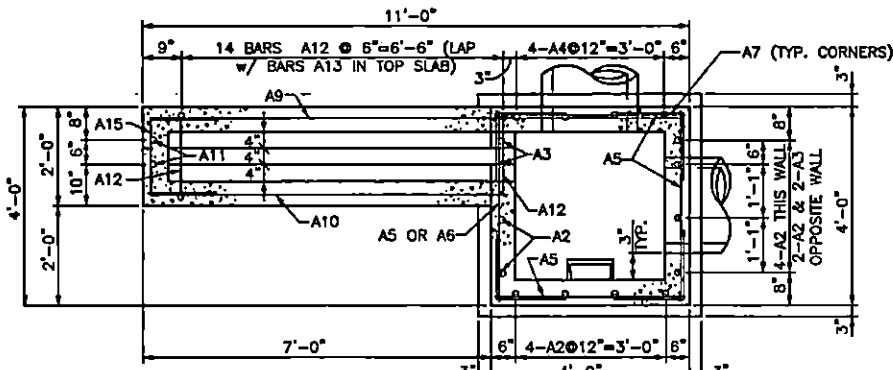
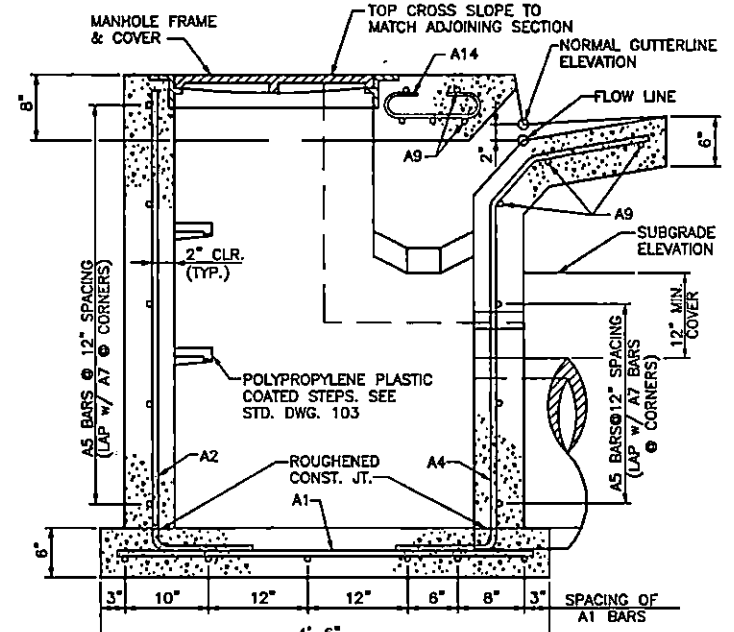
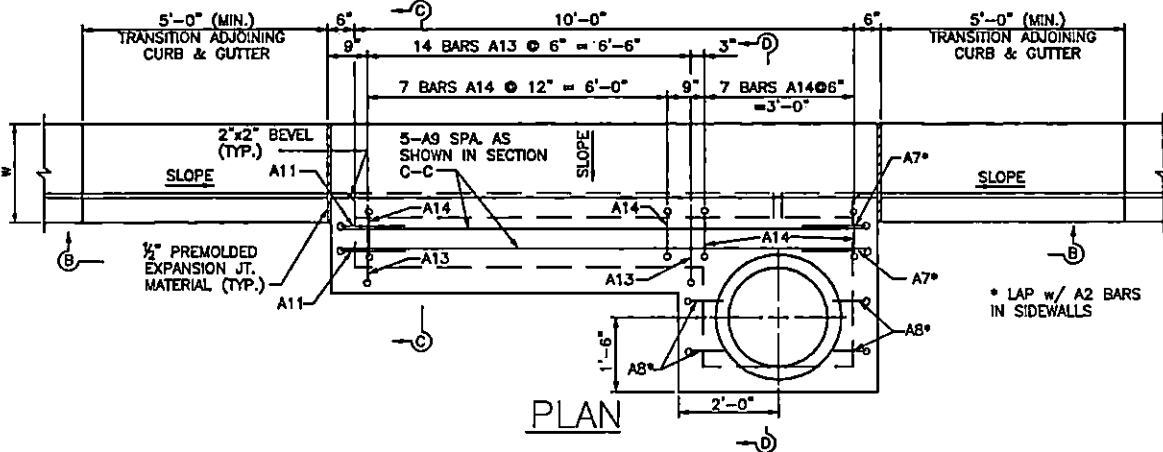
SECTION F-F



GRATE DETAILS

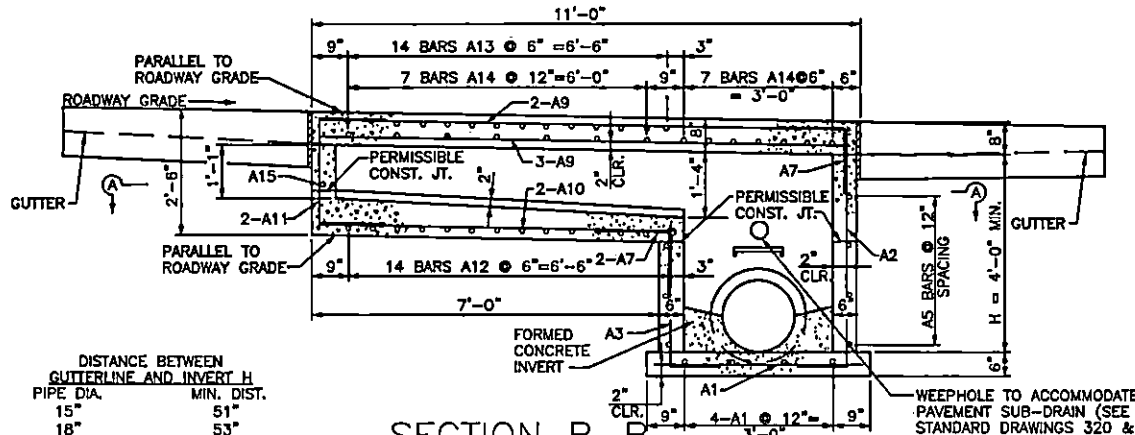
TOP OF BENCH IF PIPE RUNS STRAIGHT THROUGH INLET

 LEXINGTON	
DIVISION OF ENGINEERING	
SURFACE INLET TYPE "B"	
STANDARD DRAWING NO.	121
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE

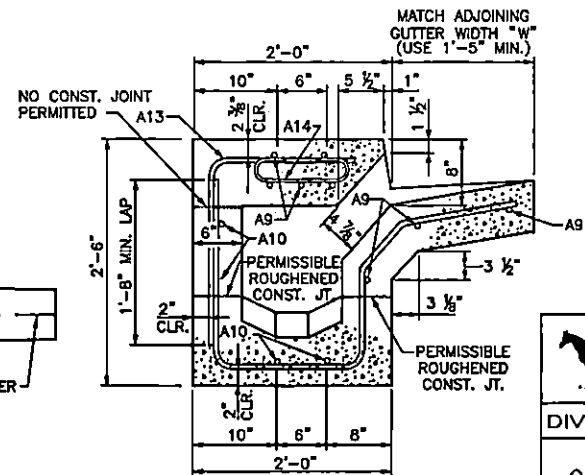


SECTION D-D

SECTION A-A



SECTION B-B



SECTION C-C

DISTANCE BETWEEN GUTTERLINE AND INVERT H	
PIPE DIA.	MIN. DIST.
15"	51"
18"	53"

SEE STD. DWG. 122-2 FOR BILL OF REINFORCEMENT & ADDITIONAL DETAILS



LEXINGTON

DIVISION OF ENGINEERING

CURB BOX INLET TYPE "A"
4'X4' BOX
15"-18" PIPES

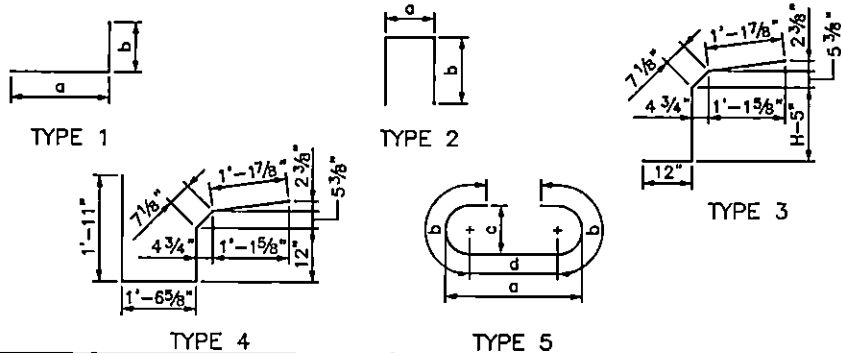
STANDARD DRAWING NO.	122-1
APPROVAL	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

BILL OF REINFORCEMENT

MARK	TYPE	SIZE	NO.	LENGTH		LOCATION	a		b		c		d	
				FT.	IN.		FT.	IN.	FT.	IN.	FT.	IN.		
A1	STR	#5	10	4	2	FOOTING								
A2	1	#5	10	H+(1'-10")		CHAMBER WALLS	1	0	H+10"					
A3	1	#5	2	H-4"		CHAMBER WALLS	1	0	H-(1'-4")					
A4	3	#5	4	H+(2'-4")		CHAMBER FRONT WALL								
A5	STR	#5	15*	3	8	CHAMBER WALLS								
A6	STR	#5	2	2	2	CHAMBER ABOVE THROAT								
A7	1	#5	19*	2	8	CORNERS	1	4	1	4				
A8	1	#5	4	2	1	CHAMBER WALLS & TOP	1	4	0	9				
A9	STR	#5	8	10	8	TOP SLAB & APRON								
A10	STR	#5	4	7	2	THROAT								
A11	2	#5	2	4	8	THROAT	2	1 5/8	1	4				
A12	4	#5	14	6	1	THROAT & APRON								
A13	1	#5	14	3	5	THROAT	1	11	1	6				
A14	5	#3	14	1	11	TOP SLAB	0	11 1/2	0	7	0	3	0	8 1/2
A15	2	#5	1	4	2	END THROAT	1	6	1	4				

* NO. OF BARS REQUIRED FOR H=4'-0"
 ADD OR DEDUCT 4-A5 & 4-A7 FOR EACH 1'-0" INCREASE OR DECREASE IN H.

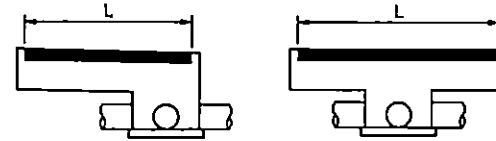
BAR TYPES



NOTES:

1. CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3500 PSI. STEEL REINFORCEMENT SHALL BE ASTM A-615, GRADE 60. ALL EXPOSED EDGES SHALL BE BEVELED 3/4" UNLESS OTHERWISE SHOWN.
2. THIS DRAWING DEPICTS A CURB BOX INLET IN A GRADE SITUATION. FOR CURB BOX INLET IN SAG SITUATION, DETAILS SHALL BE MODIFIED AS INDICATED IN DETAIL 'A'.
3. THE STANDARD OPENING LENGTH IS 10'-0" AS DETAILED HERE. THIS LENGTH MAY BE INCREASED OR DECREASED BASED ON HYDRAULIC ANALYSIS AND APPROVAL BY THE LEXINGTON-FAYETTE COUNTY URBAN GOVERNMENT ENGINEER. MODIFICATION TO THE OPENING LENGTH WILL REQUIRE MODIFICATION OF LENGTH OF BARS A9 & A10 AND INCREASE OR DECREASE IN NUMBER OF BARS A12, A13 & A14 MAINTAINING THE SAME MAXIMUM SPACING SHOWN ON THIS DRAWING.
4. MAXIMUM "H" FOR APPLICATION OF THIS DRAWING SHALL BE 10 FEET.
5. FIELD BEND OR CUT BARS A2, A4, AND A5 AS NECESSARY WHERE PIPES PENETRATE CHAMBER WALLS.
6. FOR CURB BOX INLET IN CURVE WITH CURB RADIUS OF LESS THAN 25', LONGITUDINAL BARS A9, A10 SHALL BE SHOP FABRICATED RADIALLY.

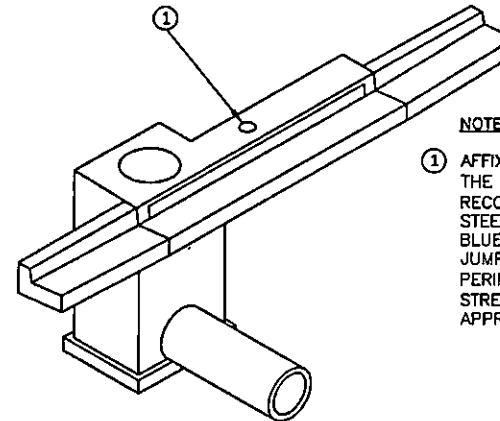
LEXINGTON — FAYETTE URBAN COUNTY GOVERNMENT



GRADE

SAG

DETAIL 'A'
 APPLICABLE SITUATIONS



NOTES:

- ① AFFIX CIRCULAR MARKER TO THE TOP OF THE INLET BOX, PER MANUFACTURER'S RECOMMENDATIONS: 4" DIAMETER STAINLESS STEEL STAMPED DISK WITH BAKED ENAMEL BLUE BACKGROUND. LOGO OF FISH JUMPING OVER WAVES WITH TEXT ON PERIMETER "STORM DRAIN * DRAINS TO STREAM*", ALMETEK INDUSTRIES OR APPROVED EQUAL.

WORK THIS DWG. WITH STD. DWG. 122-1

ISOMETRIC VIEW

LEXINGTON

DIVISION OF ENGINEERING

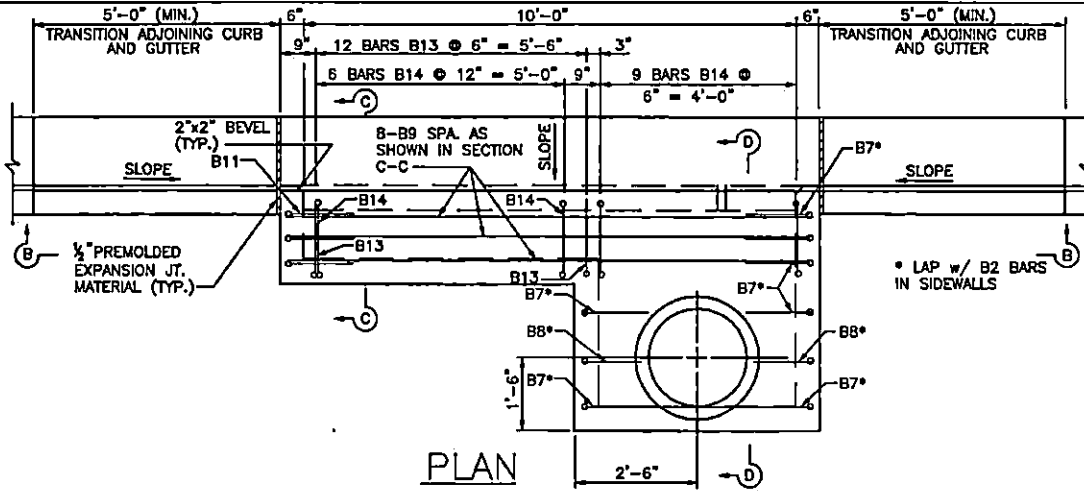
CURB BOX INLET TYPE "A"
 4'X4' BOX
 15'-18" PIPES

STANDARD DRAWING NO. 122-2

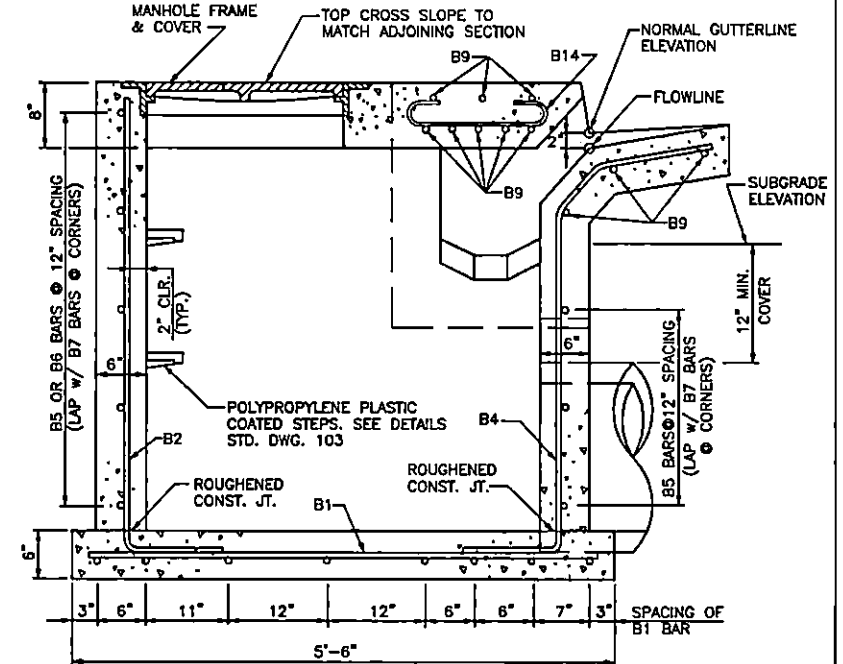
APPROVAL: 9/22/17

URBAN COUNTY ENGINEER: DATE

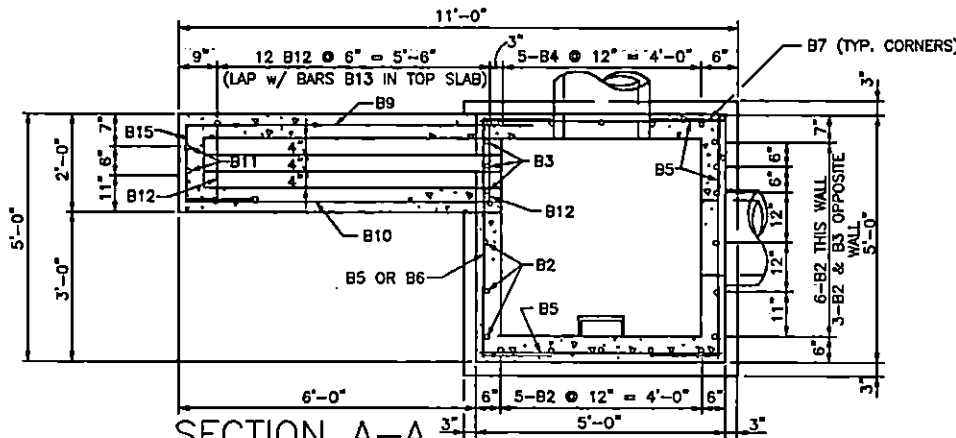
COMMISSIONER: DATE



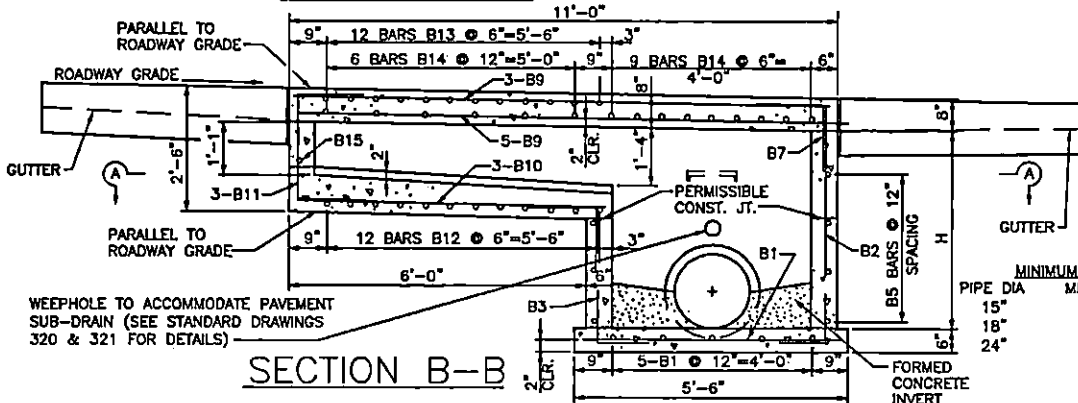
PLAN



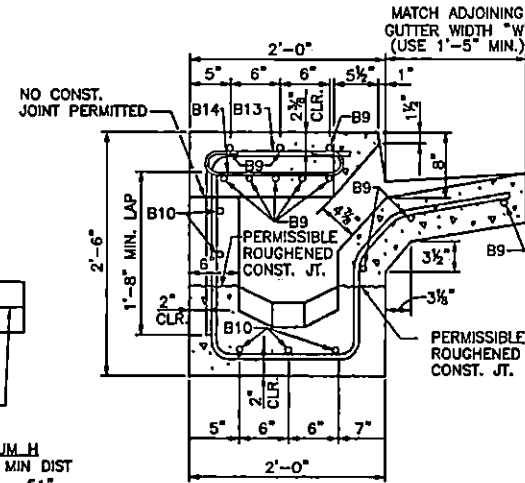
SECTION D-D



SECTION A-A



SECTION B-B



SECTION C-C

PIPE DIA	MINIMUM H	MIN DIST
15"	51"	
18"	53"	
24"	60"	

LEXINGTON
 DIVISION OF ENGINEERING
 CURB BOX INLET TYPE "B"
 5'X5' BOX
 15"-24" PIPES

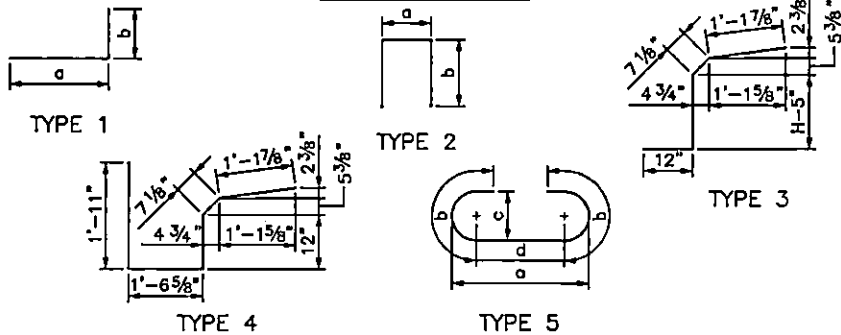
STANDARD DRAWING NO. 123-1
 APPROVAL: [Signature] 9/22/17
 URBAN COUNTY ENGINEER: [Signature] 9/22/17
 COMMISSIONER: [Signature] DATE

BILL OF REINFORCEMENT

MARK	TYPE	SIZE	NO.	LENGTH		LOCATION	a		b		c		d	
				FT.	IN.		FT.	IN.	FT.	IN.	FT.	IN.		
B1	STR	#5	13	5	2	FOOTING								
B2	1	#5	14	H+(1'-10")		CHAMBER WALLS	1	0	H+10"					
B3	1	#5	3	H-4"		CHAMBER WALLS	1	0	H-(1'-4")					
B4	3	#5	5	H+(2'-4")		CHAMBER FRONT WALL								
B5	STR	#5	15*	4	8	CHAMBER WALLS								
B6	STR	#5	2	3	2	CHAMBER ABOVE THROAT								
B7	1	#5	25*	2	8	CORNERS	1	4	1	4				
B8	1	#5	2	2	6	CHAMBER WALLS & TOP	1	4	1	2				
B9	STR	#5	11	10	8	TOP SLAB & APRON								
B10	STR	#5	5	6	2	THROAT								
B11	2	#5	3	4	8	THROAT	2	1 5/8	1	4				
B12	4	#5	12	6	1	THROAT & APRON								
B13	1	#5	12	3	5	THROAT	1	11	1	6				
B14	5	#5	15	2	4	TOP SLAB	1	5	0	7	0	3	1	2
B15	2	#5	1	4	1	END THROAT	1	6	1	4				

* NO. OF BARS REQUIRED FOR H=4'-0"
ADD OR DEDUCT 4-B5 & 4-B7 FOR EACH 1'-0" INCREASE OR DECREASE IN H.

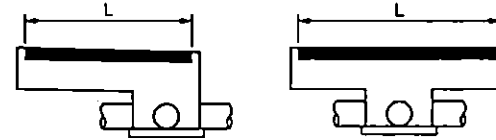
BAR TYPES



NOTES:

1. CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3500 PSI. STEEL REINFORCEMENT SHALL BE ASTM A-615, GRADE 60. ALL EXPOSED EDGES SHALL BE BEVELED 3/4" UNLESS OTHERWISE SHOWN.
2. THIS DRAWING DEPICTS A CURB BOX INLET IN A GRADE SITUATION. FOR CURB BOX BOX IN SAG SITUATION, DETAILS SHALL BE MODIFIED AS INDICATED IN DETAIL 'A'.
3. THE STANDARD OPENING LENGTH IS 10'-0" AS DETAILED HERE. THIS LENGTH MAY BE INCREASED OR DECREASED BASED ON HYDRAULIC ANALYSIS AND APPROVAL BY THE LEXINGTON-FAYETTE COUNTY URBAN GOVERNMENT ENGINEER. MODIFICATION TO THE OPENING LENGTH WILL REQUIRE MODIFICATION OF LENGTH OF BARS B9 & B10 AND INCREASE OR DECREASE IN NUMBER OF BARS B12, B13 & B14 MAINTAINING THE SAME MAXIMUM SPACING SHOWN ON THIS DRAWING.
4. MAXIMUM "H" FOR APPLICATION OF THIS DRAWING SHALL BE 10 FEET.
5. FIELD BEND OR CUT BARS B2, B4, AND B5 AS NECESSARY WHERE PIPES PENETRATE CHAMBER WALLS.
6. FOR CURB BOX INLET IN CURVE WITH CURB RADIUS OF LESS THAN 25', LONGITUDINAL BARS B9, B10 SHALL BE SHOP FABRICATED RADIALLY.
7. 30" PIPE MAY BE APPROVED IF BOTH PIPES ARE INSTALLED ON THE SAME LINE.

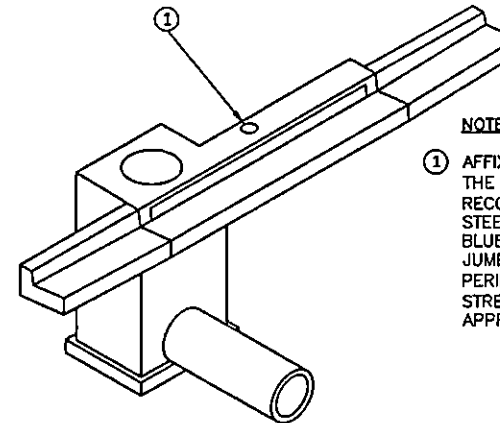
LEXINGTON — FAYETTE URBAN COUNTY GOVERNMENT



GRADE

SAG

DETAIL 'A'
APPLICABLE SITUATIONS



NOTES:

- ① AFFIX CIRCULAR MARKER TO THE TOP OF THE INLET BOX, PER MANUFACTURER'S RECOMMENDATIONS: 4" DIAMETER STAINLESS STEEL STAMPED DISK WITH BAKED ENAMEL BLUE BACKGROUND. LOGO OF FISH JUMPING OVER WAVES WITH TEXT ON PERIMETER "STORM DRAIN * DRAINS TO STREAM". ALMETEK INDUSTRIES OR APPROVED EQUAL.

WORK THIS DWG. WITH STD. DWG. 123-1

ISOMETRIC VIEW

LEXINGTON

DIVISION OF ENGINEERING

CURB BOX INLET TYPE "B"
5'X5' BOX
15"-24" PIPES

STANDARD DRAWING NO. 123-2

APPROVAL: 9/22/17

URBAN COUNTY ENGINEER DATE

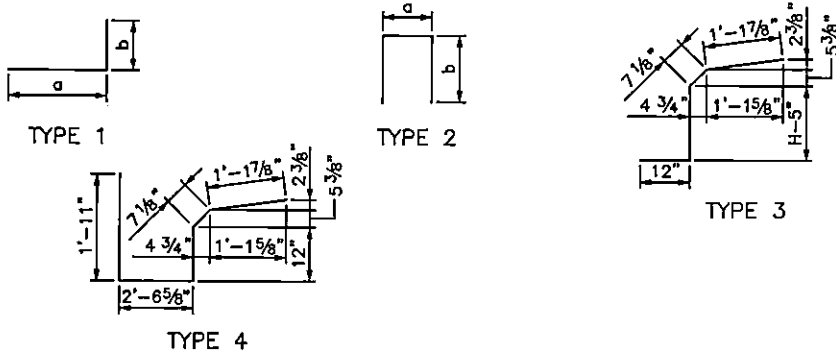
COMMISSIONER DATE

BILL OF REINFORCEMENT

MARK	TYPE	SIZE	NO.	LENGTH		LOCATION	a		b		c		d	
				FT.	IN.		FT.	IN.	FT.	IN.	FT.	IN.		
C1	STR	#5	7	4	2	FOOTING								
C2	STR	#5	4	3	2	FOOTING								
C3	1	#5	9	H+(1'-10")		CHAMBER WALLS	1	0	H+10"					
C4	1	#5	5	H-4"		CHAMBER WALLS	1	0	H-(1'-4")					
C5	3	#5	4	H+(2'-4")		CHAMBER WALLS								
C6	STR	#5	7*	2	8	CHAMBER WALLS								
C7	STR	#5	6*	3	8	CHAMBER WALLS								
C8	1	#5	19*	2	8	CORNERS	1	4	1	4				
C9	1	#5	5	2	1	CHAMBER WALLS & TOP	1	4	0	9				
C10	STR	#5	5	10	8	THROAT & APRON								
C11	STR	#5	5	7	7	TOP SLAB								
C12	STR	#5	5	7	2	THROAT								
C13	2	#5	5	4	8	END THROAT	2	1	1	4				
C14	4	#5	14	7	1	THROAT & APRON								
C15	1	#5	14	4	5	THROAT	1	11	2	6				
C16	2	#5	1	5	1	END THROAT	2	6	1	4				

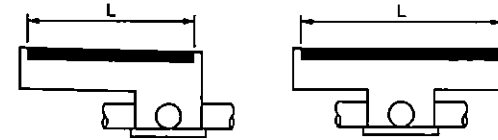
* NO. OF BARS REQUIRED FOR H=4'-0"
 ADD OR DEDUCT 2-C6, 2-C7 & 4-C8 FOR EACH 1'-0" INCREASE OR DECREASE IN H.

BAR TYPES



NOTES:

1. CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3500 PSI. STEEL REINFORCEMENT SHALL BE ASTM A-615, GRADE 60. ALL EXPOSED EDGES SHALL BE BEVELED 3/4" UNLESS OTHERWISE SHOWN.
2. THIS DRAWING DEPICTS A CURB BOX INLET IN A GRADE SITUATION. FOR CURB BOX INLET IN SAG SITUATION, DETAILS SHALL BE MODIFIED AS INDICATED IN DETAIL 'A'.
3. THE STANDARD OPENING LENGTH IS 10'-0" AS DETAILED HERE. THIS LENGTH MAY BE INCREASED OR DECREASED BASED ON HYDRAULIC ANALYSIS AND APPROVAL BY THE LEXINGTON-FAYETTE URBAN COUNTY GOVERNMENT ENGINEER. MODIFICATION TO THE OPENING LENGTH WILL REQUIRE MODIFICATION OF LENGTH OF BARS C10, C11 & C12 AND INCREASE OR DECREASE IN NUMBER OF BARS C14 & C15 MAINTAINING THE SAME MAXIMUM SPACING SHOWN ON THIS DRAWING.
4. MAXIMUM "H" FOR APPLICATION OF THIS DRAWING SHALL BE 5 FEET.
5. FIELD BEND OR CUT BARS C3, C5, C6 & C7 AS NECESSARY WHERE PIPES PENETRATE CHAMBER WALLS.
6. FOR CURB BOX INLET IN CURVE WITH CURB RADIUS OF LESS THAN 25', LONGITUDINAL BARS C10, C11 & C12 SHALL BE SHOP FABRICATED RADIALLY.

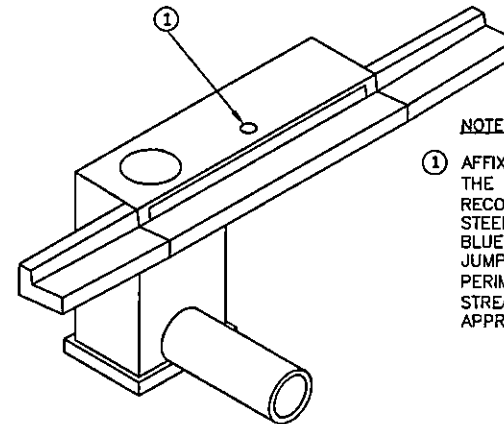


GRADE

SAG

DETAIL 'A'

APPLICABLE SITUATIONS



NOTES:

- ① AFFIX CIRCULAR MARKER TO THE TOP OF THE INLET BOX, PER MANUFACTURER'S RECOMMENDATIONS: 4" DIAMETER STAINLESS STEEL STAMPED DISK WITH BAKED ENAMEL BLUE BACKGROUND. LOGO OF FISH JUMPING OVER WAVES WITH TEXT ON PERIMETER "STORM DRAIN * DRAINS TO STREAM*". ALMETEK INDUSTRIES OR APPROVED EQUAL.

WORK THIS DWG. WITH STD. DWG. 124-1

ISOMETRIC VIEW



LEXINGTON

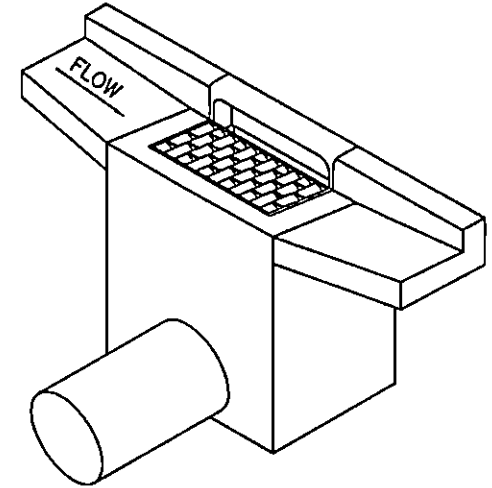
DIVISION OF ENGINEERING

CURB BOX INLET TYPE "C"
 4'X3' BOX
 SINGLE PIPE
 15" OR LESS

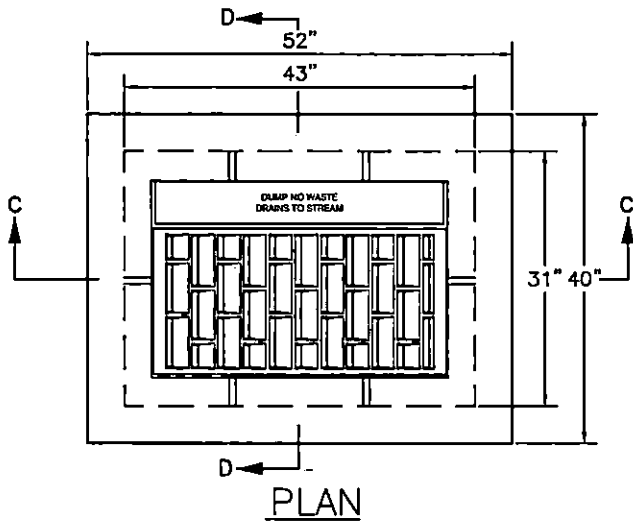
STANDARD DRAWING NO.	124-2
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE

NOTES:

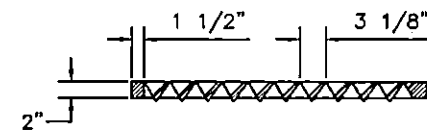
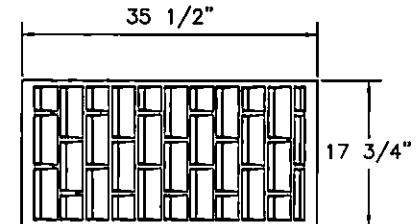
1. CURB BOX ADJUSTABLE 6" TO 9" TO MATCH TOP OF CURB.
2. NO. 5 STEEL SHALL BE USED THROUGHOUT ON 12" CENTERS. 2" CLEARANCE ON ALL EXTERIOR WALL BARS. EXTERIOR HORIZ. WALL BARS SHALL HAVE A 12" MIN. LAP AT CORNERS.
3. ALL EXPOSED FLATWORK SHALL HAVE A HAND FLOATED AND BROOMED FINISH.
4. NO STEEL IS REQUIRED IN BOTTOM SLAB.
5. ALL VERTICAL STEEL SHALL EXTEND 4" INTO BOTTOM SLAB. VERTICAL STEEL SHALL HAVE A 12" LAP INTO BOTTOM SLAB WITH 3" CLEARANCE FROM EXTERIOR BOTTOM.
6. SET BACK OF FRAME IN CONCRETE TO ANCHOR IN PLACE AFTER IT HAS BEEN ADJUSTED.
7. 18" MAX. PIPE DIAMETER.
8. EAST JORDAN IRON WORKS CATCH BASIN CURB INLET 7035 WITH TYPE M6 GRATE OR EQUIVALENT.
9. TOP OF CURB SECTION SHALL BE CAST WITH "DUMP NO WASTE DRAINS TO STREAM".



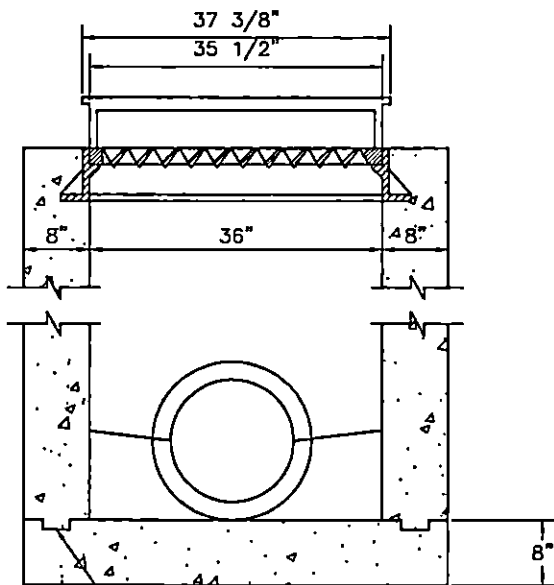
ISOMETRIC VIEW



PLAN

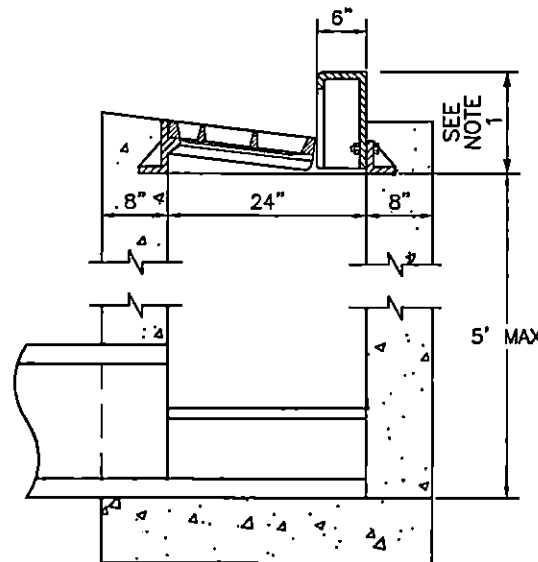


GRATE DETAIL





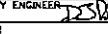
2"x4" KEY AT CONSTRUCTION JOINTS

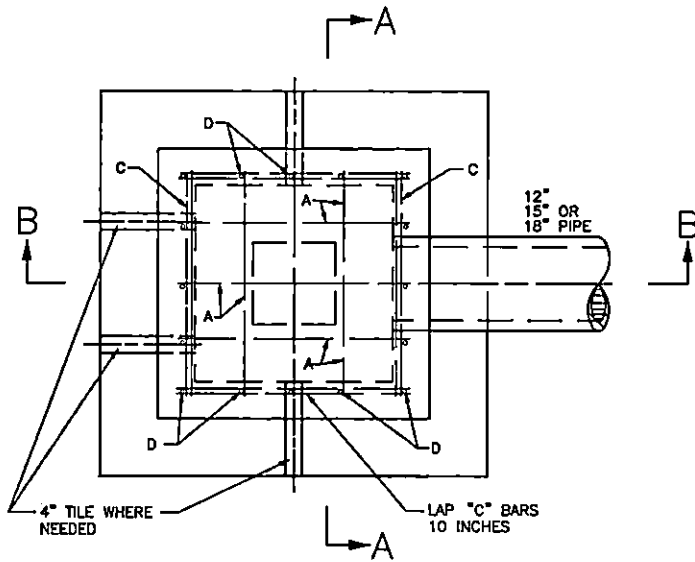
SECTION C-C



SEE NOTE 1

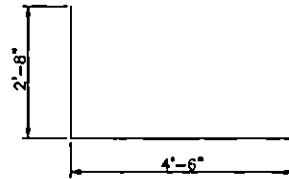
SECTION D-D

 LEXINGTON	
DIVISION OF ENGINEERING	
CURB BOX INLET TYPE "D"	
STANDARD DRAWING NO. 125	
APPROVAL: 	9/22/17
URBAN COUNTY ENGINEER: 	DATE: 9/22/17
COMMISSIONER	DATE



PLAN

DETAIL C-BAR



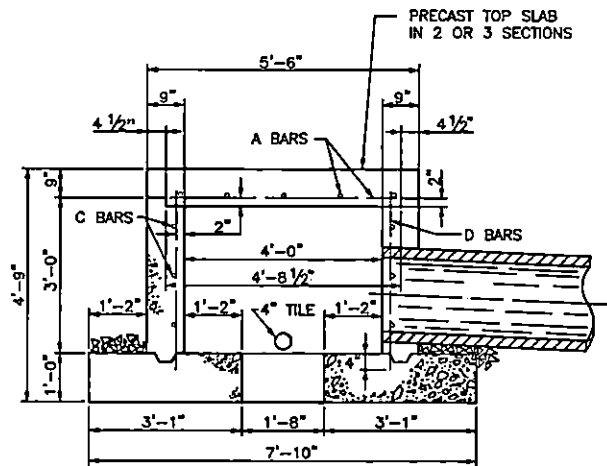
BILL OF REINFORCEMENT

MARK	QUANTITY	SIZE	LENGTH	LOCATION	DESCRIPTION
A	10	1/2" Ø	4'-7"	TOP SLAB	STRAIGHT
C	6	"	9'-9"	WALL	BENT
D	16	"	3'-4"	"	STRAIGHT

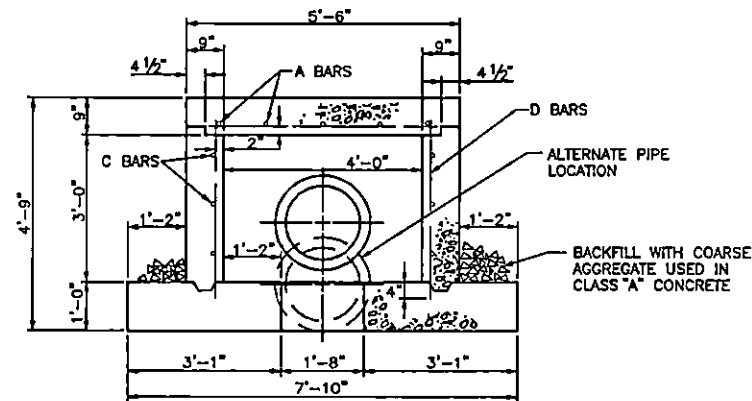
STEEL REINFORCEMENT 105 LBS.
 12" CLASS "A" CONCRETE 4.61 CU. YDS.
 15" CLASS "A" CONCRETE 4.59 CU. YDS.
 18" CLASS "A" CONCRETE 4.58 CU. YDS.

NOTES:


1. LOCATION OF OPENING MAY BE DETERMINED IN THE FIELD FOR A SIDE OR BOTTOM SPRING INLET.
2. TYPE "A" TO BE USED WHEN FILL OVER TOP IS 10' OR MORE.



SECTION B-B



SECTION A-A

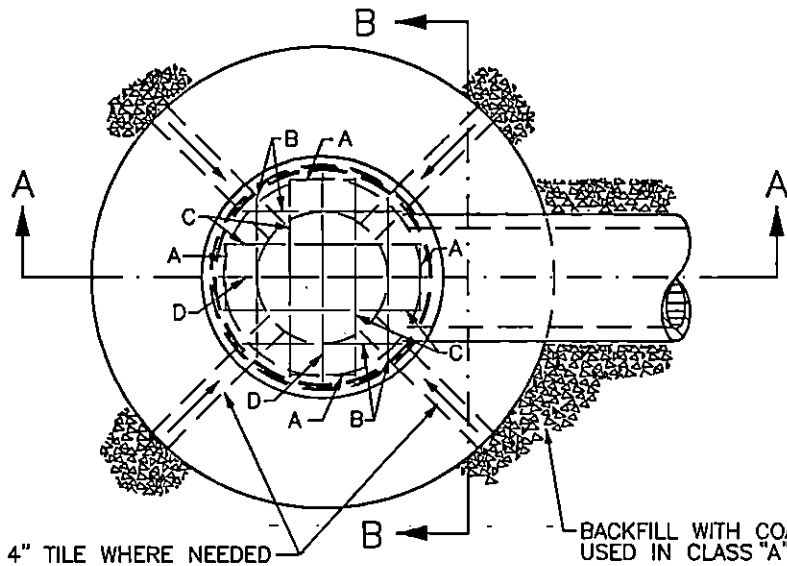


LEXINGTON

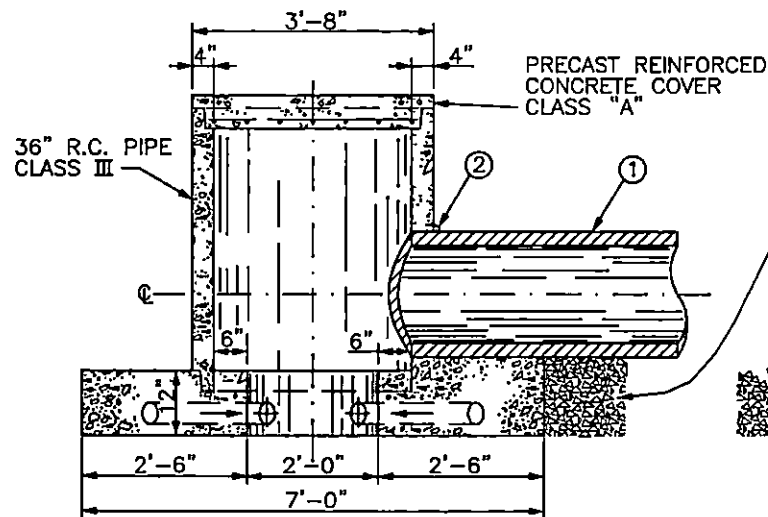
DIVISION OF ENGINEERING

SPRING BOX INLET
TYPE "A"

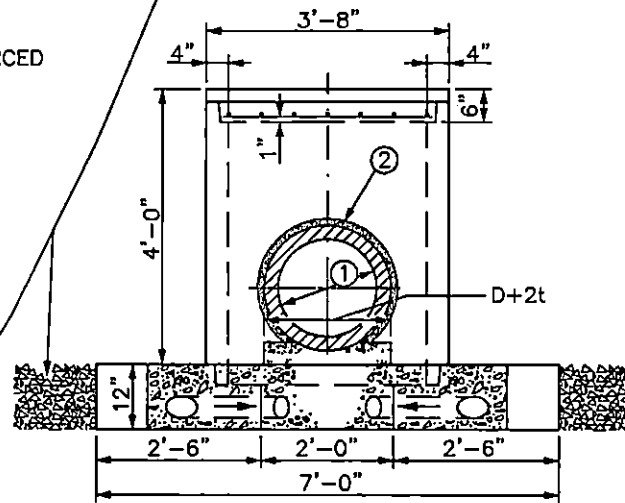
STANDARD DRAWING NO.	126
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



PLAN



SECTION A-A



SECTION B-B


NOTES:

1. SPRING BOX INLET TYPE "B" MAY BE USED WHEN FILL OVER TOP IS LESS THAN 10'.
 ① 12", 15", OR 18" DIAMETER PIPE OUTLET (SEE PIPE SECTIONS FOR SIZE AND TYPE)
2. MORTAR AROUND PIPE TO PREVENT SEEPAGE.
3. STEEL REINFORCEMENT PLACED 6" ON CENTERS.

STEEL REINFORCEMENT 13 LBS.
 CLASS "A" CONCRETE 1.54 CU. YDS.

BILL OF REINFORCEMENT

MARK	QUANTITY	SIZE	LENGTH
A	4	NO.3	1'-0"
B	4	"	2'-5"
C	4	"	3'-0"
D	2	"	3'-2"
MARK	LOCATION	DESCRIPTION	
A	TOP	STRAIGHT	
B	"	"	
C	"	"	
D	"	"	





LEXINGTON

DIVISION OF ENGINEERING

SPRING BOX INLET
TYPE "B"

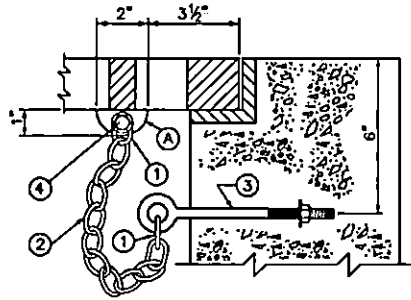
STANDARD DRAWING NO. 127

APPROVAL:  9/22/17

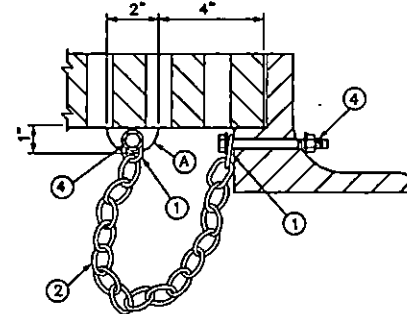
URBAN COUNTY ENGINEER  DATE

COMMISSIONER 9/22/17

DATE



GRATE CONNECTED TO WALL

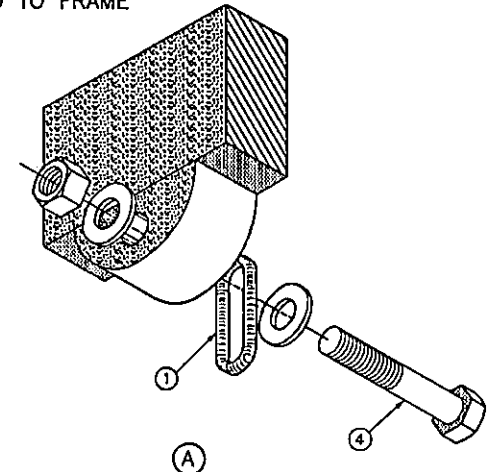


GRATE CONNECTED TO FRAME

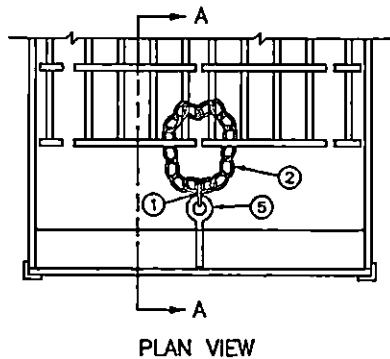
TYPICAL ILLUSTRATIONS FOR CASTINGS

NOTES:

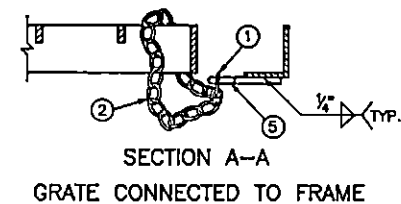
- ① CHAIN SHACKLE, OR COLD SHUT OF AN APPROVED TYPE.
- ② 3/8" PROOF COIL CHAIN OF SUFFICIENT LENGTH TO ALLOW REMOVAL AND DISPLACEMENT OF GRATE, 18" MIN.
- ③ 3/8" x 6" EYE BOLT, NUT, AND WASHER.
- ④ 3/8" HEX HEAD CAP SCREW (GRADE 2), NUT AND WASHERS. LENGTH DETERMINED BY THICKNESS OF FRAME OR GRATE. 7/16" DIA. HOLE FOR CAP SCREW. BATTER THREADS ON CAP SCREW TO PREVENT REMOVAL OF NUT.
- ⑤ 3/8" EYE BOLT (LENGTH DETERMINED BY THE FRAME DIMENSION).
6. ALL EYE BOLTS SHALL HAVE A CONTINUOUS OR SOLID EYE.
7. ALL HARDWARE SHALL BE GALVANIZED AND OF COMMERCIAL QUALITY AND SHALL BE APPROVED BY THE ENGINEER.
8. THE COST OF THE COMPLETE SECURITY DEVICE, INSTALLED, SHALL BE INCIDENTAL TO THE COST OF THE STRUCTURE.
9. THE DESIGNS SHOWN ARE ACCEPTABLE; HOWEVER ARE SUBJECT TO CHANGE IF APPROVED IN WRITING BY THE ENGINEER.



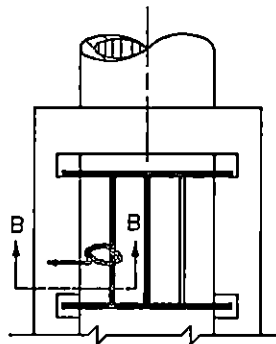
LUG ON CENTER CROSS MEMBER AND BOLT ASSEMBLY (AXONOMETRIC VIEW)



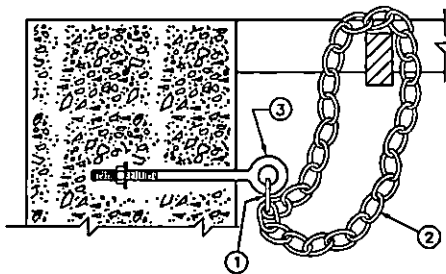
PLAN VIEW



SECTION A-A
GRATE CONNECTED TO FRAME

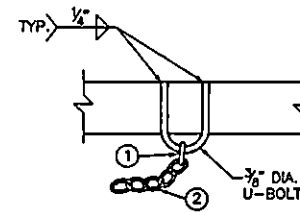


PLAN VIEW




SECTION B-B

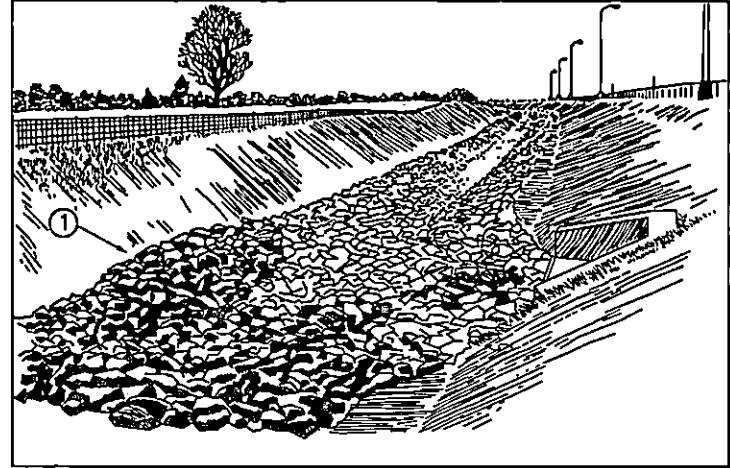
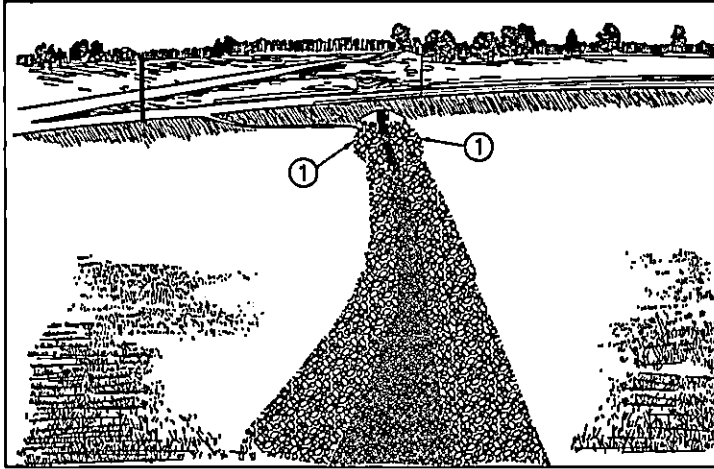
GRATE CONNECTED TO WALL



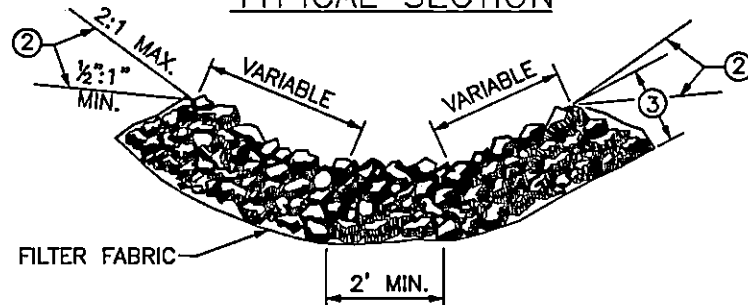
ALTERNATE FOR
STRUCTURAL STEEL
MEMBERS

TYPICAL ILLUSTRATIONS FOR STRUCTURAL STEEL UNITS

 LEXINGTON	
DIVISION OF ENGINEERING	
SECURITY DEVICES FOR FRAMES AND GRATES	
STANDARD DRAWING NO.	128
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE



TYPICAL SECTION




NOTES:

1. AGGREGATE CHANNEL LINING WILL NOT BE REQUIRED IN THE BOTTOM OF THE DITCH WHERE SOLID ROCK IS ENCOUNTERED. SIDE SLOPES SHALL BE LINED.
2. AGGREGATE ESTIMATED ON THE BASIS OF 0.50 TON/SQ. YD. PER FOOT OF DEPTH.

SHEET NOTES: ○

- ① WIDEN CHANNEL LINING AT STRUCTURES TO PREVENT EROSION.
- ② ALTERNATE LOCATION OF GROUNDLINE.
- ③ MINIMUM DEPTH OF CHANNEL LINING SHALL BE 24". LESSER DEPTHS SHALL HAVE APPROVAL FROM THE ENGINEER. STONE SHALL BE WELL GRADED SO THAT OPENINGS BETWEEN LARGER STONES ARE FILLED WITH SMALLER STONES.

SEE SHEET 130-2 FOR CHANNEL LINING MATERIAL NOTES

 LEXINGTON	
DIVISION OF ENGINEERING	
AGGREGATE CHANNEL LINING	
STANDARD DRAWING NO.	130-1
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17 DATE

NOTES:


1. BEDDING MATERIAL SHOULD NOT BE SMALLER THAN KDOT NO. 2 COARSE AGGREGATE STONE. THE REQUIREMENTS FOR KDOT NO. 2 COARSE AGGREGATE STONE ARE AS FOLLOWS:

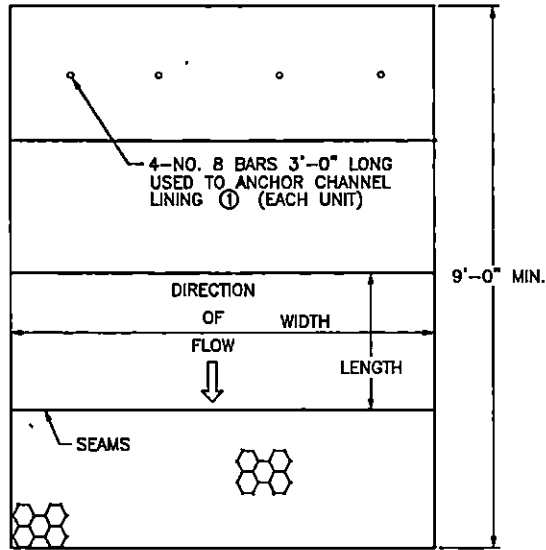
SIEVE SIZE (INCHES)	PERCENT PASSING
3 1/2	100
2 1/2	70-85
1 1/2	0-10

2. BEDDING SHOULD BE AT LEAST THREE INCHES AND SPREAD UNIFORMLY.
3. PLASTIC FILTER FABRIC MAY BE USED IN PLACE OF OR IN CONJUNCTION WITH GRAVEL FILTERS. THE FOLLOWING PARTICLE SIZE RELATIONSHIPS MUST EXIST:
 - A. FOR FILTER FABRIC ADJACENT TO GRANULAR MATERIALS CONTAINING 50 PERCENT OR LESS (BY WEIGHT) OF FINE PARTICLES (LESS THAN 0.074 mm):
 - 1.) $\frac{D \text{ (PARTICLE DIAMETER) 85 BASE (mm)}}{\text{EOS* FILTER FABRIC (mm)}} > 1$
 - 2.) TOTAL OPEN AREA OF FILTER IS LESS THAN 36 PERCENT.
 - B. FOR FILTER FABRIC ADJACENT TO ALL OTHER SOILS:
 - 1.) EOS* LESS THAN U.S. STANDARD SIEVE NO. 70
 - 2.) TOTAL OPEN AREA OF FILTER IS LESS THAN 10 PERCENT.
4. NO FILTER FABRIC SHOULD BE USED WITH LESS THAN 4 PERCENT OPEN AREA OR AN EOS* LESS THAN U.S. STANDARD SIEVE NO. 100.
5. *EOS - EQUIVALENT OPENING SIZE TO A U.S. STANDARD SIEVE SIZE.
6. THE FOLLOWING CHART SHOWS HOW TO DETERMINE THE DIAMETER OF STONE IN RELATION TO DESIGN VELOCITY.

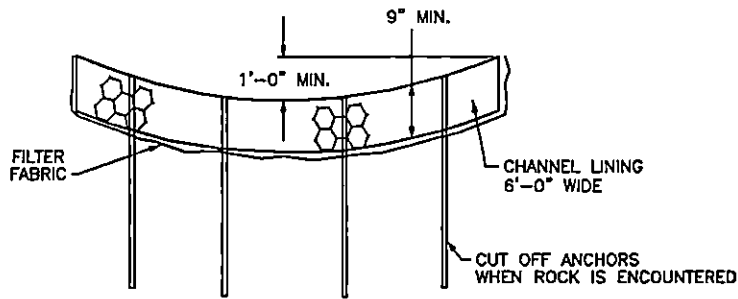
VELOCITY (FEET/SECOND)	STONE DIAMETER (INCHES)
4	2 1/2
6	5
8	9
10	14

SEE SHEET 130-1 FOR AGGREGATE CHANNEL LINING MATERIAL DRAWINGS

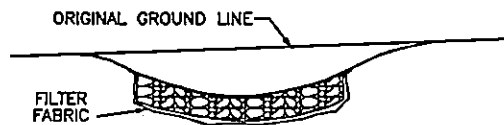
 LEXINGTON	
DIVISION OF ENGINEERING	
AGGREGATE CHANNEL LINING	
STANDARD DRAWING NO.	130-2
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17 DATE



PLAN



ELEVATION

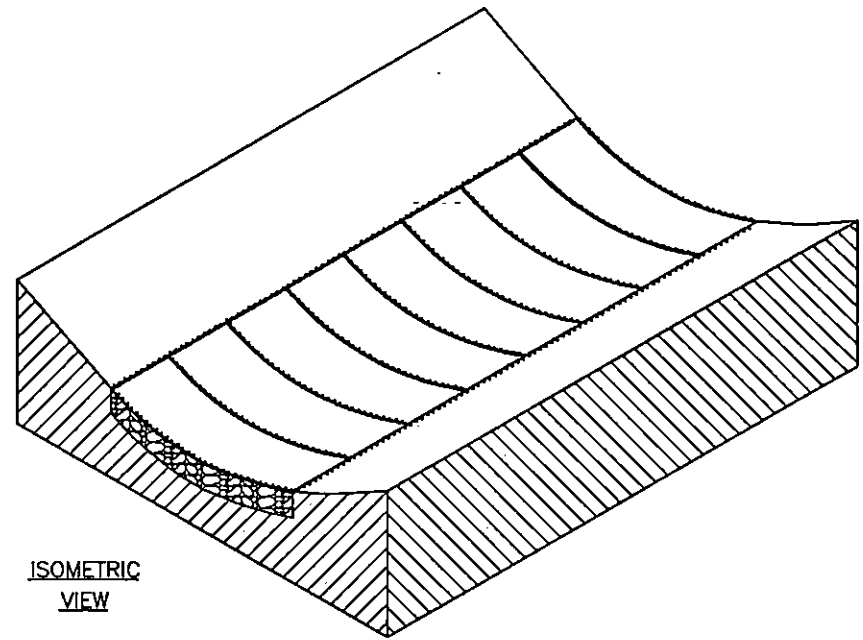


SHEET NOTES: ○

① ANCHORS REQUIRED WHEN LINING IS PLACED ON 5% GRADE OR GREATER.

NOTES:

1. SECURE THE LACING WIRE AT THE CORNER OF THE BASKET BY LOOPING AND TWISTING, CONTINUE LACING THROUGHOUT WITH DOUBLE LOOPS AT APPROXIMATELY 5 INCH INTERVALS. EACH UNIT SHALL CONSIST OF LININGS SUPPLIED IN WIDTHS OF 6'-0" AS SHOWN AND LENGTHS IN MULTIPLES OF 3'-0".
2. AGGREGATE ESTIMATED ON THE BASIS OF 0.375 TONS PER SQ. YD.
3. MATTRESS SHALL BE MANUFACTURED FROM WIRE WITH A MINIMUM TENSILE STRENGTH OF 40,000 PSI.
4. STONE SIZE PER MANUFACTURER SPECIFICATIONS.



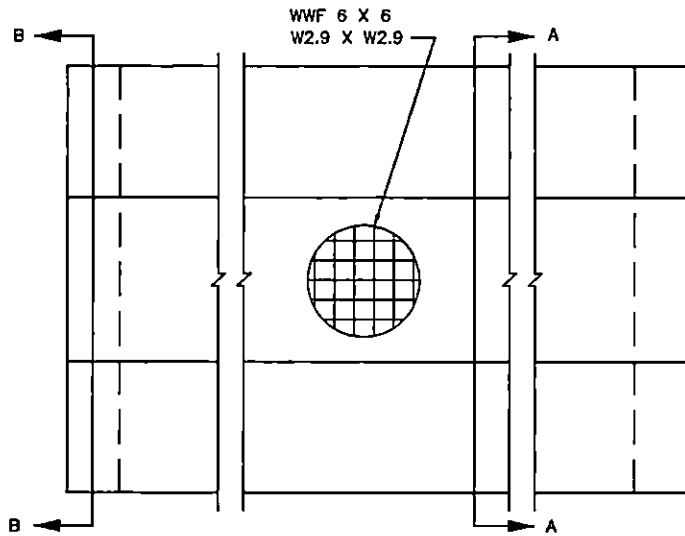
ISOMETRIC VIEW



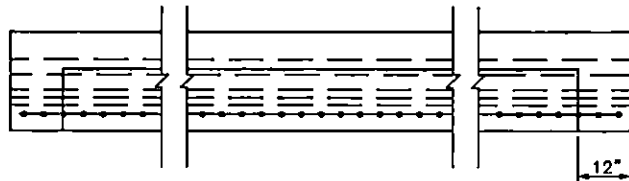
DIVISION OF ENGINEERING

MATTRESS
CHANNEL LINING

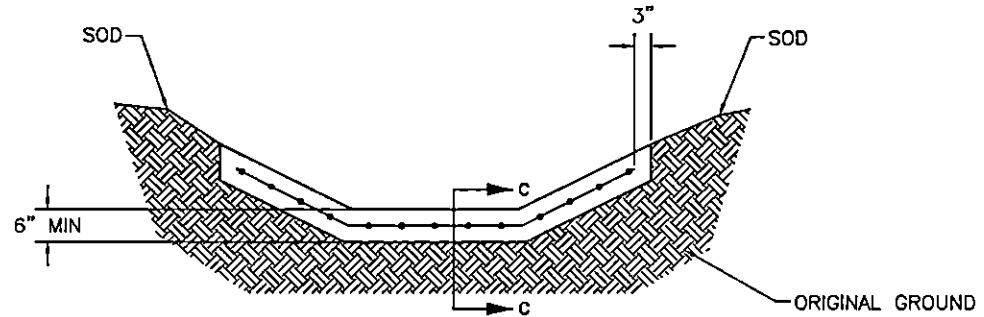
STANDARD DRAWING NO.	131
APPROVAL	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE



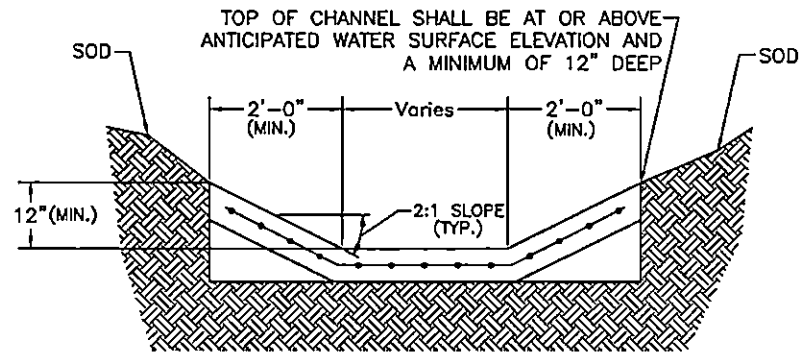
PLAN



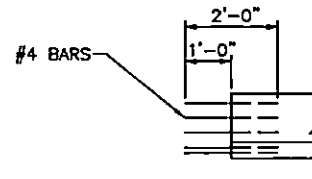
ELEVATION



SECTION A-A



SECTION B-B



SECTION C-C
(@ CONSTRUCTION JOINT)

NOTES:

1. USE "CLASS A" CONCRETE THROUGHOUT.
2. COMPACTION, FINISHING AND CURING SHALL BE THE SAME AS REQUIRED FOR CONCRETE SIDEWALK (USE WHITE COMPOUND).
3. IF THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT IN THE POURING OF THE PAVED DITCH, NO. 4 TIE BARS SPACED 6" O.C. SHALL BE USED (SEE SECTION C-C).
4. INTERMEDIATE ANCHORS MAY BE REQUIRED BY THE ENGINEER FOR SPECIAL CASES. A SPECIAL DESIGN WILL BE REQUIRED IN THIS SITUATION.
5. SHOULD THE TERRAIN OF THE EXISTING GROUND BE SO THAT WATER WOULD DRAIN INTO THE DITCH FROM ONE SIDE ONLY, THEN SODDING WILL BE REQUIRED ON THAT ONE SIDE ONLY OF THE DITCH.
6. EXPANSION JOINTS & SEALER REQUIRED ON ENDS ABUTTING STRUCTURES AND ANCHORS ON ENDS NOT ABUTTING STRUCTURES.
7. IF FIBER REINFORCED CONCRETE IS USED THE WWF 6 x 6 MAY BE ELIMINATED.
8. DO NOT PLACE PAVED DITCH ON DISTURBED SOIL.



LEXINGTON

DIVISION OF ENGINEERING

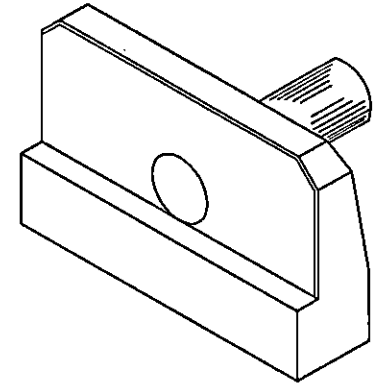
PAVED DITCH

STANDARD DRAWING NO.	132
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE

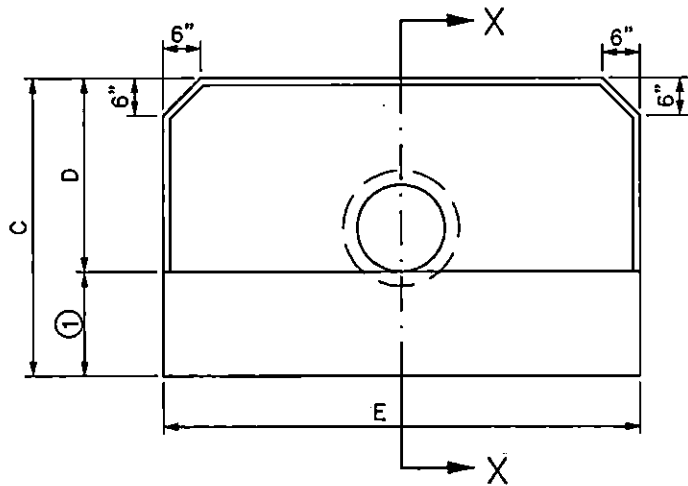
HEADWALL TYPE	DIA. OF PIPE	HEADWALL DIMENSIONS				
		A	B	C	D	E
④ STANDARD	15"	1'-8 1/2"	1'-2 1/2"	4'-3"	2'-9"	6'-9"
	18"	1'-9"	1'-3"	4'-6"	3'-0"	7'-6"
	21"	1'-9 1/2"	1'-3 1/2"	4'-9"	3'-3"	8'-3"
	24"	1'-10"	1'-4"	5'-0"	3'-6"	9'-0"
	27"	1'-10 1/2"	1'-4 1/2"	5'-3"	3'-9"	9'-9"
⑤ RAISED	15"	1'-8 1/2"	1'-2 1/2"	4'-9"	3'-3"	8'-3"
	18"	1'-9"	1'-3"	5'-0"	3'-6"	9'-0"
	21"	1'-9 1/2"	1'-3 1/2"	5'-3"	3'-9"	9'-9"
	24"	1'-10"	1'-4"	5'-6"	4'-0"	10'-6"
	27"	1'-10 1/2"	1'-4 1/2"	5'-9"	4'-3"	11'-3"

NOTES:

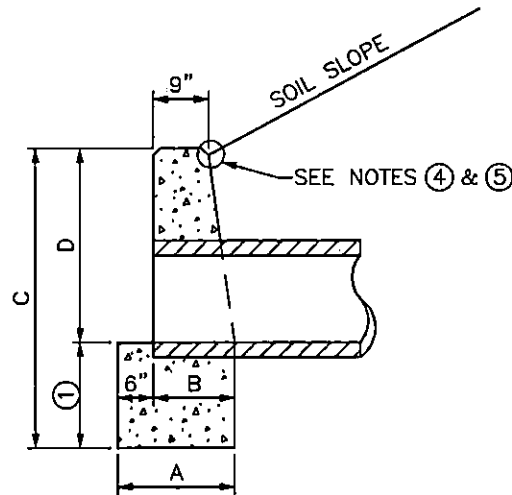
- ① HEIGHT OF FOOTER SHALL BE 18" FOR SOIL AND 12" IN ROCK.
2. ALL EXPOSED EDGES TO BE CHAMFERED 3/4".
3. ALL EXPOSED SURFACES TO HAVE A RUBBED FINISH.
- ④ STANDARD HEADWALLS ARE FLUSH WITH SOIL FILL.
- ⑤ RAISED HEADWALLS PROTRUDE 6" ABOVE SOIL FILL.
6. CHAIN LINK FENCE IS REQUIRED ON ALL HEADWALLS WHEN VERTICAL FACE "D" IS GREATER THAN 30".




ISOMETRIC VIEW

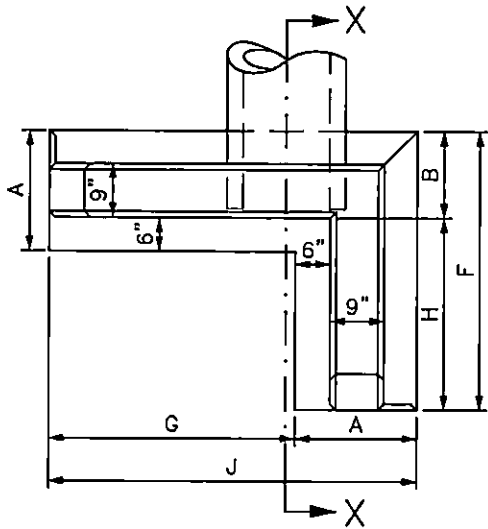


PLAN ELEVATION



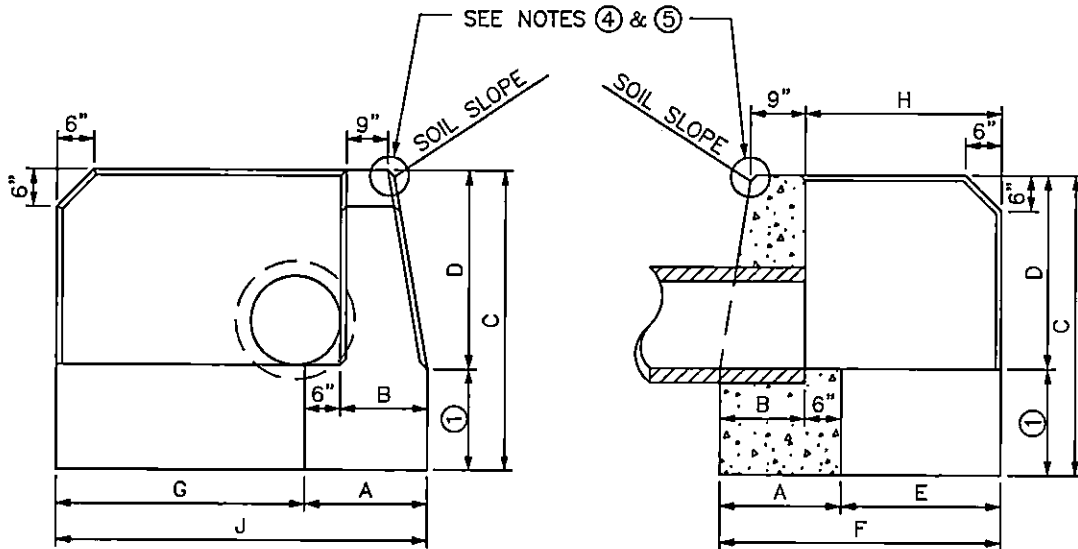
SECTION X-X

 LEXINGTON	
DIVISION OF ENGINEERING	
STRAIGHT HEADWALLS	
STANDARD DRAWING NO.	150
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE



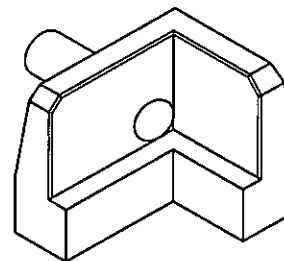
PLAN ELEVATION

HEADWALL TYPE	DIA. OF PIPE	HEADWALL DIMENSIONS								
		A	B	C	D	E	F	G	H	J
④ STANDARD ELL	15"	1'-8 1/2"	1'-2 1/2"	4'-3"	2'-9"	2'-3"	3'-11 1/2"	3'-6"	2'-9"	5'-2 1/2"
	18"	1'-9"	1'-3"	4'-6"	3'-0"	2'-6"	4'-3"	4'-0"	3'-0"	5'-9"
	21"	1'-9 1/2"	1'-3 1/2"	4'-9"	3'-3"	2'-9"	4'-6 1/2"	4'-6"	3'-3"	6'-3 1/2"
	24"	1'-10"	1'-4"	5'-0"	3'-6"	3'-0"	4'-10"	5'-0"	3'-6"	6'-10"
⑤ RAISED ELL	15"	1'-8 1/2"	1'-2 1/2"	4'-9"	3'-3"	3'-0"	4'-8 1/2"	4'-3"	3'-6"	5'-11 1/2"
	18"	1'-9"	1'-3"	5'-0"	3'-6"	3'-3"	5'-0"	4'-9"	3'-9"	6'-6"
	21"	1'-9 1/2"	1'-3 1/2"	5'-3"	3'-9"	3'-6"	5'-3 1/2"	5'-3"	4'-0"	7'-0 1/2"
	24"	1'-10"	1'-4"	5'-6"	4'-0"	3'-9"	5'-7"	5'-9"	4'-3"	7'-7"
	27"	1'-10 1/2"	1'-4 1/2"	5'-9"	4'-3"	4'-0"	5'-10 1/2"	6'-3"	4'-6"	8'-1 1/2"



FRONT ELEVATION


SECTION X-X



ISOMETRIC VIEW

NOTES:

- ① HEIGHT OF FOOTER SHALL BE 18" FOR SOIL AND 12" IN ROCK.
- ② ALL EXPOSED EDGES TO BE CHAMFERED 3/4".
- ③ ALL EXPOSED SURFACES TO HAVE A RUBBED FINISH.
- ④ STANDARD HEADWALLS ARE FLUSH WITH SOIL FILL.
- ⑤ RAISED HEADWALLS PROTRUDE 6" ABOVE SOIL FILL.
- ⑥ CHAIN LINK FENCE IS REQUIRED ON ALL HEADWALLS WHEN VERTICAL FACE "D" IS GREATER THAN 30".




LEXINGTON

DIVISION OF ENGINEERING

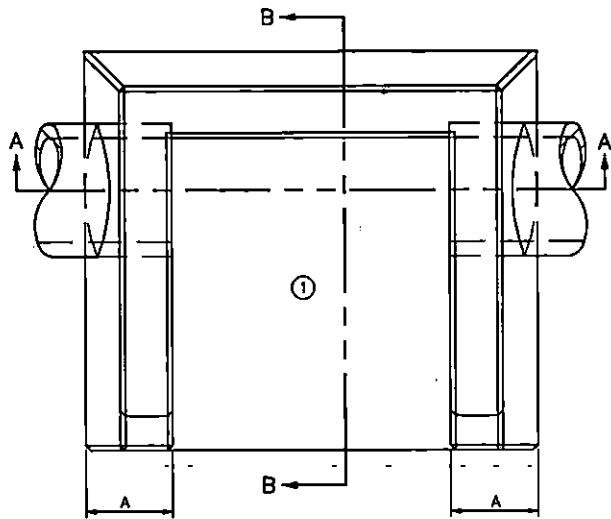
ELL HEADWALLS

STANDARD DRAWING NO. 151

APPROVAL:  9/22/17

URBAN COUNTY ENGINEER DATE

COMMISSIONER DATE



PLAN

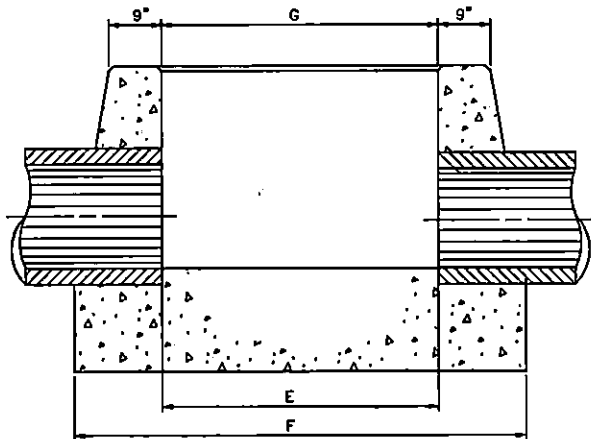
SHEET NOTE: ①

① SOLID CONCRETE BOTTOM REQUIRED.

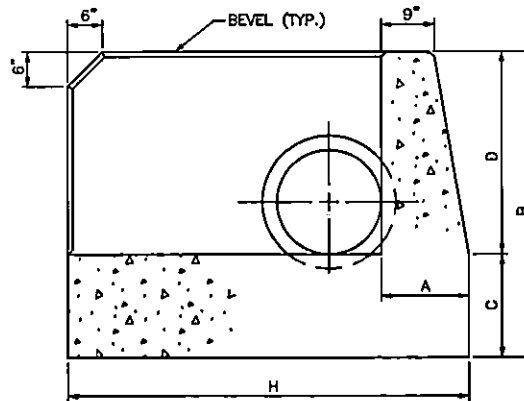
NOTES:

- VOLUME DISPLACED BY BARREL OF PIPE HAS BEEN COMPUTED USING INSIDE DIAMETER OF PIPE.
- CHAIN LINK FENCE IS REQUIRED ON ALL HEADWALLS WHEN VERTICAL FACE "D" IS GREATER THAN 30".

DIMENSIONS	DIAMETER OF PIPE				
	15"	18"	24"	30"	36"
A	1'-2"	1'-3"	1'-4"	1'-5"	1'-6"
B	4'-3"	4'-6"	5'-0"	5'-6"	6'-6"
C	1'-6"	1'-6"	1'-6"	1'-6"	2'-0"
D	2'-9"	3'-0"	3'-6"	4'-0"	4'-6"
E	3'-9"	4'-0"	4'-6"	4'-9"	5'-0"
F	6'-2"	6'-6"	7'-2"	7'-7"	8'-0"
G	3'-9"	4'-0"	4'-6"	4'-9"	5'-0"
H	5'-2"	5'-9"	6'-10"	7'-11"	9'-0"
C.Y. CONC. ONE HEADWALL	2.96	3.53	4.72	6.03	8.79



SECTION A-A



SECTION B-B

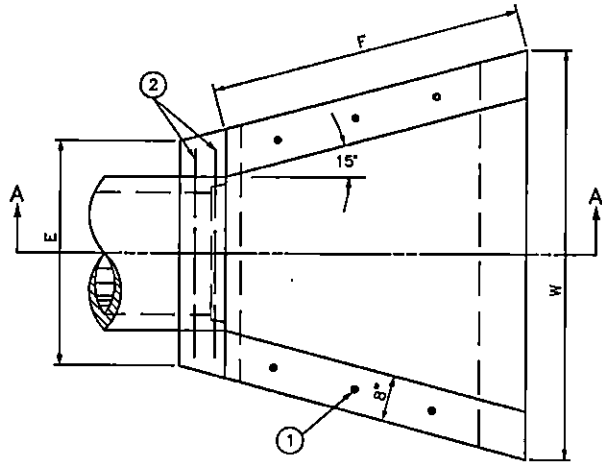


LEXINGTON

DIVISION OF ENGINEERING

U-TYPE HEADWALLS

STANDARD DRAWING NO.	152
APPROVAL:	
URBAN COUNTY ENGINEER	9/22/17
COMMISSIONER	DATE



PLAN VIEW

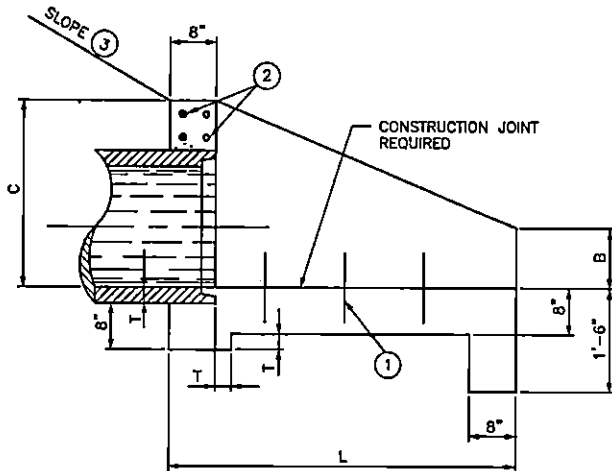
PIPE DIA.	DIMENSIONS							CLASS A CONC.	REINF. STEEL
	B	C	E	F	L	W	T	C.Y.	LBS.
15"	0'-7 1/2"	2'-0"	2'-9"	3'-5 3/8"	4'-0"	4'-10 3/4"	2 1/4"	0.90	10
18"	0'-9"	2'-3"	3'-0"	3'-11 9/16"	4'-6"	5'-4 15/16"	2 1/2"	0.97	11
21"	0'-10 1/2"	2'-6"	3'-3"	4'-5 13/16"	5'-0"	5'-11 1/8"	2 3/4"	1.17	12
24"	1'-0"	2'-9"	3'-6"	5'-0"	5'-6"	6'-5 3/8"	3"	1.38	12
27"	1'-1 1/2"	3'-0"	3'-9"	5'-6 3/16"	6'-0"	6'-11 9/16"	3 1/4"	1.62	13

SHEET NOTES:

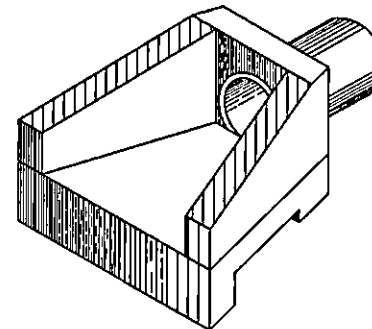
- ① 6 #4 x 1'-0" DOWELS
- ② 4 #4 x ("E" DIMENSION MINUS 4")
- ③ SLOPE SHALL BE WARPED TO FIT HEADWALL WHEN PIPE IS SKEWED AND / OR NORMAL SLOPE VARIES FROM 2:1.

NOTES:

- 1. REINFORCING STEEL MINIMUM GRADE 40, EVENLY SPACED (MIN. SPACING 12" O.C.)
- 2. VOLUME DISPLACED BY PIPE COMPUTED USING INSIDE DIAMETER OF PIPE.
- 3. WING ANGLES AND / OR DIMENSIONS MAY BE ALTERED DURING CONSTRUCTION TO ACCOMMODATE FLOW OF WATER.
- 4. APRON BETWEEN WINGS SHALL BE SLOPED IN DIRECTION OF FLOW EQUAL TO SLOPE OF PIPE, BUT NOT TO EXCEED 5%. FRONT FACE OF HEADWALL SHALL REMAIN VERTICAL.
- 5. CHAIN LINK FENCE IS REQUIRED ON ALL HEADWALLS WHEN VERTICAL FACE "C" IS GREATER THAN 30".
- 6. ALL EXPOSED EDGES ARE TO HAVE 3/4" CHAMFER.
- 7. SKEWED PIPE REQUIRES SPECIAL DESIGN.



SECTION A-A



ISOMETRIC VIEW

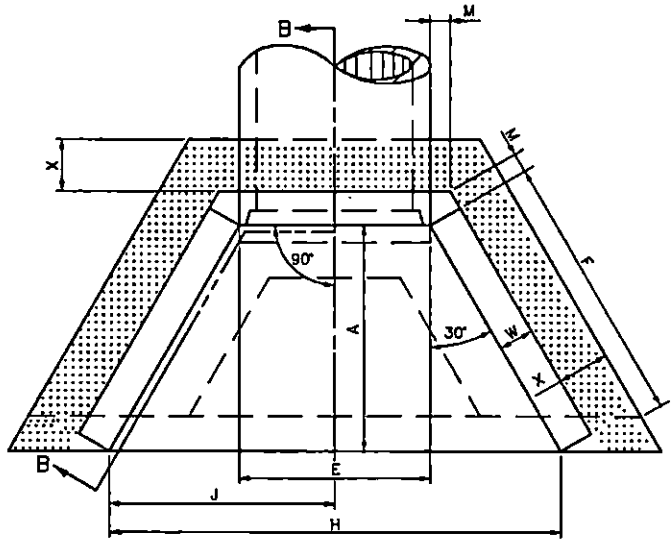


LEXINGTON

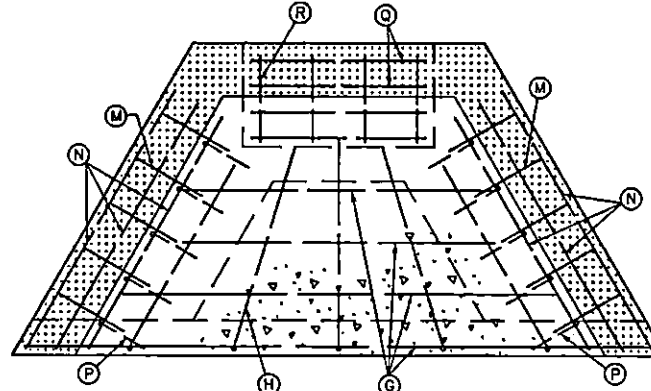
DIVISION OF ENGINEERING

PIPE CULVERT HEADWALLS
0° SKEW
15"-27" CIRCULAR PIPE

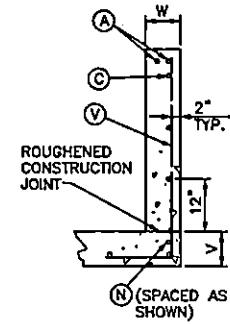
STANDARD DRAWING NO.	153
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



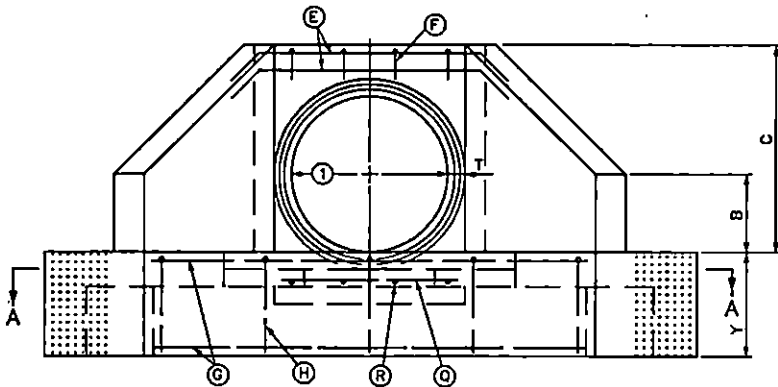
PLAN VIEW



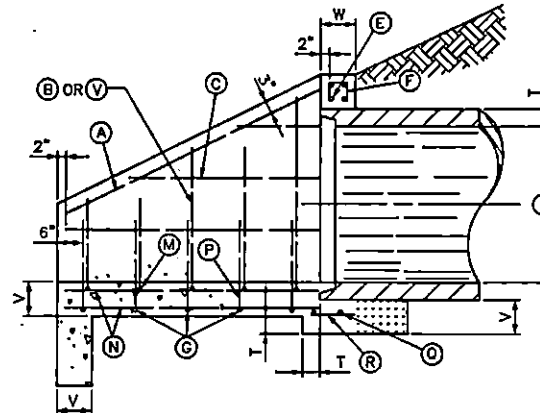
SECTION A-A



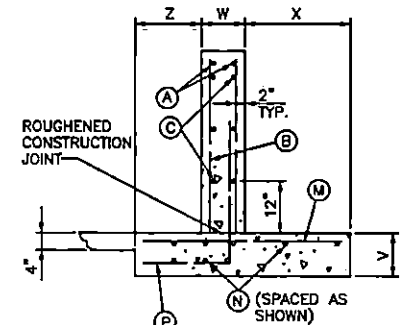
WING SECTION
30"-60" CIRCULAR PIPE



FRONT ELEVATION



SECTION B-B



WING SECTION
66"-108" CIRCULAR PIPE

NOTES:

1. [Pattern] APPLIES TO 66" DIAMETER AND GREATER. (CIRCULAR PIPE)
2. SEE SHEETS 2, 3, AND 4 OF CURRENT STD. DWG. 154 FOR DIMENSIONS, QUANTITIES, AND BILL OF REINFORCEMENT.
3. DIMENSIONS FROM FACE OF CONCRETE TO STEEL SHALL BE 2" CLEAR DISTANCE UNLESS OTHERWISE NOTED.
4. ENCIRCLED LETTERS, ○, INDICATE STEEL BAR LOCATIONS.
5. BARS (B), (C), (G), (P), (M), (V) ARE SPACED 1'-0" O.C. ALL OTHER BARS SHALL BE EVENLY SPACED.
6. BARS (B) AND (V) ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT THE END OF EACH WING.
7. BARS (C) ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT TOP OF EACH WING.
8. HEADWALLS LOCATED AT EDGE OF SHOULDER SHALL BE PARALLEL TO CENTERLINE OF THE ROAD.
9. APRON BETWEEN WINGS SHALL BE SLOPED IN DIRECTION OF FLOW EQUAL TO SLOPE OF PIPE, NOT TO EXCEED 5%.
10. FRONT OF HEADWALL AND ENDS OF WINGS SHALL REMAIN VERTICAL.
11. FENCE AND / OR HANDRAIL IS REQUIRED FOR ALL HEADWALLS, SEE STD. DWG. 308.
12. ALL EXPOSED EDGES ARE TO HAVE 3/4" CHAMFER.

SHEET NOTE: ○

① DIAMETER OF PIPE

SHEET 1 OF 4



LEXINGTON

DIVISION OF ENGINEERING

PIPE CULVERT HEADWALLS
0° SKEW
30"-108" PIPE

STANDARD DRAWING NO. 154-1

APPROVAL: [Signature] 9/22/17

URBAN COUNTY ENGINEER [Signature] DATE 9/22/17

COMMISSIONER [Signature] DATE

DIMENSION	DIAMETER OF PIPE														DIMENSION
	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"	108"	
A	3'-9"	4'-4"	4'-11"	5'-6"	6'-1"	6'-8"	7'-5"	8'-0"	8'-7"	9'-2"	9'-9"	10'-4"	10'-11"	11'-6"	A
B	1'-3"	1'-6"	1'-9"	2'-0"	2'-3"	2'-6"	2'-9"	3'-0"	3'-3"	3'-6"	3'-9"	4'-0"	4'-3"	4'-6"	B
C	3'-6"	4'-0"	4'-7"	5'-1"	5'-8"	6'-2"	7'-0"	7'-5"	8'-0"	8'-6"	9'-1"	9'-7"	10'-2"	10'-8"	C
E	3'-1"	3'-8"	4'-3"	4'-10"	5'-5"	6'-0"	6'-7"	7'-2"	7'-9"	8'-4"	8'-11"	9'-6"	10'-1"	10'-8"	E
F	4'-4"	5'-0"	5'-8"	6'-4"	7'-0"	7'-8"	8'-7"	9'-3"	9'-11"	10'-7"	11'-3"	11'-11"	12'-7"	13'-3"	F
H	7'-6"	8'-8"	10'-0"	11'-2"	12'-6"	13'-8"	15'-2"	16'-6"	17'-8"	19'-0"	20'-2"	21'-6"	22'-8"	24'-0"	H
J	3'-9"	4'-4"	5'-0"	5'-7"	6'-3"	6'-10"	7'-7"	8'-3"	8'-10"	9'-6"	10'-1"	10'-9"	11'-4"	12'-0"	J
M	0'-5"							0'-6"							M
T	0'-3.5"	0'-4.0"	0'-4.5"	0'-5.0"	0'-5.5"	0'-6.0"	0'-6.5"	0'-7.0"	0'-7.5"	0'-8.0"	0'-8.5"	0'-9.0"	0'-9.5"	0'-10.0"	T
V	0'-8"							1'-0"							V
W	0'-8"							0'-10"							W
X	-							2'-0"			2'-6"				X
Y	2'-0"							2'-6"			3'-0"				Y
Z	-							1'-3"			1'-9"				Z
CU.YDS.CONC. 2 HEADWALLS	3.36	4.30	5.35	6.53	7.82	9.22	18.76	20.95	23.25	25.67	31.48	34.31	37.25	40.32	CU.YDS.CONC. 2 HEADWALLS
LBS.STEEL 2 HEADWALLS	281	363	430	496	583	687	1320	1571	1815	2043	2451	2753	3050	3379	LBS.STEEL 2 HEADWALLS

SHEET 2 OF 4



LEXINGTON

DIVISION OF ENGINEERING

DIMENSIONS AND QUANTITIES
30"-108" HEADWALLS
CIRCULAR PIPE
0' SKEW

STANDARD DRAWING NO. 154-2

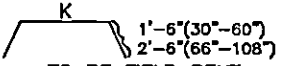
APPROVAL: *[Signature]* 9/22/17
URBAN COUNTY ENGINEER DATE
COMMISSIONER *[Signature]* 9/22/17 DATE

MARK	SIZE	NO				K	MARK	SIZE	NO				K	MARK	SIZE	NO				K	MARK	SIZE	NO				K	MARK	SIZE	NO				K											
		①	FT	IN	FT				IN	①	FT	IN				FT	IN	①	FT				IN	FT	IN	①				FT	IN	FT	IN		①	FT	IN	FT	IN	①	FT	IN	FT	IN	
30"						42" (CONTINUED)						54" (CONTINUED)						66" (CONTINUED)						78" (CONTINUED)						90"															
A	5	4	4	8		H	4	5	6	3	4	7	V2	5	4	5	0	3	9	P	5	16	5	0	3	3	G2	4	3	10	6														
C1	4	2	2	4		N	4	6	5	6		V3	5	4	6	0	4	9	Q	5	3	6	2		G3	4	3	14	0		A	5	4	12	3										
C2	4	2	4	2		R	4	4	0	9		V4	5	2	7	0	5	9	R	5	7	2	7		G4	4	3	16	4		B1	5	8	3	10										
E1	5	2	6	4	3	4	V1	5	4	3	6	2	3							H	4	9	10	5	8	3	B2	5	8	4	9														
E2	5	2	6	8	3	8	V2	5	4	4	6	3	3							M	4	20	3	9		B3	5	8	5	9															
F	4	3	1	3	0	4	V3	5	4	5	6	4	3							N	4	14	9	9		B4	5	8	6	8															
G1	4	2	3	10								60"						72"																											
G2	4	3	6	2								A	5	4	8	4		A	5	4	10	1		Q	5	3	7	5		B5	5	8	7	7											
H	4	4	5	1	3	5							C1	4	2	2	1		B1	5	8	3	0		R	5	8	2	8		C1	4	4	1	11										
N	4	6	4	2		48"						C2	4	2	4	2		B2	5	8	4	0								C2	4	4	4	0											
Q	4	2	2	9		A	5	4	6	11		E1	5	2	9	3	6	3	B5	5	4	6	11								C3	4	4	6	1										
R	4	3	0	8		C1	4	2	1	10		E2	5	2	9	7	6	7	C1	4	4	2	7		A	5	4	11	7		C4	4	4	8	3										
V1	5	4	3	1	1	10	C2	4	2	3	10		F	4	6	1	3	0	4	C2	4	4	4	8		B1	5	8	3	6		E1	5	2	14	2	9	2							
V2	5	4	4	1	2	10	C3	4	2	5	10		G1	4	2	6	6		C3	4	4	6	9		B2	5	8	4	6		E2	5	2	14	8	9	8								
						E1	5	2	8	1	5	1	G2	4	3	10	0		C4	4	4	8	10		B3	5	8	5	5		F	4	9	1	9	0	6								
						E2	5	2	8	5	5	5	G3	4	3	12	4		C5	4	8	9	1		B4	5	8	6	5		G1	4	2	9	6										
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						G1	4	1	4	0		N	4	6	7	7		E2	5	2	12	11	7	11	B6	5	4	8	4		G3	4	3	16	5										
36"						G2	4	3	7	5		Q	4	2	5	8		F	4	8	1	9	0	6	C1	4	4	2	10		G4	4	3	18	9										
C1	4	2	1	7		G3	4	3	9	9		R	4	6	0	10		G1	4	3	9	2		C2	4	4	4	11		H	4	10	12	1	9	5									
C2	4	2	3	8		H	4	6	6	10	5	2	V1	5	4	4	3	3	0	G2	4	3	12	6		C3	4	4	7	0		M	4	22	4	9									
C3	4	2	4	10		N	4	6	6	2		V2	5	4	5	3	4	0	G3	4	3	14	10		C4	4	4	9	1		N	4	16	11	1										
E1	5	2	6	11	3	11	Q	4	2	4	6		V3	5	4	6	2	4	11	H	4	9	9	10	7	8	C5	4	12	10	5		P	6	22	6	6	4	3						
E2	5	2	7	3	4	3	R	4	5	0	9		V4	5	4	7	2	5	11	M	4	18	3	9		E1	5	2	13	7	8	7	Q	5	4	8	7								
F	4	4	1	3	0	4	V1	5	4	3	9	2	6							N	4	14	9	1		F	4	9	1	9	0	6													
G1	4	3	5	0		V2	5	4	4	9	3	6							P	5	18	5	3	3	6	G1	4	1	9	6															
G2	4	3	7	4		V3	5	4	5	9	4	6							Q	5	3	6	10		G2	4	3	11	10																
H	4	5	5	8	4	0							66"																																
N	4	6	4	10								A	5	4	9	4																													
Q	4	2	3	4								B1	5	8	2	10																													
R	4	4	0	8								B2	5	8	3	10																													
V1	5	4	3	4	2	1							B3	5	8	4	9																												
V2	5	4	4	4	3	1	54"						B4	5	8	5	9																												
V3	5	2	5	4	4	1	C1	4	2	0	11		C1	4	4	1	5		A	5	4	10	10		P	5	22	5	9	4	0														
						C2	4	2	3	0		C2	4	4	3	5		B1	5	8	3	4		Q	5	3	8	0																	
						C3	4	2	5	1		C3	4	4	5	6		B2	5	8	4	3		R	5	9	2	8																	
						C4	4	4	6	10		C4	4	4	7	7		B3	5	8	5	3																							
						E1	5	2	8	8	5	8	C5	4	8	8	4		B4	5	8	6	2																						
						E2	5	2	9	0	6	0	E1	5	2	11	9	6	10	B5	5	8	7	2																					
A	5	4	6	2		F	4	6	1	3	0	4	E2	5	2	12	3	7	4																										
C1	4	2	2	9		G1	4	1	5	3		F	4	7	1	9	0	6	C2	4	4	3	8																						
C2	4	2	4	9		G2	4	3	8	9		G1	4	3	8	0		C3	4	4	5	10																							
C3	4	2	5	6		G3	4	3	11	0		G2	4	3	11	4		C4	4	4	7	11																							
E1	5	2	7	6	4	6	H	4	6	7	5	5	9	G3	4	3	13	10		E1	5	2	13	0	8	0																			
E2	5	2	7	10	4	10	N	4	6	6	10		H	4	7	9	3	7	1	E2	5	2	13	6	8	6																			
F	4	4	1	3	0	4	Q	4	2	5	1		M	4	16	3	9		F	4	8	1	9	0	6																				
G1	4	3	6	4		R	4	6	0	10		N	4	14	8	4		G1	4	1	7	1																							
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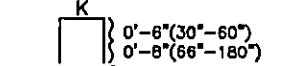
NOTES:

- NUMBER OF BARS IN ONE HEADWALL.
- DIMENSIONS ARE OUT TO OUT OF BARS.
- ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

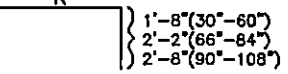
BENT BAR SHAPES



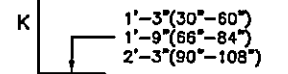
TO BE FIELD BENT BARS (E)



BARS (F)



BARS (H)



BARS (P) AND (V)

SHEET 3 OF 4



LEXINGTON

DIVISION OF ENGINEERING

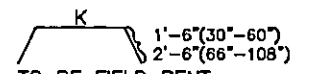
BILL OF REINFORCEMENT
30"-90" DIAMETER
CIRCULAR PIPE HEADWALLS
0° SKEW

STANDARD DRAWING NO.	154-3
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

MARK	SIZE	NO				K				MARK	SIZE	NO				K				MARK	SIZE	NO				K				MARK	SIZE	NO				K			
		①	FT	IN	FT	IN	①	FT	IN			FT	IN	①	FT	IN	FT	IN	①			FT	IN	FT	IN	①	FT	IN	FT			IN	①	FT	IN	FT	IN		
96"										102"										108"																			
A	5	4	13	0						A	5	4	13	9						A	5	4	14	6															
B ₁	5	8	4	1						B ₁	5	8	4	4						B ₁	5	8	4	7															
B ₂	5	8	5	0						B ₂	5	8	5	3						B ₂	5	8	5	6															
B ₃	5	8	5	11						B ₃	5	8	6	2						B ₃	5	8	6	5															
B ₄	5	8	6	10						B ₄	5	8	7	2						B ₄	5	8	7	4															
B ₅	5	8	7	10						B ₅	5	8	8	1						B ₅	5	8	8	3															
B ₆	5	8	8	9						B ₆	5	8	9	0						B ₆	5	8	9	3															
C ₁	4	4	3	0						C ₁	4	4	9	11						B ₇	5	8	10	2															
C ₂	4	4	5	2						C ₁	4	4	2	0						C ₁	4	4	3	3															
C ₃	4	4	7	3						C ₂	4	4	4	2						C ₂	4	4	5	5															
C ₄	4	4	9	5						C ₃	4	4	6	4						C ₃	4	4	7	7															
C ₅	4	4	11	7						C ₄	4	4	8	6						C ₄	4	4	9	8															
C ₆	4	12	11	9						C ₅	4	4	10	7						C ₅	4	4	11	10															
E ₁	5	2	14	9	9	9				C ₆	4	16	12	5						C ₆	4	16	13	1															
E ₂	5	2	15	3	10	3				E ₁	5	2	15	4	10	4																							
F	4	10	1	9	0	6				E ₂	5	2	15	10	10	10				E ₁	5	2	15	10	10	10													
G ₁	4	3	10	9						F	4	10	1	9	0	6				E ₂	5	2	16	5	11	5													
G ₂	4	3	14	3						G ₁	4	3	12	1						F	4	11	1	9	0	6													
G ₃	4	3	17	9						G ₂	4	3	15	8						G ₁	4	1	9	10															
G ₄	4	3	20	0						G ₃	4	3	19	2						G ₂	4	3	13	4															
H	4	10	12	8	10	0				G ₄	4	3	21	7						G ₃	4	3	16	10															
M	4	24	4	9						H	4	11	13	3	10	7				G ₄	4	3	20	3															
N	4	16	11	9						M	4	26	4	9						G ₅	4	3	22	7															
P	6	24	6	9	4	6				N	4	16	12	5						H	4	11	13	10	11	2													
Q	5	4	9	2						P	7	26	7	0	4	9				M	4	28	4	9															
R	5	10	3	3						Q	5	4	9	9						N	4	16	13	1															
										R	5	10	3	4						P	7	28	7	3	5	0													
																					Q	5	4	10	4														
																						R	5	11	3	4													

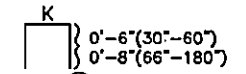
- NOTES:**
- ① NUMBER OF BARS IN ONE HEADWALL.
 2. DIMENSIONS ARE OUT TO OUT OF BARS.
 3. ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES

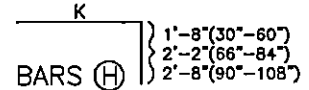


TO BE FIELD BENT

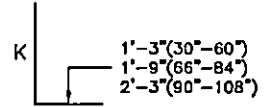
BARS ⑤



BARS ⑥



BARS ⑧



BARS ⑨ AND ⑩

SHEET 4 OF 4



LEXINGTON

DIVISION OF ENGINEERING

BILL OF REINFORCEMENT
96"-108" DIAMETER
CIRCULAR PIPE HEADWALLS
0° SKEW

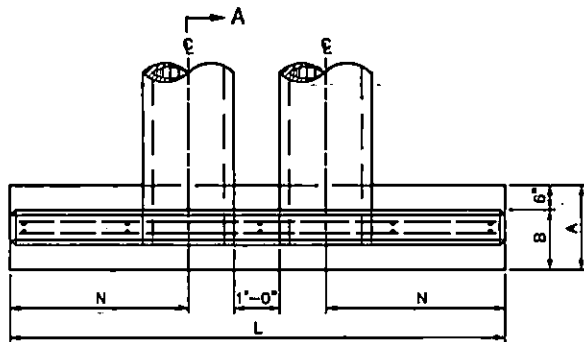
STANDARD DRAWING NO.	154-4
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

DIMENSIONS AND QUANTITIES

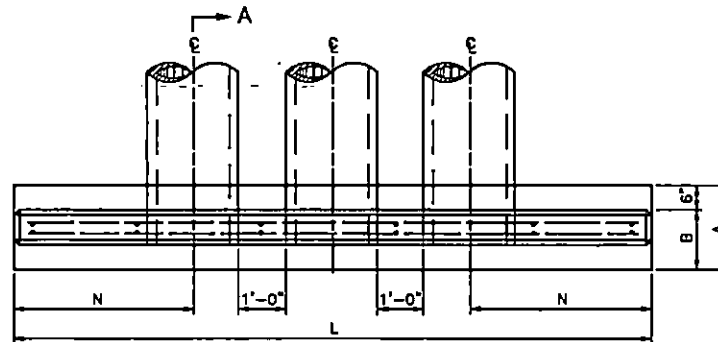
HEADWALL TYPE	PIPE DIA.	A	B	C	E	L	M	N	CU. YD. CONC. 2 HDWLS.
STANDARD DOUBLE LINE	18"	1'-9"	1'-3"	4'-6"	3'-0"	10'-5"	10 3/4"	3'-9"	4.18
	24"	1'-10"	1'-4"	5'-0"	3'-6"	12'-6"		4'-6"	5.65
STANDARD TRIPLE LINE	18"	1'-9"	1'-3"	4'-6"	3'-0"	13'-4"		3'-9"	4.87
	24"	1'-10"	1'-4"	5'-0"	3'-6"	16'-0"		4'-6"	6.68
RAISED DOUBLE LINE	18"	1'-9"	1'-3"	5'-0"	3'-6"	11'-11"		4'-6"	5.28
	24"	1'-10"	1'-4"	5'-6"	4'-0"	14'-0"		5'-3"	7.43
RAISED TRIPLE LINE	18"	1'-9"	1'-3"	5'-0"	4'-0"	14'-10"		4'-6"	6.76
	24"	1'-10"	1'-4"	5'-6"	4'-6"	17'-6"		5'-3"	8.83

NOTES:

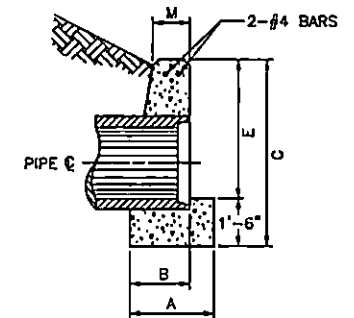
1. ALL VOLUMES ARE IN CUBIC YARDS FOR TWO HEADWALLS; VOLUME DISPLACED BY BARREL OF PIPE HAS BEEN COMPUTED USING INSIDE DIAMETER OF PIPE. NO DEDUCTION HAS BEEN MADE FOR BEVELED EDGES.
2. WHERE HEADWALLS ARE LOCATED AT THE EDGE OF THE SHOULDER, THE TOP OF THE HEADWALLS SHALL BE PARALLEL TO THE EDGE OF SHOULDER.
3. WHERE A RAISED HEADWALL IS USED ON THE OUTLET END OF THE PIPE, THE TOPS OF BOTH WALLS SHALL BE AT THE SAME ELEVATION.
4. CHAIN LINK FENCE IS REQUIRED ON ALL HEADWALLS WHEN VERTICAL FACE "E" IS GREATER THAN 30°.



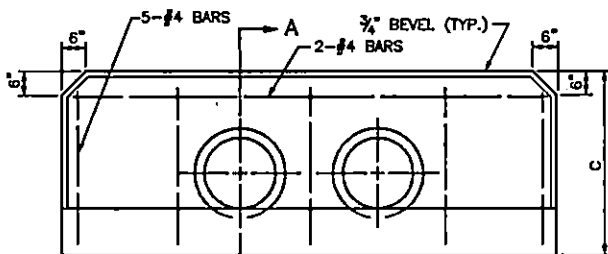
PLAN



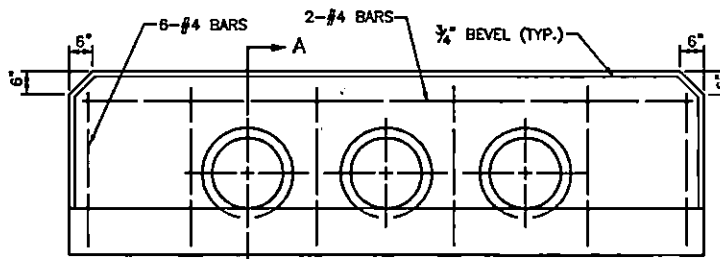
PLAN



SECTION A-A



ELEVATION



ELEVATION



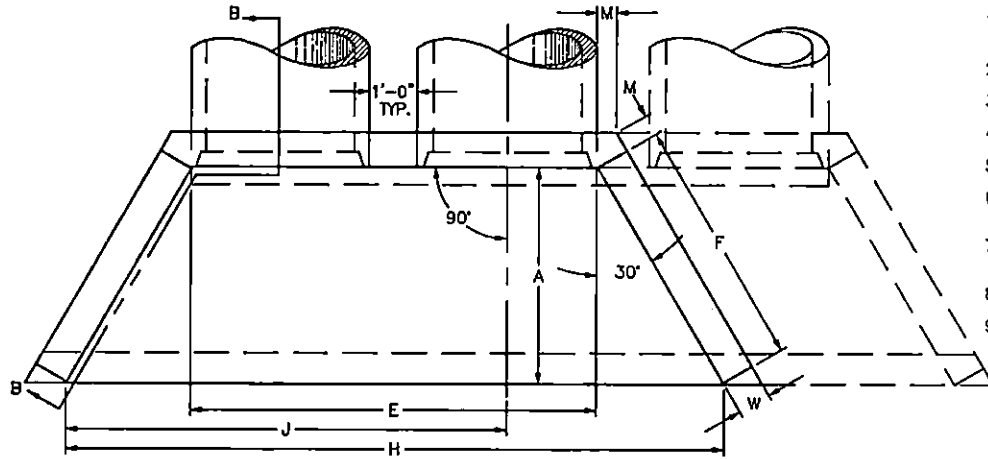
LEXINGTON

DIVISION OF ENGINEERING

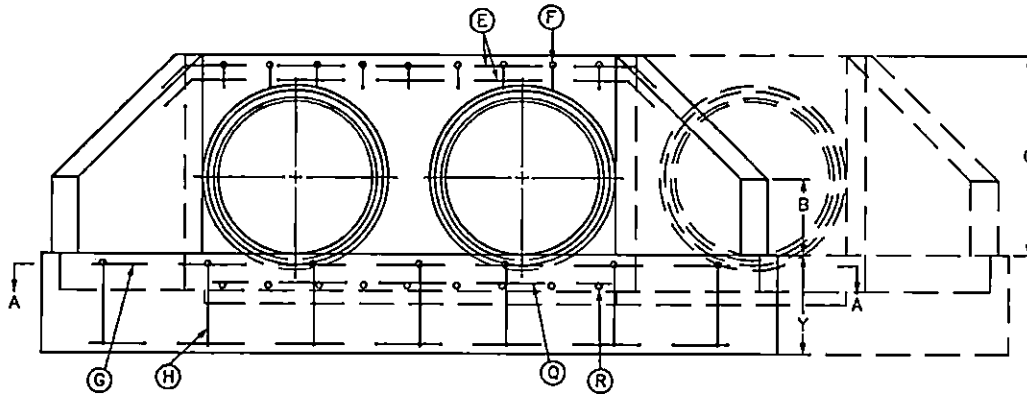
18"-24" DOUBLE & TRIPLE PIPE CULVERT HEADWALLS AT 0° SKEW

STANDARD DRAWING NO. 158

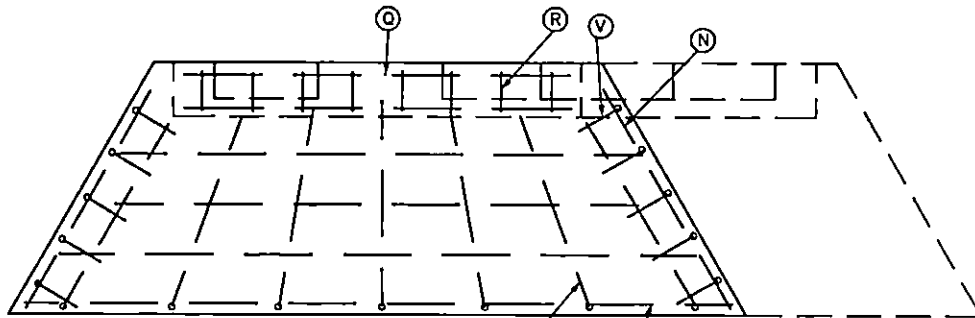
APPROVAL: *[Signature]* 9/22/17
 URBAN COUNTY ENGINEER DATE
 COMMISSIONER *[Signature]* 9/22/17 DATE



PLAN VIEW



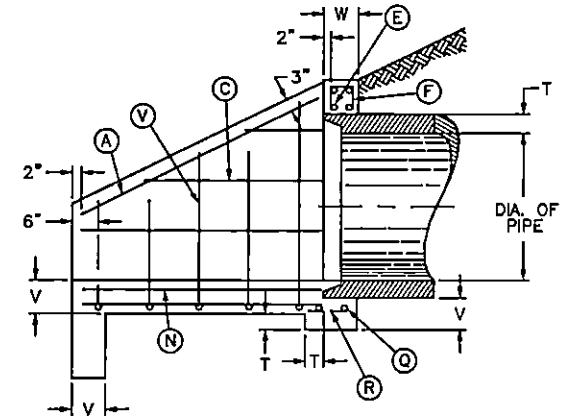
FRONT ELEVATION



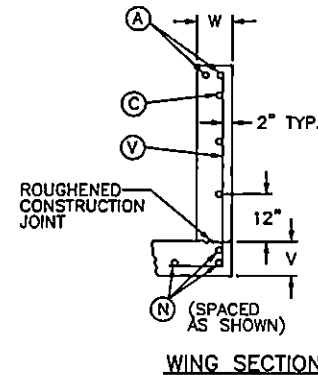
SECTION A-A

NOTES:

1. SEE SHEETS 2 AND 3 OF CURRENT STD. DWG. 159 FOR DIMENSIONS, QUANTITIES, AND BILL OF REINFORCEMENT.
2. ENCIRCLED LETTERS, ○, INDICATE STEEL BAR LOCATIONS.
3. BARS ○, ○, ○ ARE SPACED 1'-0" O.C. ALL OTHER BARS SHALL BE EVENLY SPACED.
4. BARS ○ ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT THE END OF EACH WING.
5. BARS ○ ARE PLACED IN ORDER OF INCREASING LENGTHS, BEGINNING AT THE TOP OF EACH WING.
6. HEADWALLS LOCATED AT THE EDGE OF SHOULDER SHALL BE PARALLEL TO CENTERLINE OF THE ROAD.
7. APRON BETWEEN WINGS SHALL BE SLOPED IN DIRECTION OF FLOW EQUAL TO SLOPE OF PIPE. FRONT FACE AND ENDS OF WINGS SHALL REMAIN VERTICAL.
8. DIMENSIONS FROM FACE OF CONCRETE TO STEEL SHALL BE 2" CLEAR DISTANCE.
9. CHAIN LINK FENCE IS REQUIRED ON ALL HEADWALLS WHEN VERTICAL FACE "C" IS GREATER THAN 30". SEE STD. DWG. 308.



SECTION B-B



WING SECTION

SHEET 1 OF 3



LEXINGTON

DIVISION OF ENGINEERING

DOUBLE & TRIPLE PIPE
CULVERT HEADWALLS
0° SKEW

STANDARD DRAWING NO. 159-1

APPROVAL: *[Signature]* 9/22/17
URBAN COUNTY ENGINEER DATE
COMMISSIONER *[Signature]* 9/22/17 DATE

DIMENSIONS FOR MULTIPLE PIPE HEADWALLS - 0° SKEW

DIMENSION	DOUBLE				TRIPLE				DIMENSION
	30"	36"	42"	48"	30"	36"	42"	48"	
A	3'-9"	4'-4"	4'-11"	5'-6"	3'-9"	4'-4"	4'-11"	5'-6"	A
B	1'-3"	1'-6"	1'-9"	2'-0"	1'-3"	1'-6"	1'-9"	2'-0"	B
C	3'-6"	4'-0"	4'-7"	5'-1"	3'-6"	4'-0"	4'-7"	5'-1"	C
E	7'-2"	8'-4"	9'-6"	10'-8"	11'-3"	13'-0"	14'-9"	16'-6"	E
F	4'-4"	5'-0"	5'-8"	6'-4"	4'-4"	5'-0"	5'-8"	6'-4"	F
H	11'-6"	13'-4"	15'-2"	17'-0"	15'-6"	18'-0"	20'-6"	22'-10"	H
J	-	-	-	-	7'-9"	9'-0"	10'-3"	11'-5"	J
M	0'-5"				0'-5"				M
T	0'-3.5"	0'-4"	0'-4.5"	0'-5"	0'-3.5"	0'-4"	0'-4.5"	0'-5"	T
V	0'-8"				0'-8"				V
W	0'-8"				0'-8"				W
Y	2'-0"				2'-0"				Y
CLASS "A" CONC. CU. YDS. 2 HEADWALLS	4.91	6.22	7.75	9.38	6.49	8.20	10.19	12.30	CLASS "A" CONC. CU. YDS. 2 HEADWALLS
LBS. STEEL 2 HEADWALLS	379	480	561	660	475	594	702	797	LBS. STEEL 2 HEADWALLS

SHEET 2 OF 3



LEXINGTON

DIVISION OF ENGINEERING

DIMENSIONS AND QUANTITIES
30"-48"
DOUBLE & TRIPLE
HEADWALLS-CIRCULAR PIPE
0° SKEW

STANDARD DRAWING NO. 159-2

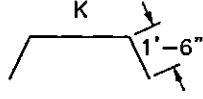
APPROVAL:  9/22/17
URBAN COUNTY ENGINEER DATE
COMMISSIONER  9/22/17
DATE

MARK	SIZE	NO				K	MARK	SIZE	NO				K	MARK	SIZE	NO				K	MARK	SIZE	NO				K		
		①	FT	IN	FT				IN	①	FT	IN				FT	IN	①	FT				IN	FT	IN	①		FT	IN
DOUBLE 30"						42"						TRIPLE 30"						42"											
A	5	4	4	8		A	5	4	6	2		A	5	4	4	8		A	5	4	6	2		A	5	4	6	2	
C1	4	2	2	4		C1	4	2	2	9		C1	4	2	2	4		C1	4	2	2	9		C1	4	2	2	9	
C2	4	2	4	2		C2	4	2	4	9		C2	4	2	4	2		C2	4	2	4	9		C2	4	2	4	9	
E1	5	2	10	6	7	6	E1	5	2	12	10	9	10	E1	5	2	14	7	11	7	E1	5	2	18	1	15	1		
E2	5	2	10	8	7	8	E2	5	2	13	0	10	0	E2	5	2	14	9	11	9	E2	5	2	18	3	15	3		
F	4	8	1	3	0	4	F	4	10	1	3	0	4	F	4	12	1	3	0	4	F	4	15	1	3	0	4		
G1	4	2	7	8			G1	4	3	13	9			G1	4	2	11	10			G1	4	3	16	8				
G2	4	3	10	0			G2	4	7	6	3	4	7	G2	4	3	14	1			G2	4	10	6	3	4	7		
H	4	6	5	1	3	5	H	4	6	5	6			H	4	8	5	1	3	5	H	4	6	5	6				
N	4	6	4	2			N	4	2	9	2			N	4	6	4	2			N	4	2	14	5				
Q	4	2	7	1			Q	4	10	0	9			Q	4	2	11	1			Q	4	15	0	9				
R	4	8	0	8			R	4	12	0	8			R	4	12	0	8			R	4	15	0	9				
V1	5	4	3	1	1	10	V1	5	4	3	6	2	3	V1	5	4	3	1	1	10	V1	5	4	3	6	2	3		
V2	5	4	4	1	2	10	V2	5	4	4	6	3	3	V2	5	4	4	1	2	10	V2	5	4	4	6	3	3		
V3	5	4	5	6	4	3	V3	5	4	5	6	4	3	V3	5	4	4	1	2	10	V3	5	4	5	6	4	3		
36"						48"						36"						48"											
A	5	4	5	5		A	5	4	6	11			A	5	4	5	5			A	5	4	6	11					
C1	4	2	1	7		C1	4	2	1	10			C1	4	2	1	7			C1	4	2	1	10					
C2	4	2	3	8		C2	4	2	3	10			C2	4	2	3	8			C2	4	2	3	10					
C3	4	2	4	10		C3	4	2	5	10			C3	4	2	4	10			C3	4	2	5	10					
E1	5	2	11	8	8	8	E1	5	2	14	0	11	0	E1	5	2	16	4	13	4	E1	5	2	19	10	16	10		
E2	5	2	11	10	8	10	E2	5	2	14	2	11	2	E2	5	2	16	6	13	6	E2	5	2	20	0	17	10		
F	4	9	1	3	0	4	F	4	11	1	3	0	4	F	4	13	1	3	0	4	F	4	17	1	3	0	4		
G1	4	3	9	7			G1	4	1	11	0			G1	4	3	14	4			G1	4	1	16	9				
G2	4	3	12	0			G2	4	3	13	3			G2	4	3	16	8			G2	4	3	19	0				
H	4	7	5	8	4	0	H	4	9	16	10	5	2	H	4	9	5	8	4	0	H	4	12	6	11	5	3		
N	4	6	4	10			N	4	6	4	10			N	4	6	4	10			N	4	6	4	10				
Q	4	2	8	2			Q	4	2	8	2			Q	4	2	12	8			Q	4	12	6	11	5	3		
R	4	9	0	8			R	4	9	0	8			R	4	13	0	8			R	4	6	6	2				
V1	5	4	3	4	2	1	V1	5	4	2	10	4		V1	5	4	3	4	2	1	V1	5	4	3	9	2	6		
V2	5	4	4	4	3	1	V2	5	4	4	4	3	1	V2	5	4	4	4	3	1	V2	5	4	4	9	3	6		
V3	5	2	5	4	4	1	V3	5	4	3	9	2	6	V3	5	2	5	4	4	1	V3	5	4	3	9	2	6		
							V2	5	4	4	9	3	6								V2	5	4	4	9	3	6		
							V3	5	4	5	9	4	6								V3	5	4	5	9	4	6		

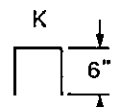
- NOTES:**
- ① NUMBER OF BARS IN ONE HEADWALL.
 - 2. DIMENSIONS ARE OUT TO OUT OF BARS.
 - 3. ALL BARS ARE STRAIGHT EXCEPT THOSE SHOWN BELOW.

BENT BAR SHAPES

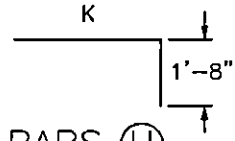
TO BE FIELD BENT



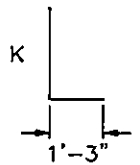
BARS (E)



BARS (F)



BARS (H)



BARS (V)

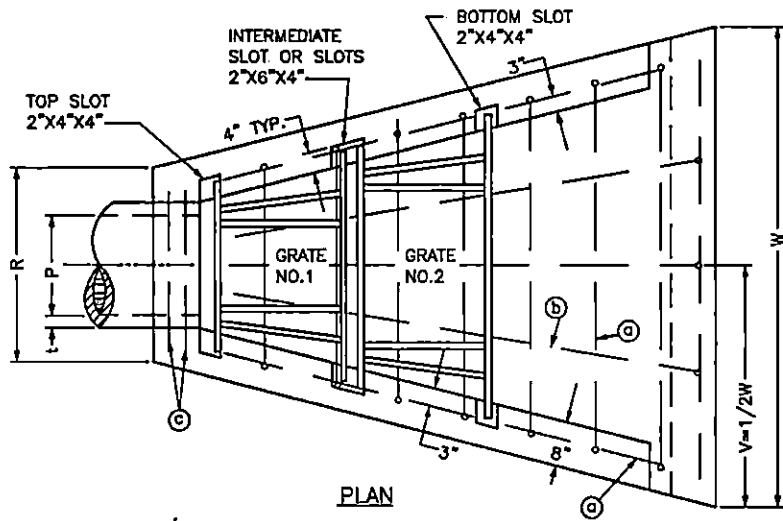
LEXINGTON

DIVISION OF ENGINEERING

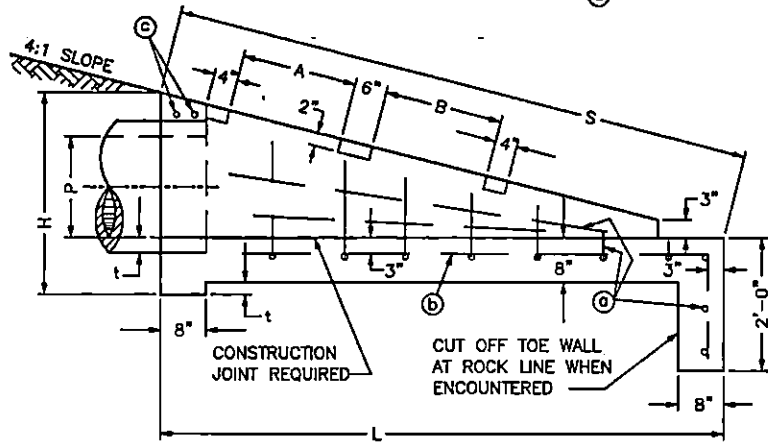
BILL OF REINFORCEMENT
30"-48" DOUBLE & TRIPLE
HEADWALLS-CIRCULAR PIPE
0° SKEW

STANDARD DRAWING NO. 159-3

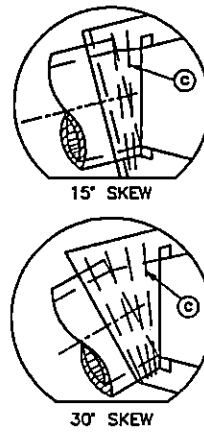
APPROVAL: 9/22/17
URBAN COUNTY ENGINEER DATE
COMMISSIONER 9/22/17 DATE



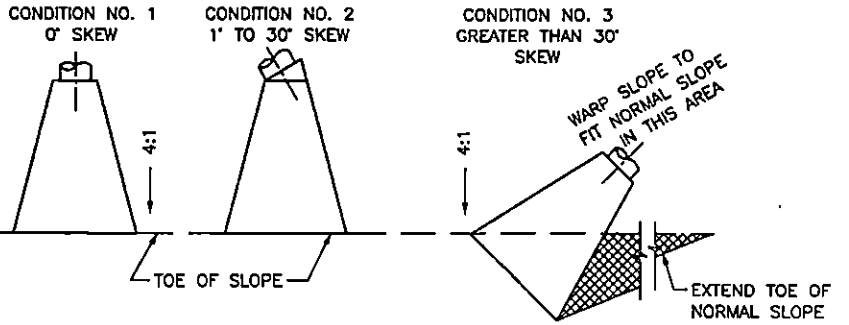
PLAN



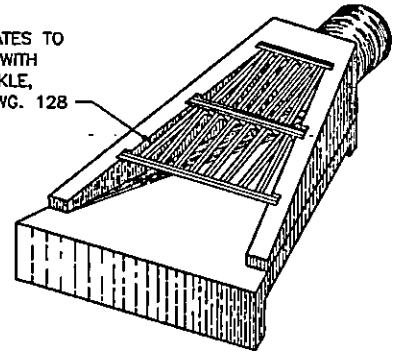
ELEVATION



PLAN VIEW OF STRUCTURE LOCATIONS



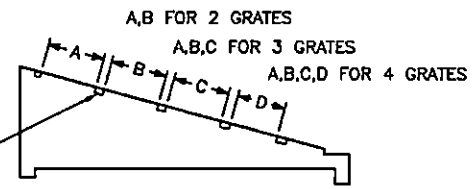
SECURE GRATES TO STRUCTURE WITH CHAIN SHACKLE, SEE STD. DWG. 128



18"-24" TRIMETRIC VIEW

- NOTES:
1. THE MINIMUM REQUIREMENT FOR REINFORCING STEEL SHALL BE GRADE 40. FIELD BENDING WILL BE PERMITTED.
 2. ONE ADDITIONAL (C) BAR WILL BE REQUIRED FOR EACH 15' SKEW.
 3. t IS CONCRETE PIPE WALL THICKNESS.

DETAIL SHOWING LOCATION OF SLOTS FOR GRATES



SEE STD. DWG. 163 FOR GRATE DETAILS.

DIMENSIONS										
P	H	L	S	R	V	W	A	B	C	D
18"	3'-0"	8'-6"	8'-9 1/8"	2'-11 1/2"	3'-7 1/2"	7'-3"	1'-9"	1'-9"	-	-
24"	3'-7"	10'-8"	11'-0"	3'-6 1/2"	4'-5 1/2"	8'-11"	2'-9"	2'-9"	-	-
30"	4'-2"	12'-10"	13'-2 3/4"	4'-1 1/2"	5'-3 1/2"	10'-7"	2'-9"	2'-9"	1'-9"	-
36"	4'-9"	15'-0"	15'-5 1/2"	4'-8 1/2"	6'-1 1/2"	12'-3"	2'-9"	2'-9"	1'-9"	1'-9"

NO. OF GRATES REQ'D	
2'	3'
2	-
-	2
1	2
2	2

NO. 4 REINFORCEMENT BARS					LBS.	CLASS "A" CONC. CU.YD.
NUMBER-LENGTH AND WEIGHT						
(C)	(B)	(2)	(C)			
14 AT 6'-5"	3 AT 8'-6"	2 AT 2'-8"			81	1.8
16 AT 8'-0"	3 AT 10'-6"	2 AT 3'-3"			111	2.7
18 AT 9'-7"	3 AT 12'-9"	2 AT 3'-10"			146	3.8
20 AT 11'-4"	3 AT 15'-0"	2 AT 4'-5"			187	5.1

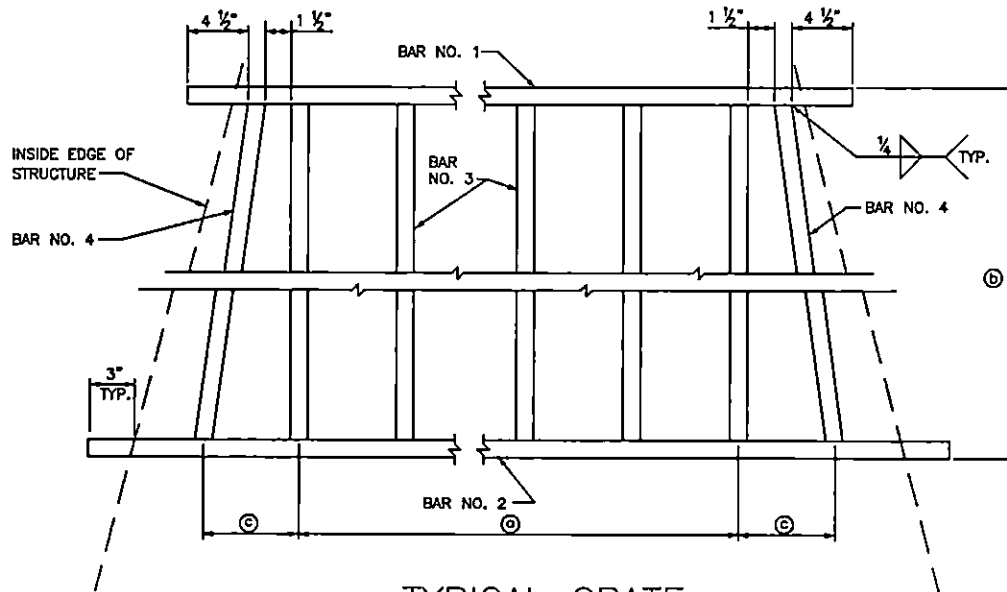


DIVISION OF ENGINEERING

SLOPED AND FLARED BOX INLET-OUTLET
18"-24"-30"-36"
ALL SKEWS

STANDARD DRAWING NO.	162
APPROVAL	9/22/17
URBAN COUNTY ENGINEER	9/22/17
COMMISSIONER	DATE

BOX INLET-OUTLET SIZE	GRATE		BAR NO. 1	BAR NO. 2	BAR NO. 3		BAR NO. 4	LBS. STRUCTURAL STEEL	
	NO.	SIZE	LENGTH	LENGTH	NO. BARS	LENGTH	LENGTH	EACH GRATE	TOTAL
18"	1	2'-0"	2'-6 1/2"	3'-5 3/4"	4	1'-10"	1'-10 1/4"	116	272
	2	2'-0"	3'-7 5/8"	4'-6 7/8"	6	1'-10"	1'-10 1/4"	156	
24"	1	3'-0"	3'-1 1/2"	4'-6 5/8"	5	2'-10"	2'-10 3/8"	187	454
	2	3'-0"	4'-8 1/2"	6'-1 5/8"	8	2'-10"	2'-10 3/8"	267	
30"	1	3'-0"	3'-8 1/2"	5'-1 1/2"	6	2'-10"	2'-10 3/8"	215	796
	2	3'-0"	5'-3 1/2"	6'-8 5/8"	9	2'-10"	2'-10 3/8"	294	
	3	2'-0"	6'-10 1/2"	7'-9 3/4"	13	1'-10"	1'-10 1/4"	287	
36"	1	3'-0"	4'-3 1/2"	5'-8 1/2"	7	2'-10"	2'-10 3/8"	242	1218
	2	3'-0"	5'-10 1/2"	7'-3 5/8"	10	2'-10"	2'-10 3/8"	321	
	3	2'-0"	7'-5 1/2"	8'-4 3/4"	14	1'-10"	1'-10 1/4"	308	
	4	2'-0"	8'-6 3/4"	9'-5 7/8"	16	1'-10"	1'-10 1/4"	347	



TYPICAL GRATE

NOTES:

- Ⓒ EQUALLY SPACE BARS NO. 3.
 - Ⓓ SIZE OF GRATE EITHER 2'-0" OR 3'-0".
 - Ⓔ 5 1/2" FOR 2'-0" GRATE, 7" FOR 3'-0" GRATE.
1. ALL COMPONENTS ARE 1" x 2" STRUCTURAL STEEL BARS.
 2. SEE STD. DWG. 162.
 3. SECURE GRATE TO STRUCTURE WITH CHAIN SHACKLE, SEE STD. DWG. 128.



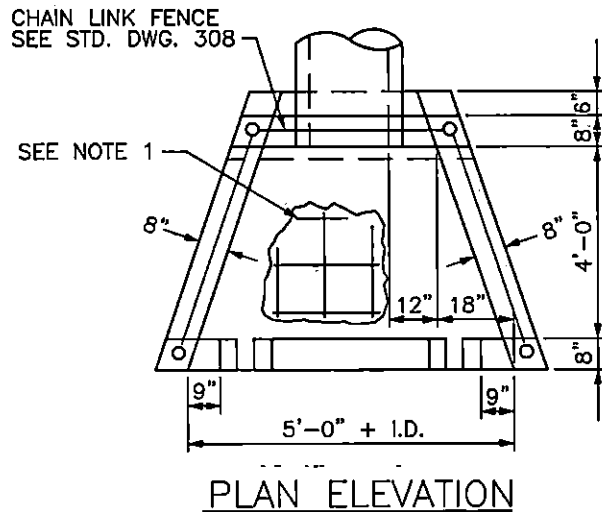
LEXINGTON

DIVISION OF ENGINEERING

GRATES FOR SLOPED AND FLARED BOX INLET-OUTLET

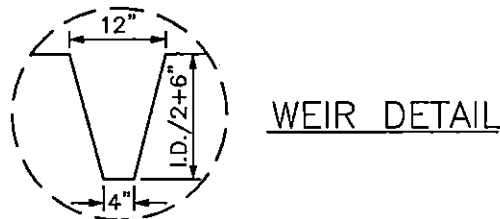
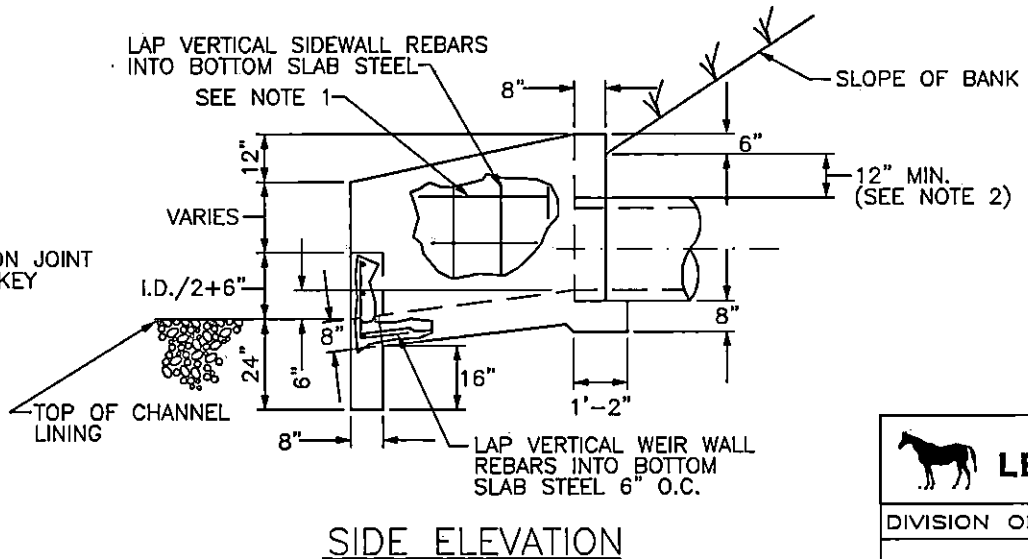
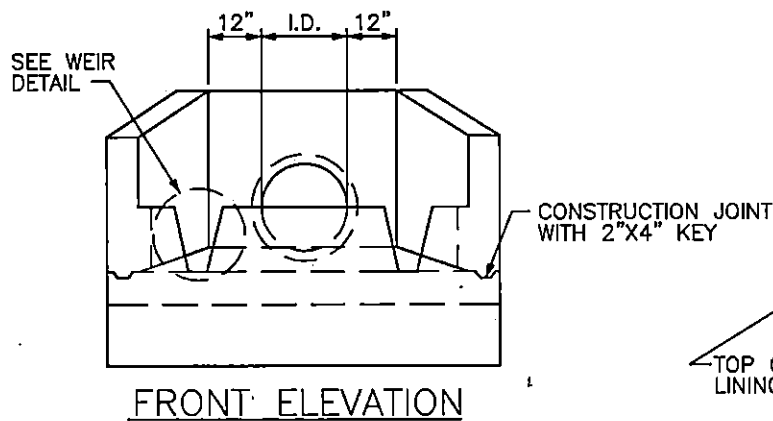
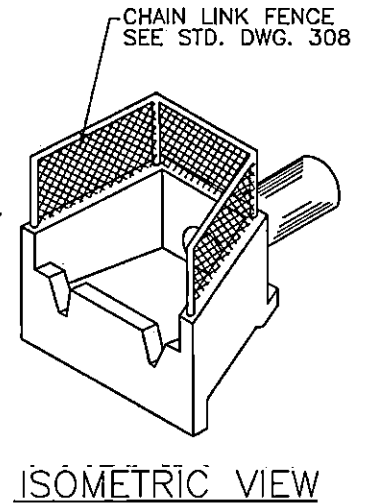
STANDARD DRAWING NO. 163


APPROVAL: *[Signature]* 9/22/17
 URBAN COUNTY ENGINEER / DATE
 COMMISSIONER *[Signature]* 9/22/17 / DATE



NOTES:

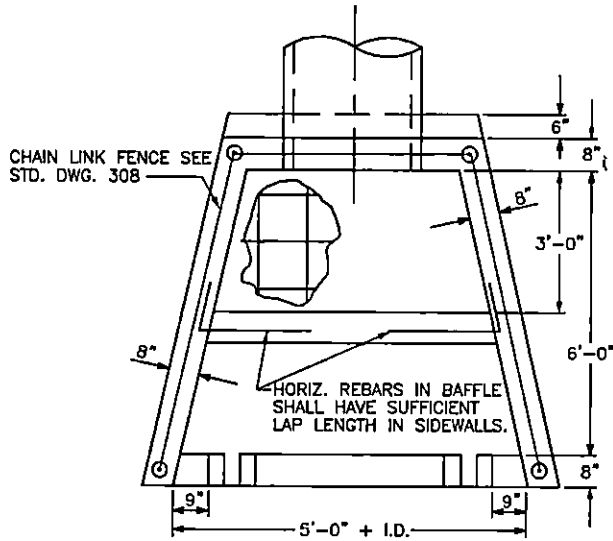
1. NO. 5 STEEL BARS TO BE USED THROUGHOUT ON 12" CENTERS.
2. HEIGHT OF WALL SHALL BE DETERMINED BY THE AMOUNT OF FILL BEHIND PIPE. TOP OF WALL SHALL BE 18" ABOVE TOP O.D. OF PIPE.
3. TOP OF END SILL SHALL BE LEVEL WITH CENTERLINE OF PIPE.
4. CHANNEL LINING TO BE WIDTH OF END SILL, 18" MINIMUM THICKNESS, AND COMPOSED OF CLASS III CHANNEL LINING.
5. ALL VERTICAL OR SLOPED EXPOSED SURFACES SHALL HAVE A RUBBED FINISH.
6. ALL EXPOSED FLAT WORK TO HAVE A HAND FLOATED AND BROOMED FINISH.
7. ALL EXPOSED EDGES SHALL HAVE A 3/4" CHAMFER.
8. ALL STEEL SHALL HAVE 2" MINIMUM CLEARANCE TO THE CONCRETE FACE ON THE BACKFILL SIDE OF THE WALLS.
9. FENCES REQUIRED ON HEADWALLS.



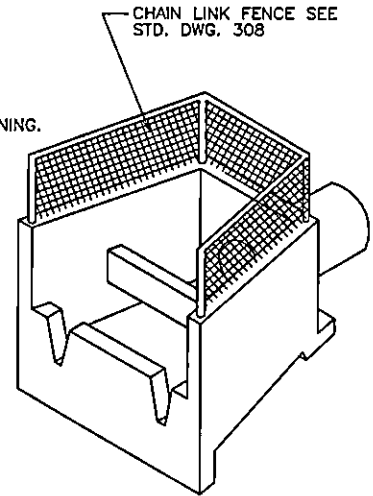
 LEXINGTON	
DIVISION OF ENGINEERING	
IMPACT STILLING BASIN 15"-24" PIPES	
STANDARD DRAWING NO.	164
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE

NOTES:

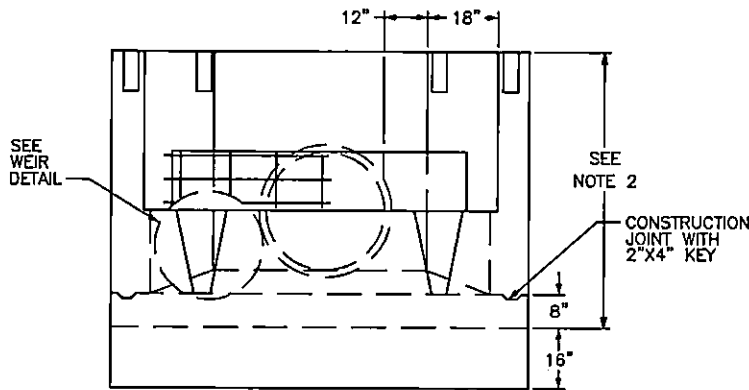
1. NO. 5 STEEL BARS SHALL BE USED THROUGHOUT ON 12" CENTERS EXCEPT ON BAFFLE WHERE HORIZONTAL AND VERTICAL STEEL WILL BE ON 6" CENTERS.
2. HEIGHT OF WALL SHALL BE DETERMINED BY THE AMOUNT OF FILL BEHIND PIPE. TOP OF WALL SHALL BE 18" ABOVE TOP O.D. OF PIPE.
3. TOP OF END SILL SHALL BE LEVEL WITH CENTERLINE OF PIPE.
4. TOP OF BAFFLE SHALL BE LEVEL WITH CROWN OF PIPE, AND THE BOTTOM SHALL BE LEVEL WITH CENTERLINE OF PIPE.
5. CHANNEL LINING TO BE 2 TIMES THE WIDTH OF THE END SILL AND EXTEND A MINIMUM OF 4' BEYOND THE STILLING BASIN WITH AN 18" MINIMUM THICKNESS AND COMPOSED OF CLASS III CHANNEL LINING.
6. CHANNEL LINE SPILL SLOPES BEYOND SIDES OF HEADWALL WITH CLASS III CHANNEL LINING. CHANNEL LINING SHALL EXTEND 4' IN WIDTH ON SLOPES AT WINGWALL AND TO DOWNSTREAM END OF CHANNEL.
7. ALL VERTICAL OR SLOPED EXPOSED SURFACES SHALL HAVE A RUBBED FINISH.
8. ALL EXPOSED FLATWORK SHALL HAVE A HANDFLOATED AND BROOMED FINISH.
9. ALL EXPOSED EDGES SHALL HAVE A 3/4" CHAMFER.
10. ALL STEEL SHALL HAVE A 2" MINIMUM CLEARANCE TO THE CONCRETE FACE ON THE BACKFILL SIDE OF THE STRUCTURE.
11. CHAIN LINK FENCE IS REQUIRED ON ALL HEADWALLS WHEN THE VERTICAL FACE IS GREATER THAN 30".
12. ALL LARGER PIPES SHALL HAVE A SPECIAL DESIGN STILLING BASIN.
13. ALL LONGITUDINAL REINFORCING BARS IN BAFFLE SHALL HAVE SUFFICIENT ANCHORAGE LENGTH IN SIDEWALLS.



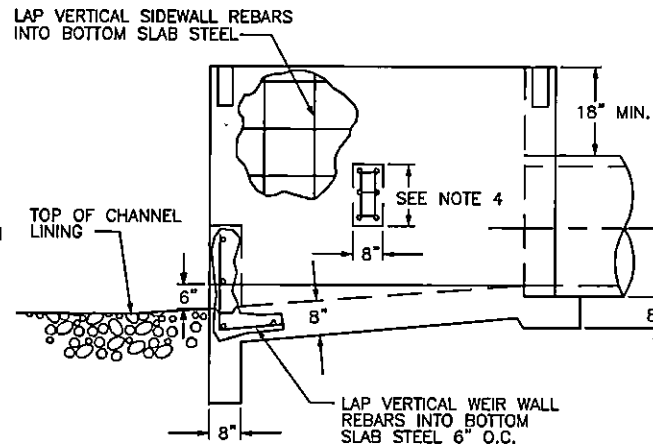
PLAN ELEVATION



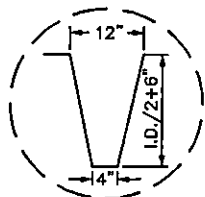
ISOMETRIC VIEW



FRONT ELEVATION



SIDE ELEVATION



WEIR DETAIL

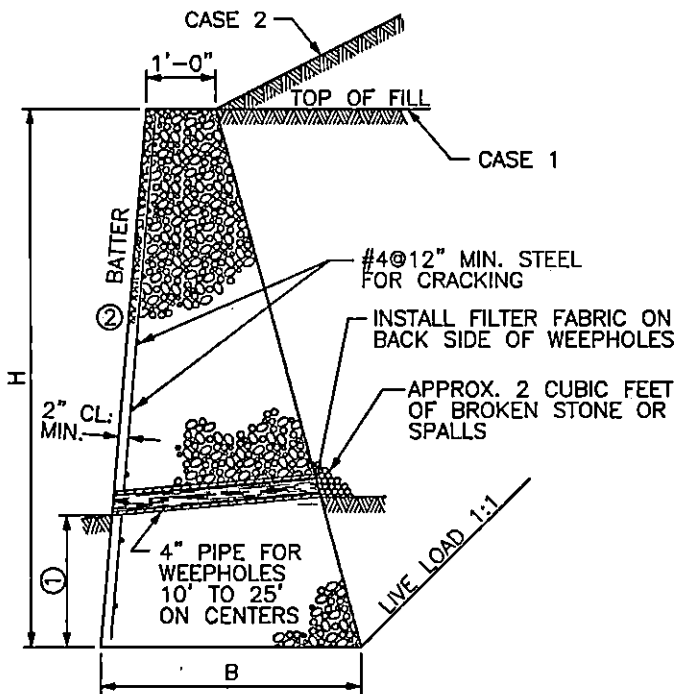


LEXINGTON

DIVISION OF ENGINEERING

IMPACT STILLING BASIN
27"-48" PIPES

STANDARD DRAWING NO.	165
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



RETAINING WALL

H	B	END AREA SQ. FT.	VOLUME C.Y./L.F.
CASE 1 OR 2			
2'-6"	1'-3"	2.8125	0.1042
3'-0"	1'-6"	3.7500	0.1389
3'-6"	1'-9"	4.8125	0.1782
4'-0"	2'-0"	6.0000	0.2222
4'-6"	2'-3"	7.3125	0.2708
5'-0"	2'-6"	8.7500	0.3241
5'-6"	2'-9"	10.3125	0.3819
6'-0"	3'-0"	12.0000	0.4444
6'-6"	3'-3"	13.8125	0.5116
7'-0"	3'-6"	15.7500	0.5833
7'-6"	3'-9"	17.8125	0.6597
8'-0"	4'-0"	20.0000	0.7407
8'-6"	4'-3"	22.3125	0.8264
9'-0"	4'-6"	24.7500	0.9167
9'-6"	4'-9"	27.3125	1.0116
CASE 1			
10'-0"	5'-0"	30.0000	1.1111
10'-6"	5'-3"	32.8125	1.2153
11'-0"	5'-6"	35.7500	1.3241
11'-6"	5'-9"	38.8125	1.4375
12'-0"	6'-0"	42.0000	1.5556
CASE 2			
10'-0"	6'-0"	35.0000	1.2963
10'-6"	6'-3"	38.0625	1.4097
11'-0"	6'-6"	41.2500	1.5278
11'-6"	6'-9"	44.5625	1.6505
12'-0"	7'-0"	48.0000	1.7778

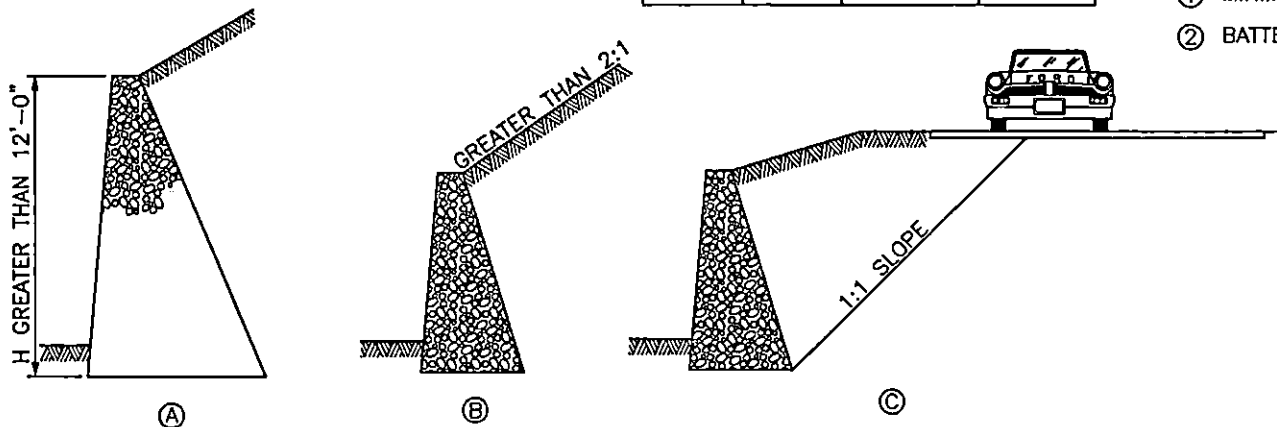
NOTES:

- THE RETAINING WALL DEPICTED ON THIS DRAWING SHALL BE USED WHEN THE HEIGHT ("H" DIMENSION) OF THE WALL IS 2'-6" TO 12'-0" PROVIDED THE FILL COMPLIES WITH THE FOLLOWING CONDITIONS:
 CASE 1 - TOP OF FILL IS LEVEL WITH TOP OF WALL.
 CASE 2 - WALL IS SURCHARGED WITH DEAD LOAD FILL SLOPES OF 2:1 OR LESS.
- AREAS AND VOLUMES HAVE BEEN COMPUTED WITHOUT DEDUCTING FOR BEVELED EDGES OR PIPE DRAINS. WHEN A RETAINING WALL VARIES IN HEIGHT, THE PRISMOIDAL FORMULA SHALL BE USED IN COMPUTING VOLUMES.
- GRAVITY TYPE RETAINING WALLS SHALL BE CONSTRUCTED OF CLASS "A" CONCRETE.
- TRANSVERSE EXPANSION JOINTS 1/2 INCH IN WIDTH SHALL BE PLACED AT INTERVALS OF NOT OVER 30 FEET THROUGHOUT THE LENGTH OF RETAINING WALLS AND EXPANSION JOINT MATERIAL SHALL BE PLACED THEREIN. ALL EXPOSED EDGES SHALL BE BEVELED 3/4 INCH. THE WALLS SHALL NOT BE SURCHARGED EXCEPT IN SPECIAL CASES WHEREIN SPECIAL DRAWINGS WILL BE FURNISHED.


SHEET NOTES: ○

SPECIAL DESIGNS SHALL BE REQUIRED WHEN ANY ONE OF THE FOLLOWING CONDITIONS EXIST:

- (A) WALL HEIGHT IS GREATER THAN 12'-0" (CASE 1 OR CASE 2 FILL).
- (B) WALL IS SURCHARGED WITH DEAD LOAD FILL SLOPES GREATER THAN 2:1.
- (C) WALL IS SURCHARGED WITH A LIVE LOAD WITHIN THE LIMITS OF A 1:1 SLOPE EXTENDING FROM THE BASE OF THE WALL.
- ① MINIMUM VALUE FOR FIRM SOIL IS 2'-0".
- ② BATTER: H=3'-0" TO LESS THAN 5'-0" (VERTICAL)
 H=5'-0" TO LESS THAN 10'-0" (1":1)
 H=10'-0" TO 12'-0" (2":1)



SPECIAL DESIGNS REQUIRED





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DIVISION OF ENGINEERING

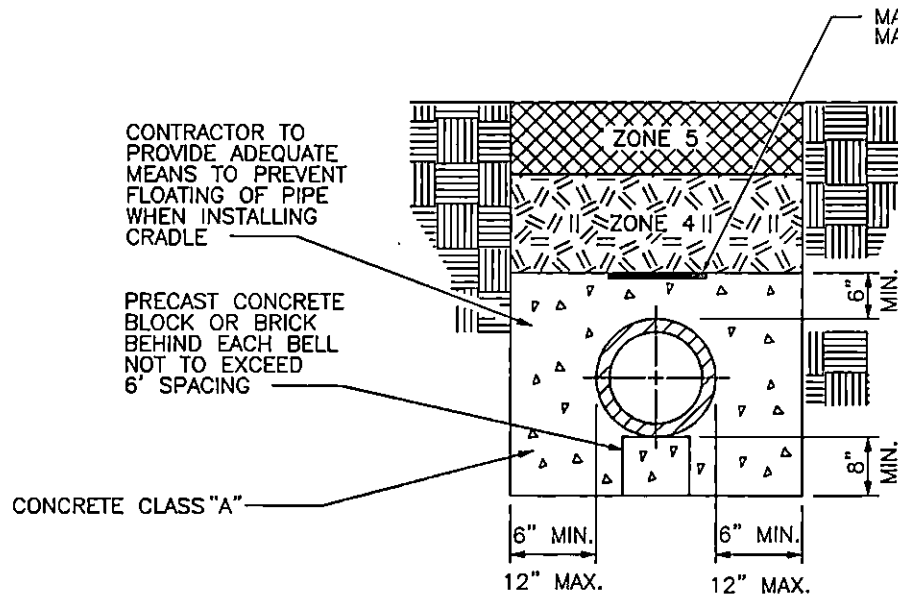
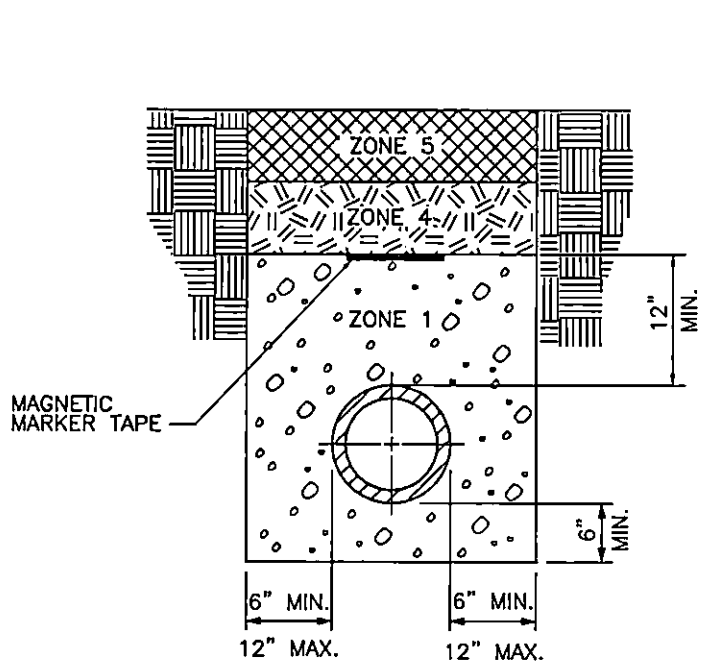
RETAINING WALL
GRAVITY TYPE

STANDARD DRAWING NO. 180

APPROVAL:  9/22/17

URBAN COUNTY ENGINEER  DATE 9/22/17

COMMISSIONER DATE



PIPE LAID IN ROCK OR SOIL TRENCH

STANDARD CONCRETE ENCASEMENT
(NOTE: AS REQUIRED BY DESIGN)

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

NOTES:

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



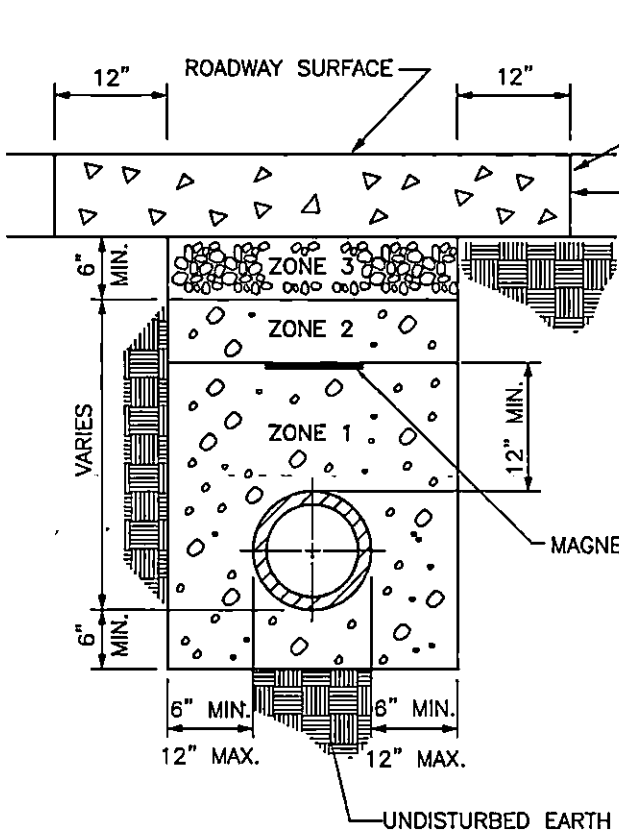
LEXINGTON

DIVISION OF ENGINEERING

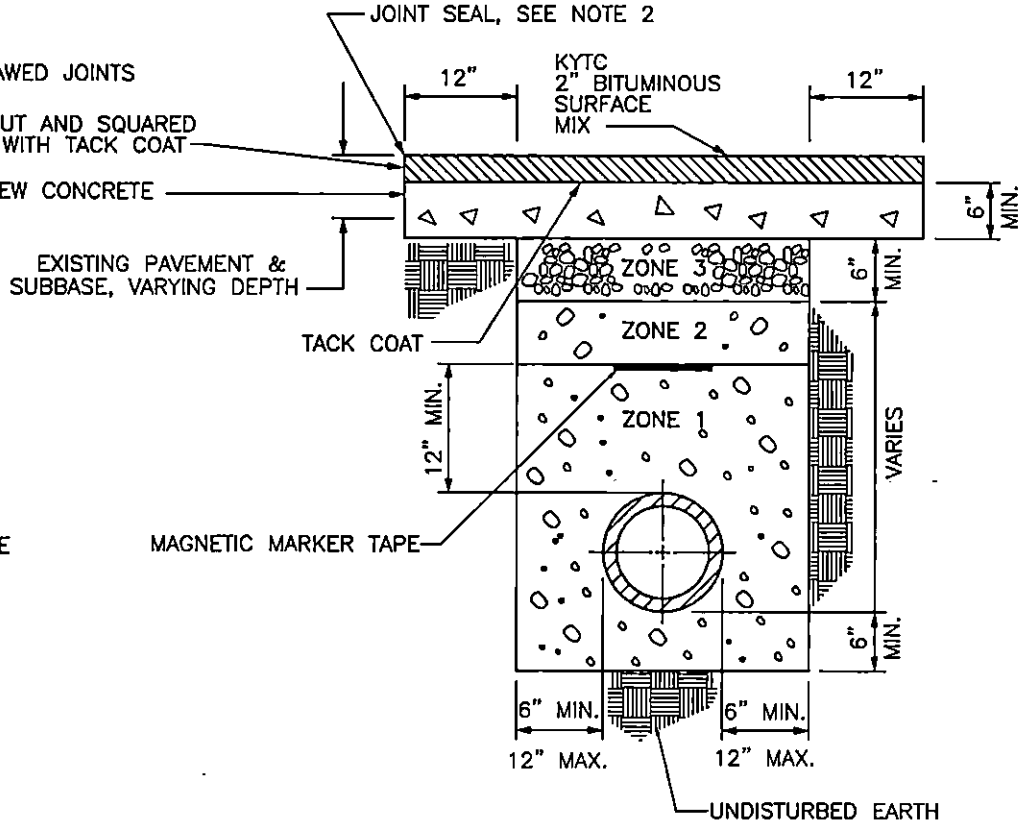
TRENCHING, LAYING,
BACKFILLING AND BEDDING
OUTSIDE R/W LIMITS

STANDARD DRAWING NO.	200
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

CONCRETE PAVEMENT



BITUMINOUS PAVEMENT



NOTES:

1. REPLACE CONCRETE PAVEMENT WITH NEW CONCRETE PAVEMENT, 6" MINIMUM OR EXISTING THICKNESS, WHICHEVER IS GREATER.
2. SEAL PERIMETER OF CUT PAVEMENT WITH CRACK SEALANT THAT MEETS ASTM D6690, TYPE 2.
3. MAGNETIC MARKER TAPE FOR SANITARY SEWER ONLY.

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

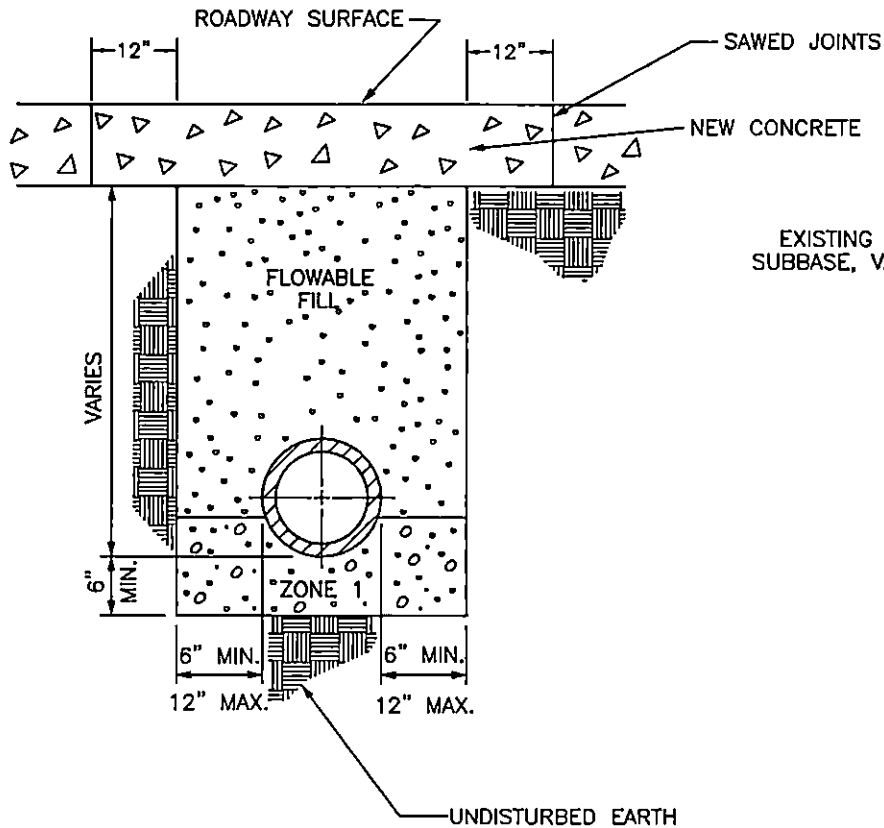


DIVISION OF ENGINEERING

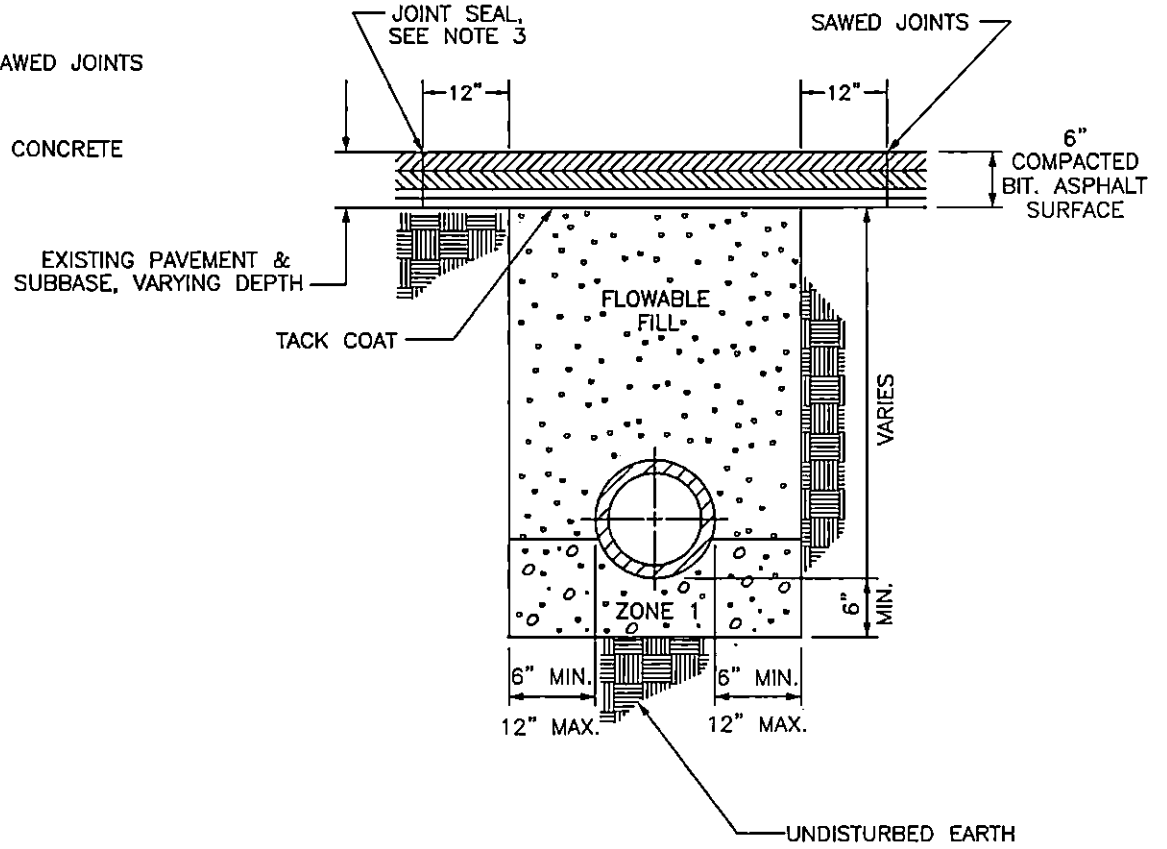
TRENCHING, LAYING, BACKFILLING AND BEDDING UNDER STREET PAVEMENT

STANDARD DRAWING NO.	201-1
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

CONCRETE PAVEMENT



BITUMINOUS PAVEMENT



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

NOTES:

1. FLOWABLE FILL PER KYTC SPECIFICATION 601.03.03 FROM STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION CURRENT EDITION.
2. REPLACE CONCRETE PAVEMENT WITH NEW CONCRETE PAVEMENT, 6" MINIMUM OR EXISTING THICKNESS, WHICHEVER IS GREATER.
3. SEAL PERIMETER OF CUT PAVEMENT WITH CRACK SEALANT THAT MEETS ASTM D6690, TYPE 2.



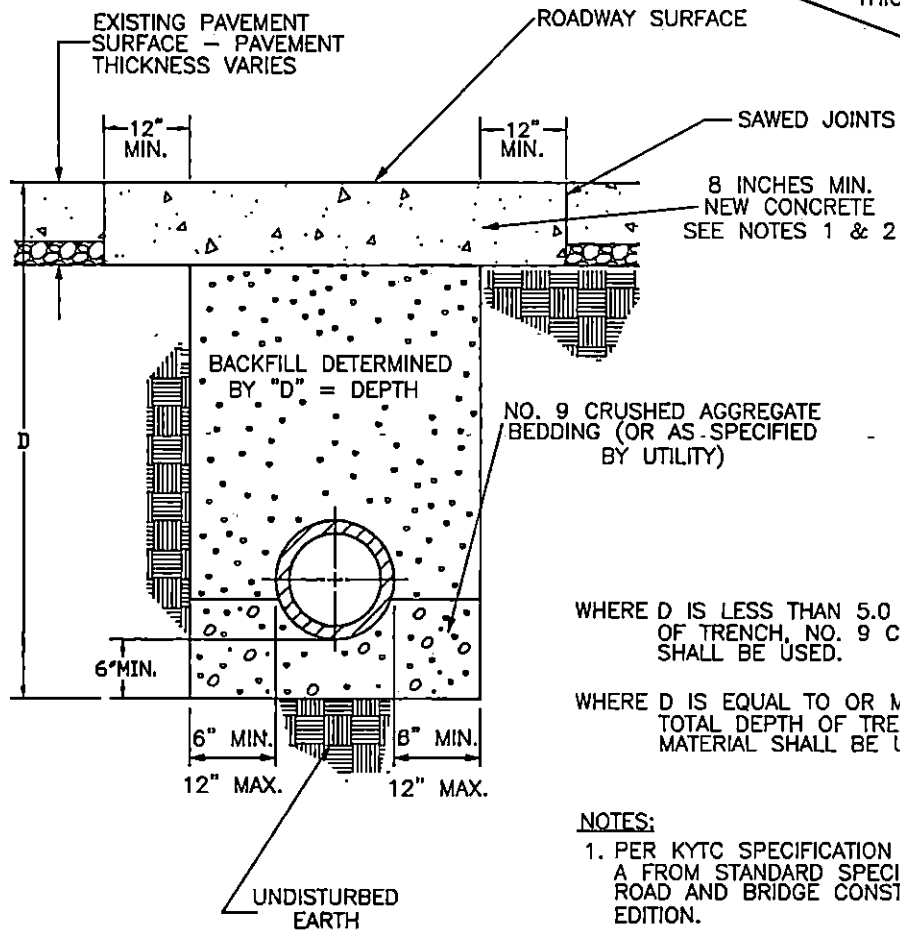
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TRENCHING, LAYING, BACKFILLING, AND BEDDING UNDER STREET PAVEMENT USING FLOWABLE FILL

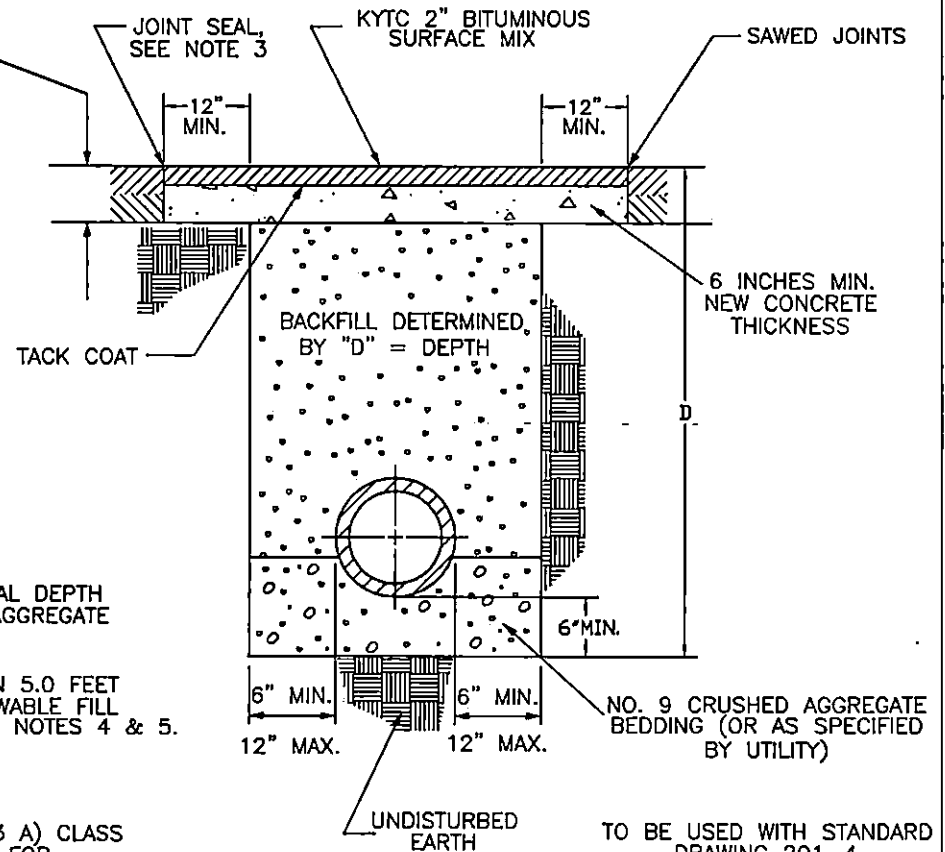
STANDARD DRAWING NO.	201-2
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

CONCRETE PAVEMENT



EXISTING PAVEMENT SURFACE - PAVEMENT THICKNESS VARIES

BITUMINOUS PAVEMENT




WHERE D IS LESS THAN 5.0 FEET TOTAL DEPTH OF TRENCH, NO. 9 CRUSHED AGGREGATE SHALL BE USED.

WHERE D IS EQUAL TO OR MORE THAN 5.0 FEET TOTAL DEPTH OF TRENCH, FLOWABLE FILL MATERIAL SHALL BE USED. SEE NOTES 4 & 5.

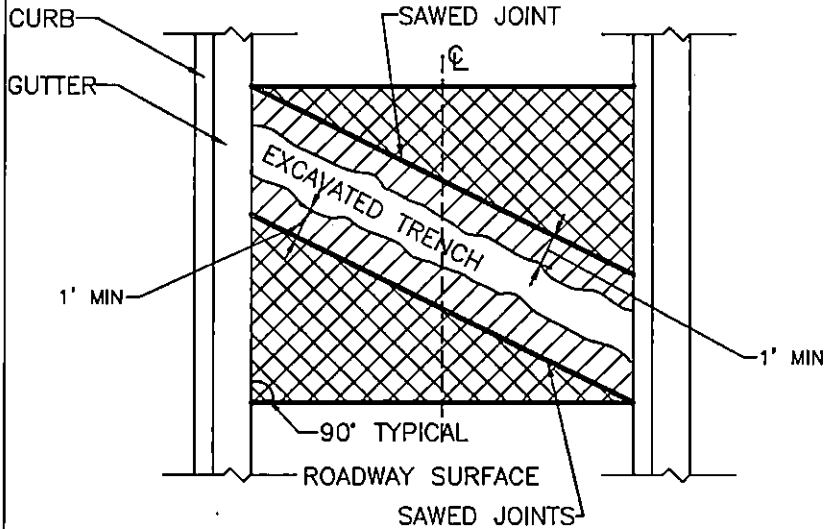
NOTES:

1. PER KYTC SPECIFICATION 601.03.03 A) CLASS A FROM STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, CURRENT EDITION.
2. REPLACE CONCRETE PAVEMENT WITH NEW CONCRETE PAVEMENT.
3. SEAL PERIMETER OF CUT PAVEMENT WITH CRACK SEALANT THAT MEETS ASTM D6690, TYPE 2.
4. FLOWABLE FILL TO BE PROPORTIONED PER KYTC SPECIFICATION 601.03.03 B) 5) FROM STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, CURRENT EDITION.
5. UTILITY DESIGNERS AND CONTRACTORS SHALL ACCOUNT FOR AND PROVIDE ANY SUITABLE MEANS TO PREVENT PIPE/CONDUIT FLOATATION.

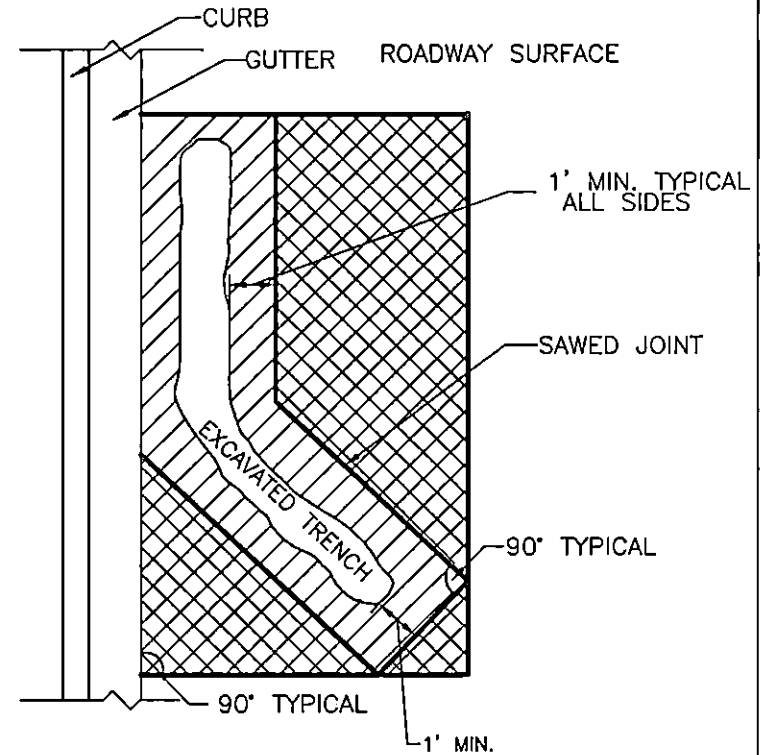
TO BE USED WITH STANDARD DRAWING 201-4

 LEXINGTON	
DIVISION OF ENGINEERING	
UTILITY TRENCH RESTORATION BENEATH EXISTING PAVED ROADS (SECTION VIEW)	
STANDARD DRAWING NO.	201-3
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

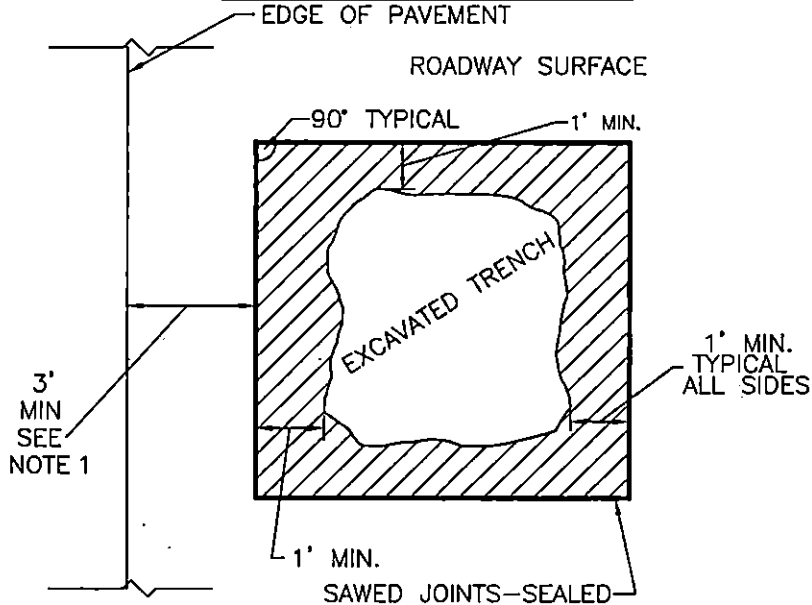
TRANSVERSE EXCAVATION



LONGITUDINAL EXCAVATION – ADJACENT TO CURB OR GUTTER

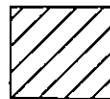


ISOLATED EXCAVATION

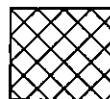


NOTES:

1. WHEN LESS THAN 3', THEN THE PAVEMENT SHALL BE REMOVED TO THE EDGE OF PAVEMENT AND REPLACED PER STANDARD DRAWING 201-3.
2. STREET CUT SHALL BE ORIENTED EITHER PARALLEL OR PERPENDICULAR TO CURB OR GUTTER.
3. ALL SAWS JOINTS SHALL PRODUCE NEAT CUTS WITH SQUARED EDGES.



AREA SHALL BE EXCAVATED TO 8" BELOW ROADWAY SURFACE, THEN REPLACED PER STANDARD DRAWING 201-3.



AREA SHALL BE MILLED 2" AND REPLACED WITH 2" BITUMINOUS SURFACE MIX.

TO BE USED WITH STANDARD DRAWING, 201-3



LEXINGTON

DIVISION OF ENGINEERING

UTILITY TRENCH RESTORATION
BENEATH EXISTING PAVED ROADS
(PLAN VIEW)

STANDARD DRAWING NO.	201-4
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

TABLE OF:
MAXIMUM ALLOWABLE FILL HEIGHTS
 (LIVE LOAD NOT INCLUDED)

DIAMETER (INCHES)	DUCTILE IRON PIPE	POLYVINYL CHLORIDE (PVC) PIPE	
	CLASS 50 *	SDR-35	SDR-26 HEAVY WALL
	MAXIMUM DEPTH OF COVER (FEET)	MAXIMUM DEPTH OF COVER (FEET)	MAXIMUM DEPTH OF COVER (FEET)
4	—	—	—
6	20	15	—
8	20	15	—
10	20	15	—
12	20	15	—
14	20	—	—
15	—	15	—
16	20	—	—
18	20	—	20
20	18	—	—
21	—	—	20
24	17	—	20
27	—	—	20
30	14	—	—
36	14	—	—
42	13	—	—
48	13	—	—

NOTES:

1. DEPTH IS BASED ON LAYING CONDITION UTILIZING NO. 9 STONE ENCASING PIPE FROM 6" MINIMUM BELOW PIPE TO A PLANE, LEVEL WITH THE TOP OF THE PIPE AND 6" TO 12" NO. 9 STONE TO EDGE OF TRENCH.
2. WEIGHT OF SOIL AND ROCK COVER MIX IS ASSUMED TO BE APPROXIMATELY 120 LB./CU. FT.
3. DUCTILE IRON PIPE HAS FLEXIBLE LINING.
4. DESIGN ENGINEERS SHOULD USE THIS STANDARD DRAWING FOR GENERAL GUIDELINES AND SHOULD CHECK THEIR DESIGN FOR SAFE, NON-DESTRUCTIVE FILL HEIGHTS FOR ACTUAL BRAND OF PIPE PROPOSED.
5. SPECIAL TRENCHING DETAILS AND PROCEDURES SHOULD BE USED WHERE FILL DEPTHS ARE HIGHER THAN THOSE SHOWN IN TABLE.
6. INSTALLATIONS REQUIRING A DEPTH GREATER THAN 20', MUST BE APPROVED BY THE ENGINEER.

* LIGHTEST CLASS OF DUCTILE IRON PIPE

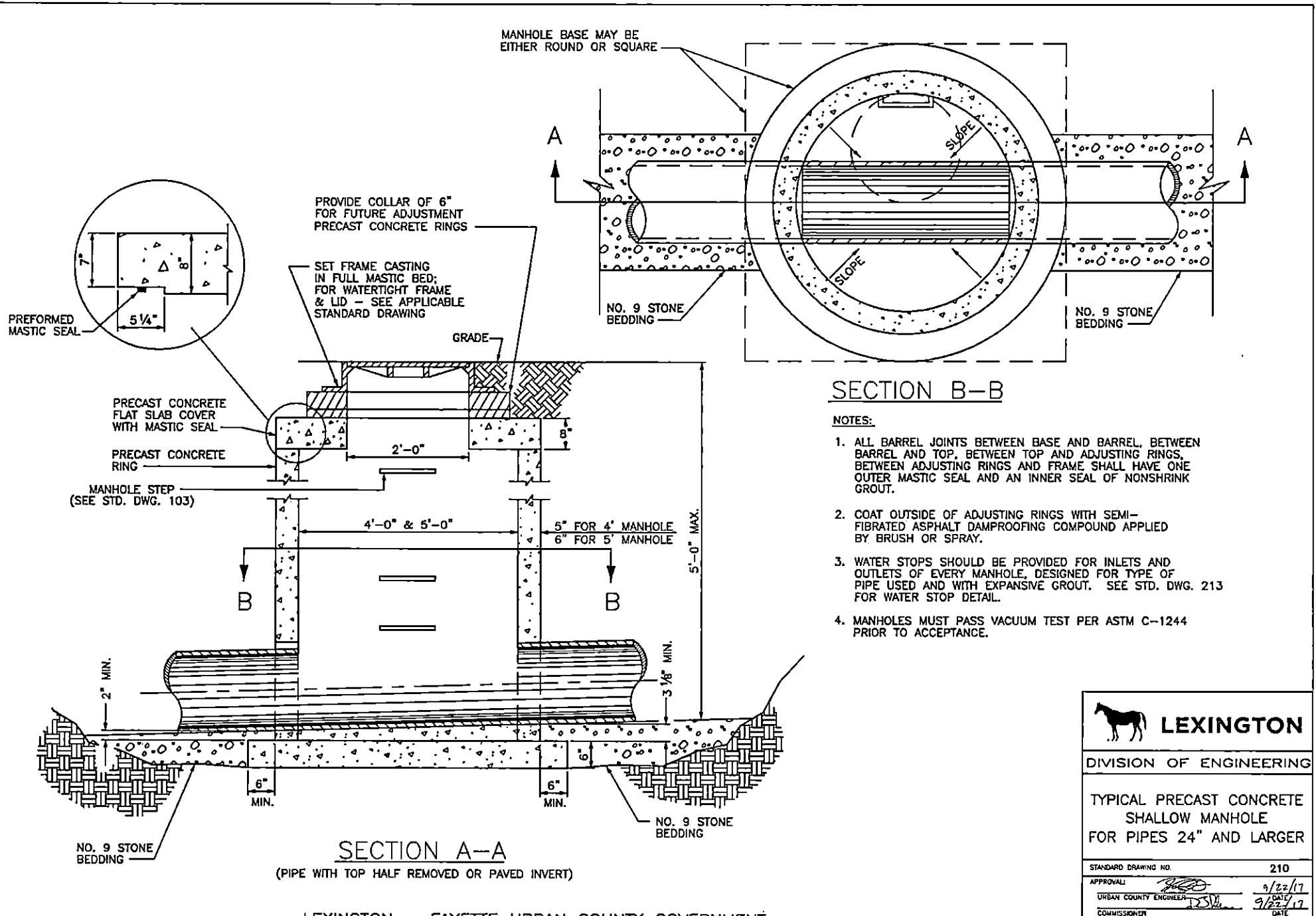



LEXINGTON

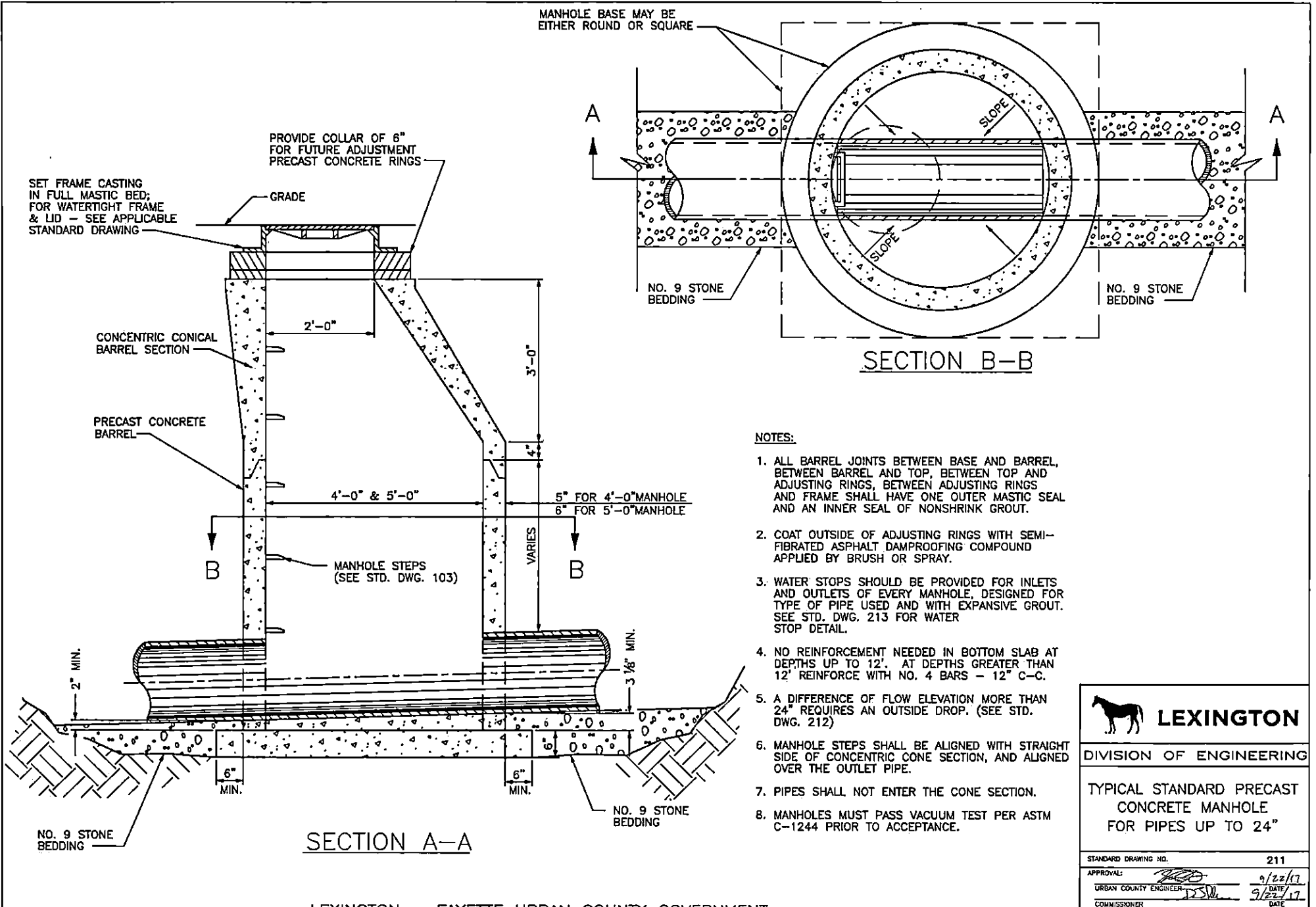
DIVISION OF ENGINEERING

SANITARY SEWER PIPE:
 TYPES & MAXIMUM
 ALLOWABLE FILL HEIGHTS


STANDARD DRAWING NO.	204
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

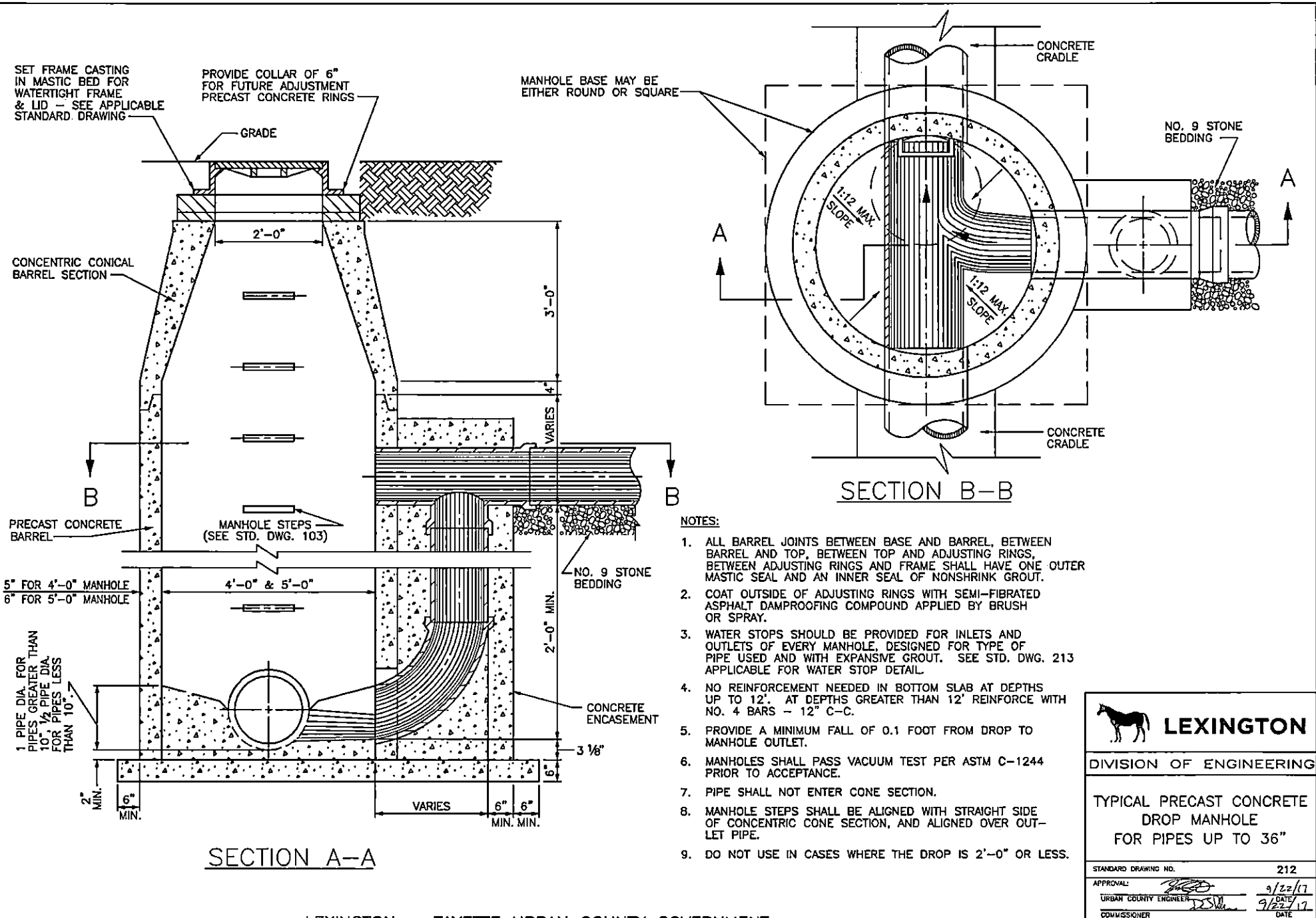


 LEXINGTON	
DIVISION OF ENGINEERING	
TYPICAL PRECAST CONCRETE SHALLOW MANHOLE FOR PIPES 24" AND LARGER	
STANDARD DRAWING NO.	210
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17 DATE




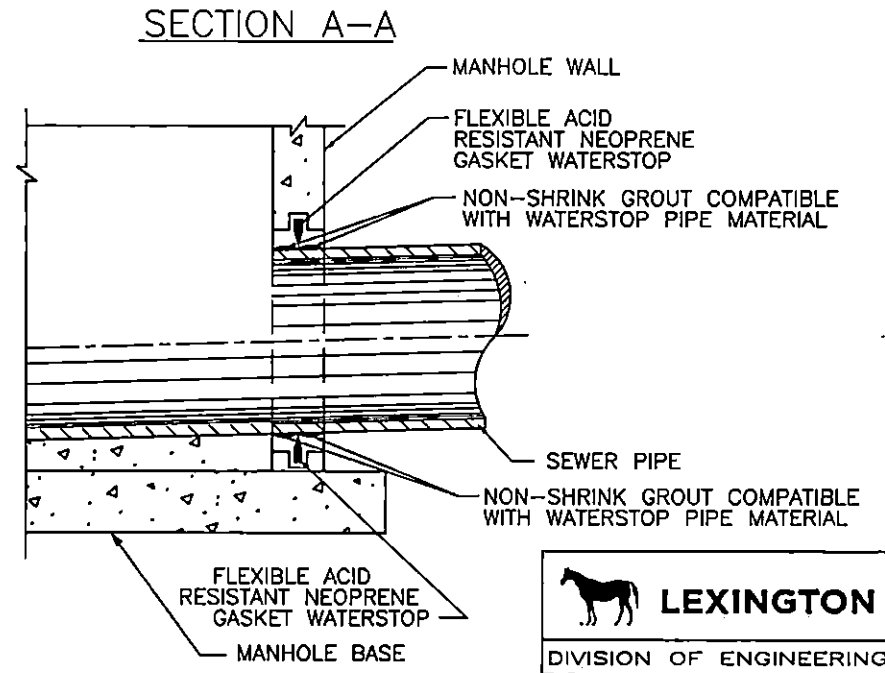
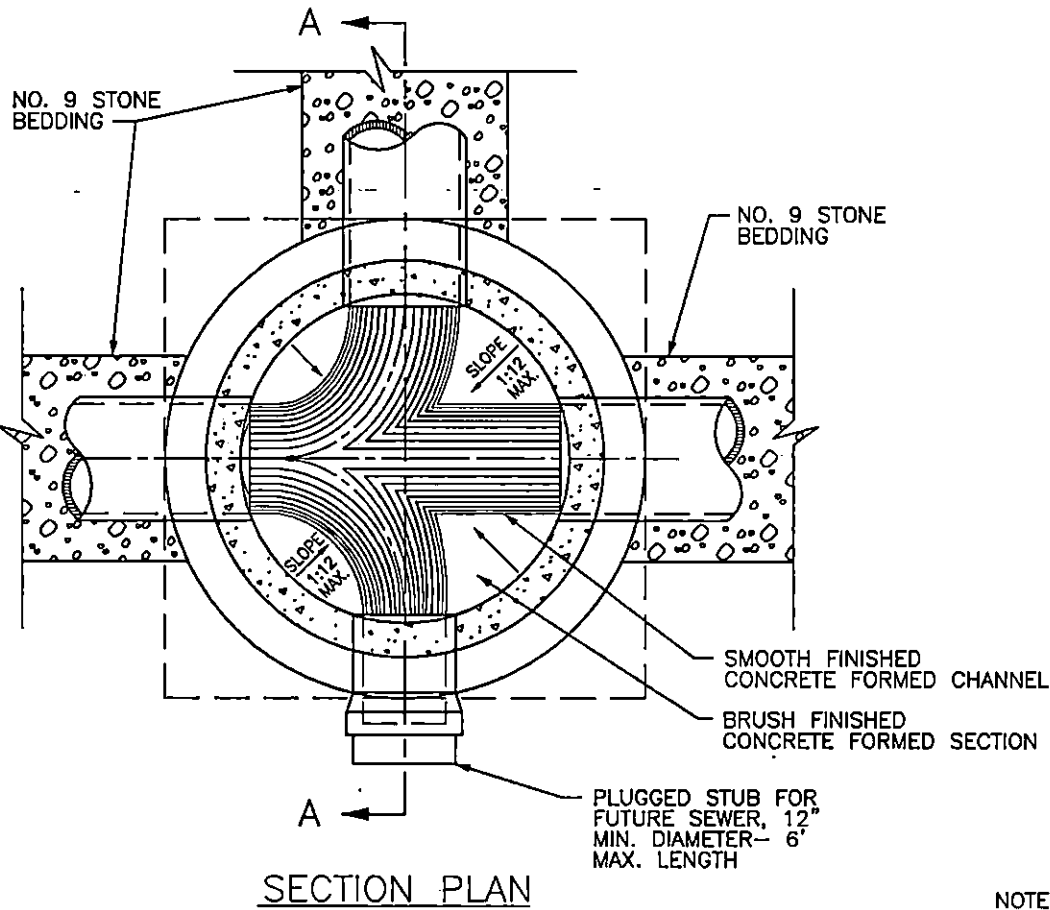
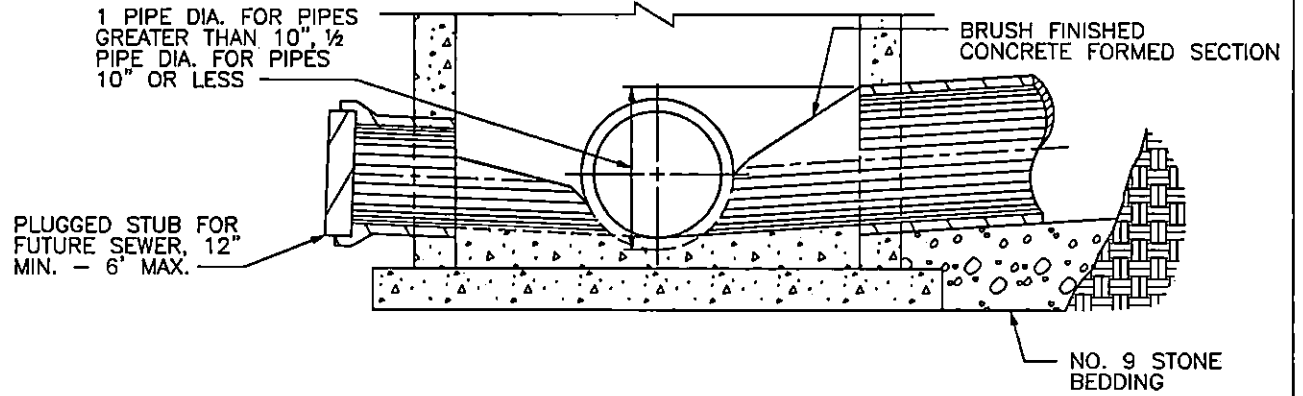
- NOTES:**
1. ALL BARREL JOINTS BETWEEN BASE AND BARREL, BETWEEN BARREL AND TOP, BETWEEN TOP AND ADJUSTING RINGS, BETWEEN ADJUSTING RINGS AND FRAME SHALL HAVE ONE OUTER MASTIC SEAL AND AN INNER SEAL OF NONSHRINK GROUT.
 2. COAT OUTSIDE OF ADJUSTING RINGS WITH SEMI-FIBRATED ASPHALT DAMPROOFING COMPOUND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

 LEXINGTON	
DIVISION OF ENGINEERING	
TYPICAL STANDARD PRECAST CONCRETE MANHOLE FOR PIPES UP TO 24"	
STANDARD DRAWING NO.	211
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE



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

 LEXINGTON	
DIVISION OF ENGINEERING	
TYPICAL PRECAST CONCRETE DROP MANHOLE FOR PIPES UP TO 36"	
STANDARD DRAWING NO.	212
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE



WATER STOP DETAIL

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



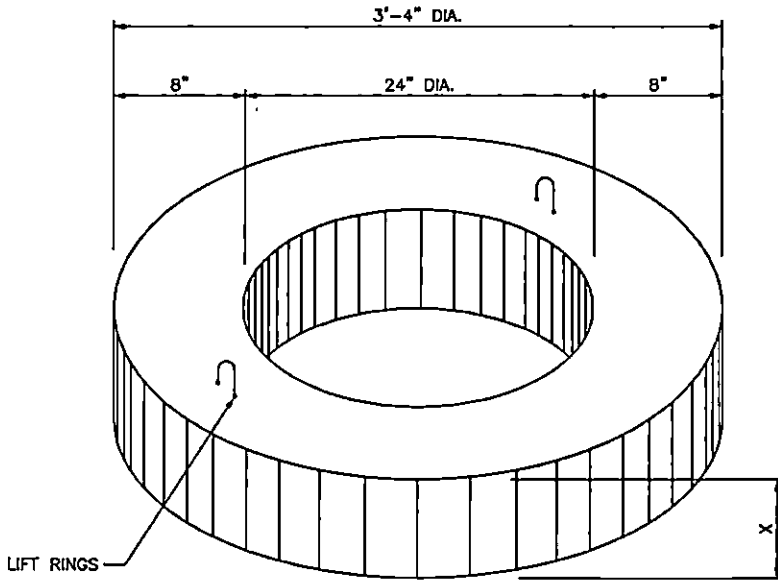
DIVISION OF ENGINEERING

STANDARD MANHOLE
JUNCTION AND WATER
STOP DETAILS

STANDARD DRAWING NO.	213
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

NOTES:

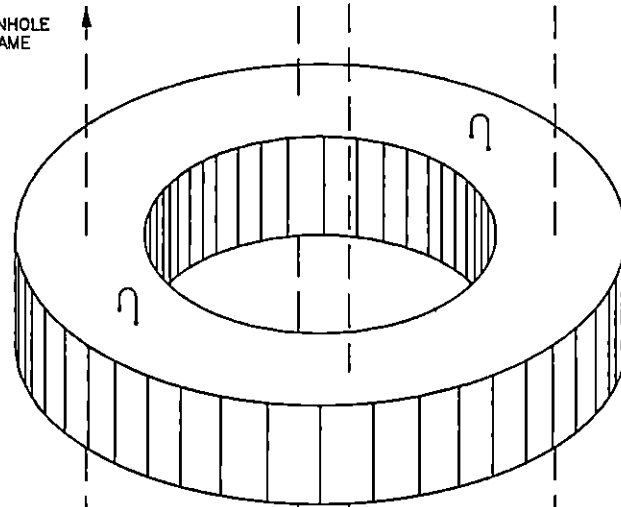
1. LIFT RINGS TO BE CUT BEFORE ADDING THE NEXT RING OR TOP.
2. COAT OUTSIDE AND IN BETWEEN ADJUSTING RINGS WITH SEMI-FIBRATED ASPHALT DAMPROOFING COMPOUND APPLIED BY BRUSH OR SPRAY.
3. GRADE RINGS WITH NON-PARALLEL SURFACES MAY BE USED TO ADJUST CASTING TO SLOPED SURFACE.
4. CONCRETE: CLASS "A" 3500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



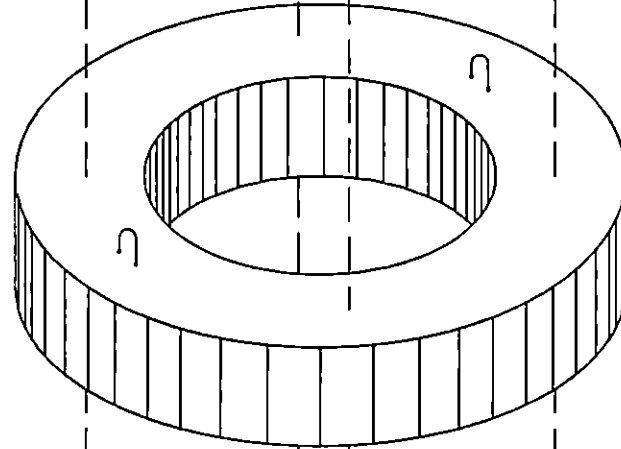
GRADE RING WIDTH CHART

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

TO MANHOLE LID FRAME



TO MANHOLE ECCENTRIC CONE SECTION



LEXINGTON

DIVISION OF ENGINEERING

SEWER MANHOLE ADJUSTMENT GRADE RINGS

STANDARD DRAWING NO. 214

APPROVAL: *[Signature]* 9/22/17
 URBAN COUNTY ENGINEER DATE
 COMMISSIONER *[Signature]* 9/22/17 DATE

GENERAL NOTES

1. SHALLOW MANHOLE TYPE CONSTRUCTION SHOWN ON STD. DWG. 210 MAY BE USED FOR ALL MANHOLES UP TO 5' IN DEPTH.
2. ALL DIMENSIONS ARE BASED ON SIZE OF LARGEST PIPE IN MANHOLE.
3. MANHOLES FOR PIPE LARGER THAN 36" SHALL BE SPECIALLY DESIGNED.
4. BOTTOM SLAB OF MANHOLES SHALL BE SPECIALLY DESIGNED WITH REGARD TO AREA, THICKNESS, AND REINFORCING IN SITUATIONS WHERE HIGH WATER TABLE OR UNSTABLE SOIL CONDITIONS EXIST.
5. MANHOLE STEPS SHALL BE INSTALLED IN A VERTICAL LINE AND SHALL COMPLY WITH OSHA STANDARDS IN ALL RESPECTS.
6. ALL FLOORS OF MANHOLES SHALL SLOPE AT LEAST 1" PER FT. FROM WALL TO CHANNELS AND SHALL HAVE SMOOTH FLOAT AND BRUSH FINISH.
7. CHANNEL SURFACE OF MANHOLES FROM INLET TO OUTLET SHALL HAVE SMOOTH FLOAT FINISH.
8. ELEVATIONS OF PIPES IN MANHOLES SHALL BE SUCH THAT THE TOP OF ALL INFLUENT PIPES WILL BE AT AN ELEVATION EQUAL TO OR GREATER THAN THE TOP OF THE EFFLUENT PIPE.
9. A MINIMUM FALL OF 0.10 FOOT SHALL BE PROVIDED.
10. BASE OF MANHOLES GREATER THAN 12' DEEP TO BE REINFORCED WITH NO. 4 BARS AT 12" BOTH WAYS.
11. ASPHALT DAMPROOFING COMPOUND IS REQUIRED ON PRECAST MANHOLES IN WET AREAS OR OTHERWISE AS DIRECTED BY THE ENGINEER.
12. LEAKS IN MANHOLES OBSERVED DURING CONSTRUCTION OR INSPECTION SHALL BE CORRECTED IMMEDIATELY.
13. MANHOLES SHALL PASS VACUUM TEST PER ASTM C-1244 PRIOR TO ACCEPTANCE.
14. ALL INLETS, INCLUDING LATERALS, MUST HAVE FLOW CHANNELS.
15. NEW CONNECTIONS TO EXISTING SANITARY SEWER MANHOLES MUST REPLACE EXISTING BRICK MANHOLES OR DAMAGED MANHOLES AT NO EXPENSE TO THE LFUGG.
16. FIELD POURED BASES (DOGHOUSE MANHOLES) SHALL ONLY BE ALLOWED WITH PRIOR APPROVAL OF THE LFUGG.

SPECIFICATIONS

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



LEXINGTON

DIVISION OF ENGINEERING

MANHOLE SIZE STANDARDS
AND GENERAL NOTES
FOR DEEP MANHOLES

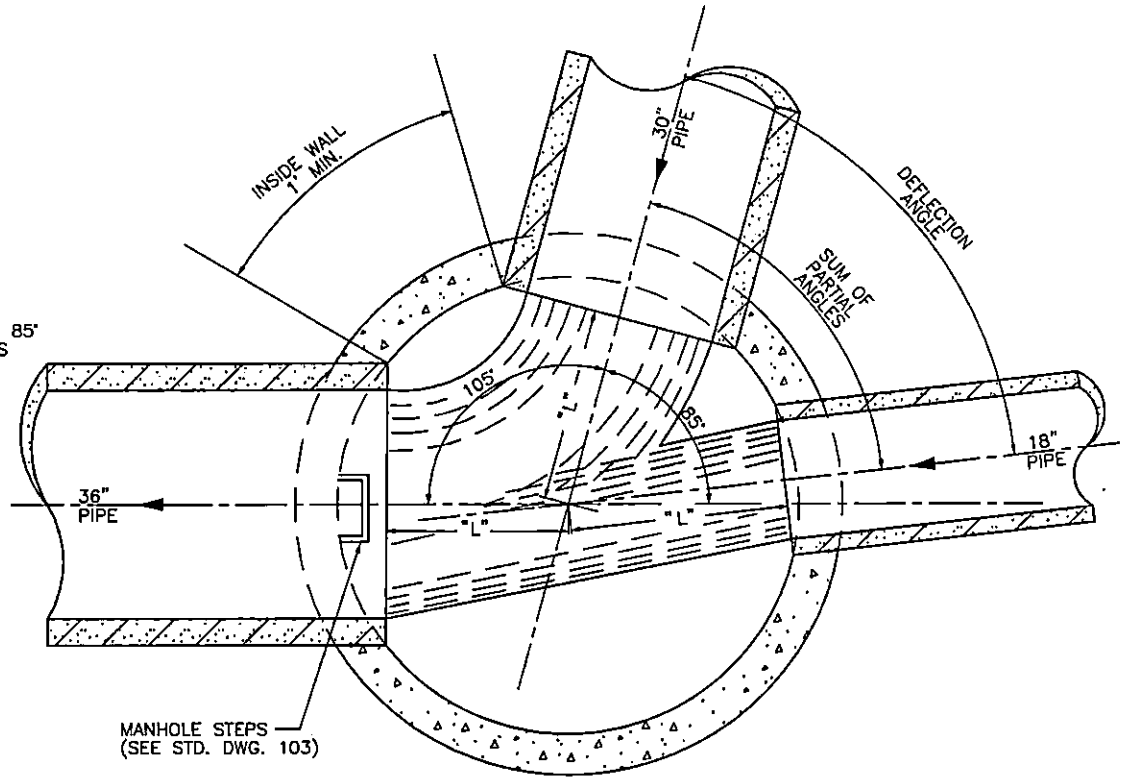
STANDARD DRAWING NO.	216
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

CIRCULAR MANHOLE NOTES:

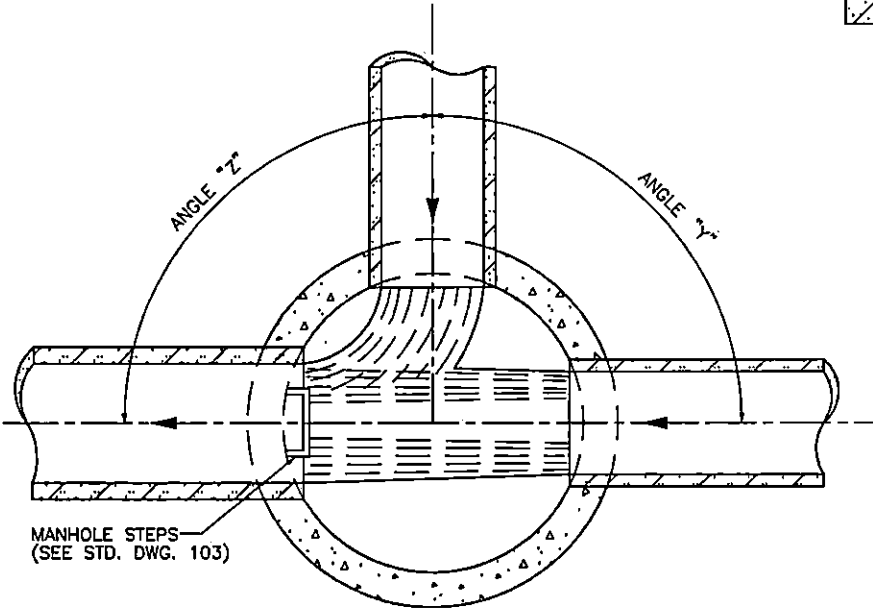
1. THE ANGLE BETWEEN ANY TWO PIPES (e.g. ANGLE "Y" OR "Z") MUST BE GREATER THAN THE SUM OF THE PARTIAL ANGLES. REFER TO SEPARATE STANDARD DRAWINGS FOR TABLE OF MINIMUM PARTIAL ANGLES. ANGLES SMALLER THAN LISTED ON TABLE SHALL REQUIRE LARGER MANHOLE SELECTION.
2. THE MAXIMUM DEFLECTION ANGLE BETWEEN ANY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

EXAMPLE FOR SANITARY MANHOLE SIZE SELECTION:

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



PLAN SECTION



PLAN SECTION

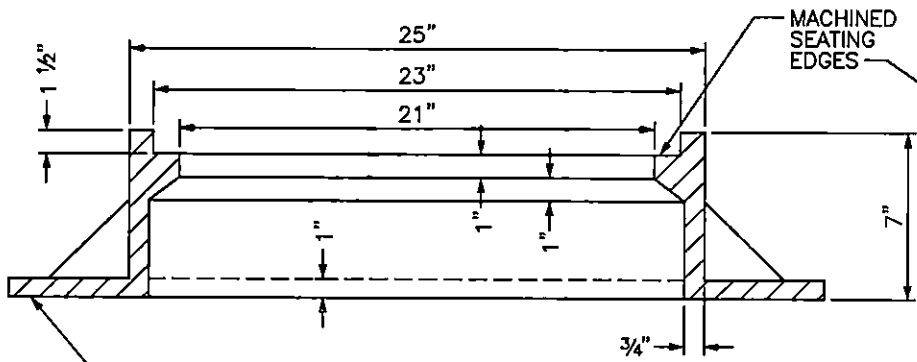
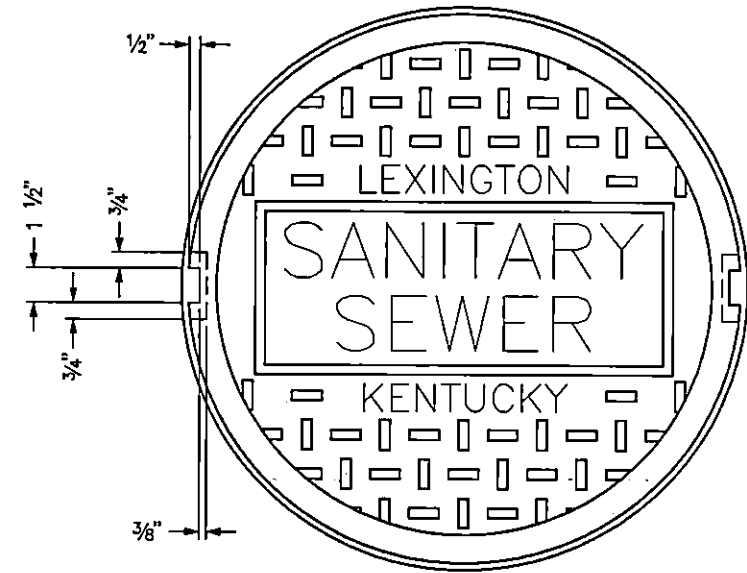
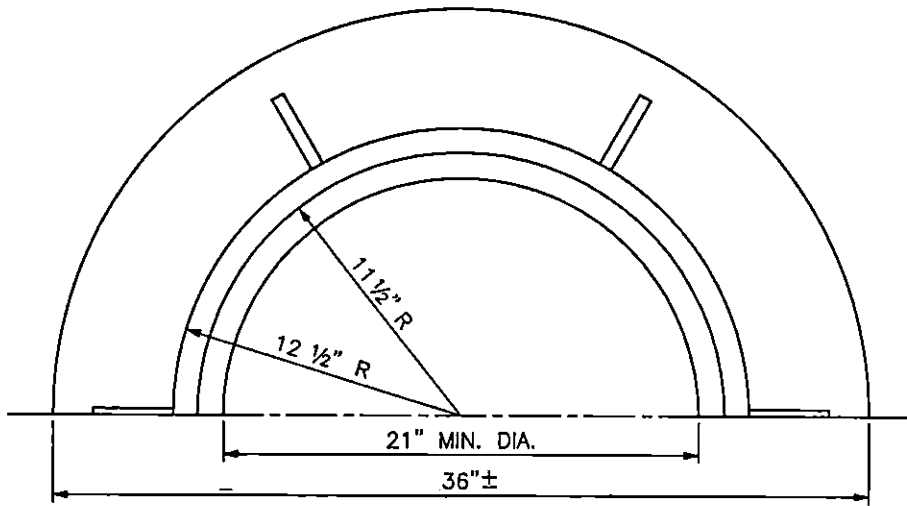
TABLE OF MINIMUM PARTIAL ANGLES FOR SANITARY MANHOLES

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

LEXINGTON
 DIVISION OF ENGINEERING

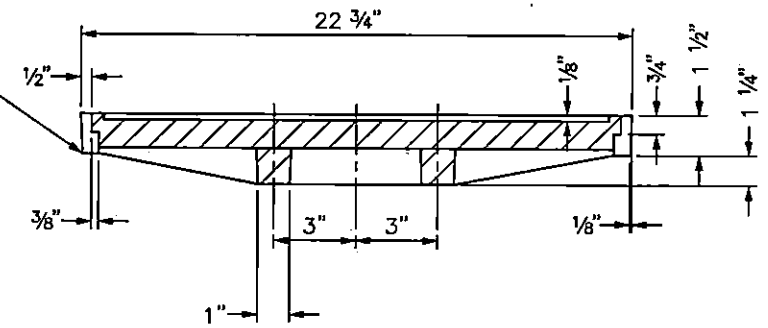
DEFLECTION ANGLE
CRITERIA FOR
SANITARY MANHOLES

STANDARD DRAWING NO.	217
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	/ DATE
COMMISSIONER	9/22/17
	DATE



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

FRAME DETAIL



COVER DETAIL

NOTE:

MANHOLE FRAME & LID ASSEMBLY SHALL HAVE A MINIMUM LID WEIGHT OF 120 LBS. AND A TOTAL MINIMUM FRAME & LID WEIGHT OF 305 LBS. WITH ALL STEEL IN ACCORDANCE WITH ASTM A-48 CLASS 35 SPEC.



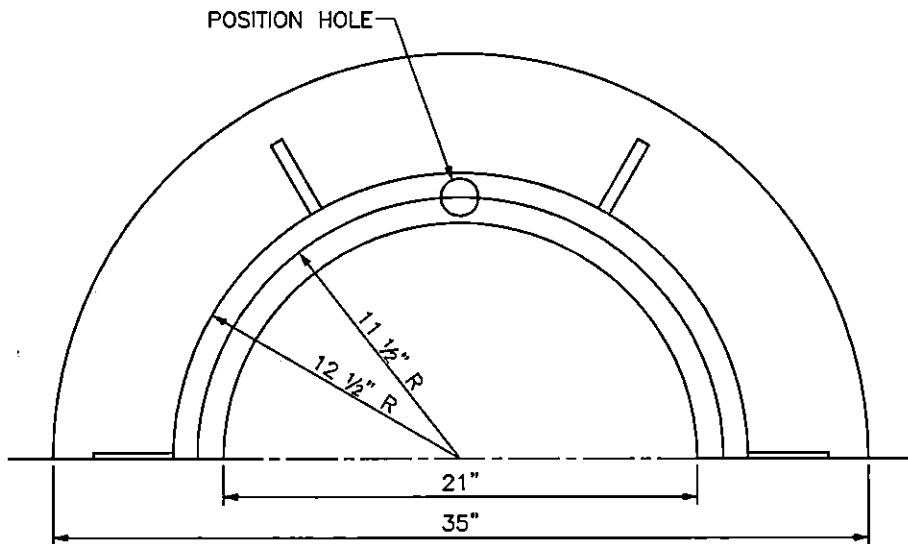
LEXINGTON

DIVISION OF ENGINEERING

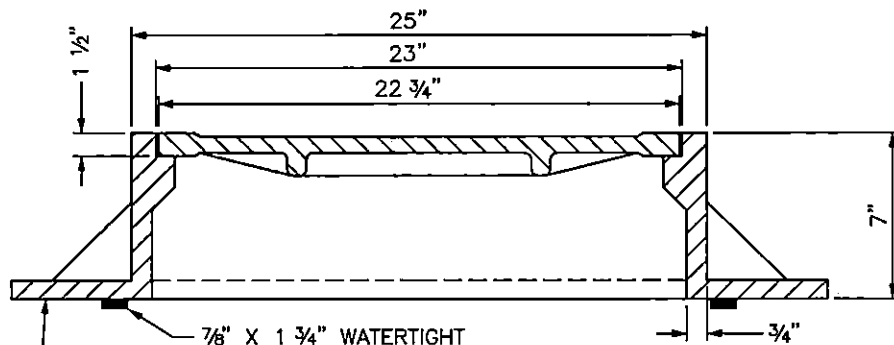
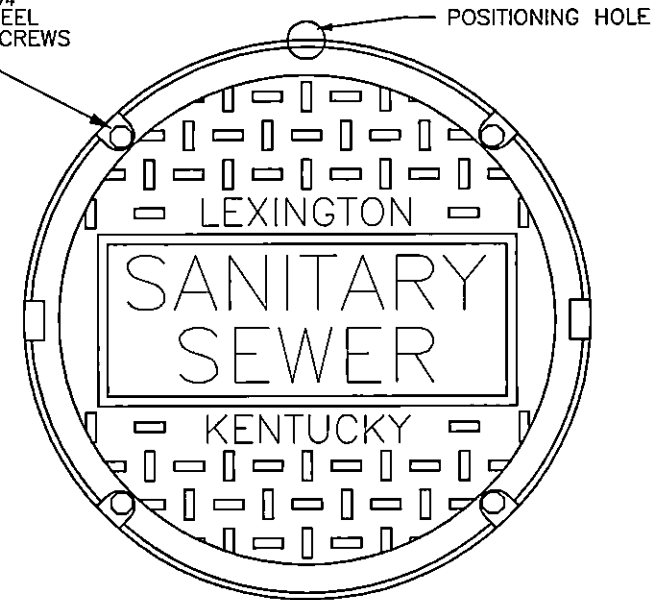
STANDARD CIRCULAR
MANHOLE FRAME & COVER

STANDARD DRAWING NO. 220

APPROVAL: *[Signature]* 9/22/17
URBAN COUNTY ENGINEER DATE
[Signature] 9/22/17
COMMISSIONER DATE



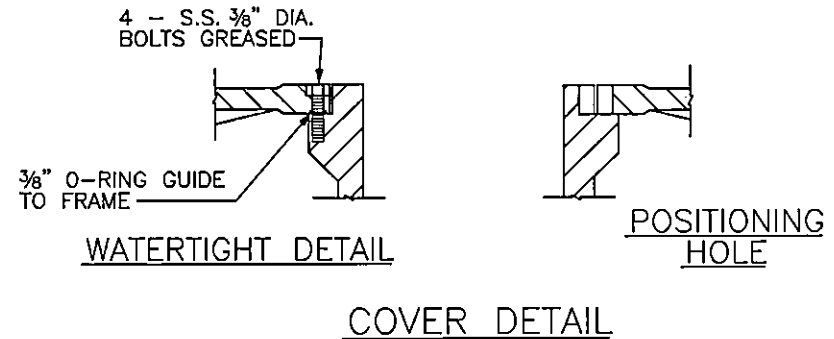
4 1/2" - 13" X 1 3/4"
STAINLESS STEEL
REC'D CAP SCREWS
GREASED



7/8" X 1 3/4" WATERTIGHT
GASKET BETWEEN BOTTOM
FRAME AND TOP OF BARREL

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

FRAME DETAIL



NOTE:

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

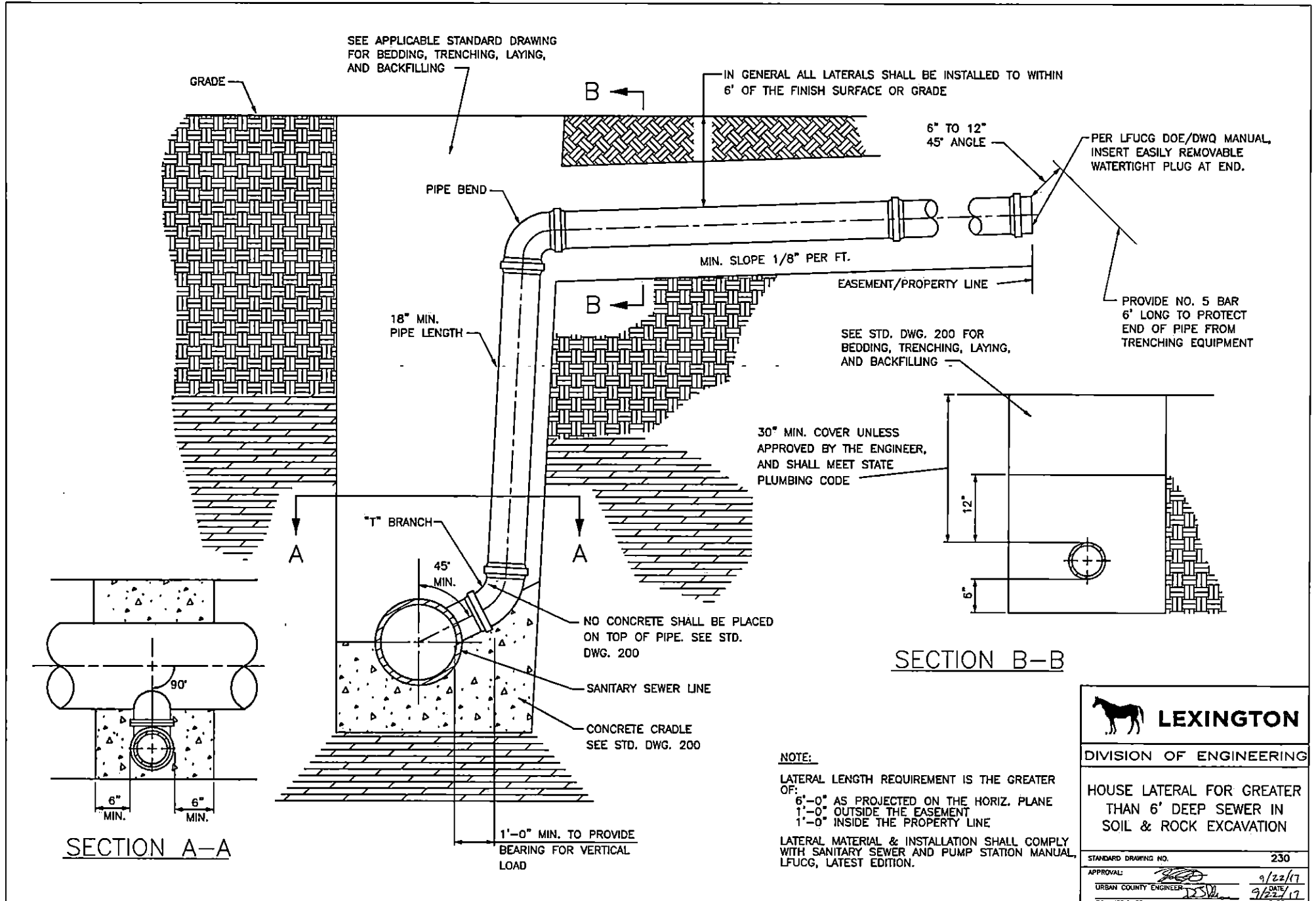


LEXINGTON

DIVISION OF ENGINEERING

STANDARD WATERTIGHT
MANHOLE FRAME & COVER

STANDARD DRAWING NO.	222
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



SEE APPLICABLE STANDARD DRAWING FOR BEDDING, TRENCHING, LAYING, AND BACKFILLING

IN GENERAL ALL LATERALS SHALL BE INSTALLED TO WITHIN 6' OF THE FINISH SURFACE OR GRADE

6" TO 12" 45° ANGLE

PER LFUGG DOE/DWQ MANUAL, INSERT EASILY REMOVABLE WATERTIGHT PLUG AT END.

PIPE BEND

MIN. SLOPE 1/8" PER FT.

EASEMENT/PROPERTY LINE

18" MIN. PIPE LENGTH

SEE STD. DWG. 200 FOR BEDDING, TRENCHING, LAYING, AND BACKFILLING

PROVIDE NO. 5 BAR 6' LONG TO PROTECT END OF PIPE FROM TRENCHING EQUIPMENT

30" MIN. COVER UNLESS APPROVED BY THE ENGINEER, AND SHALL MEET STATE PLUMBING CODE

12"

6"

SECTION B-B

"T" BRANCH

45° MIN.

NO CONCRETE SHALL BE PLACED ON TOP OF PIPE. SEE STD. DWG. 200

SANITARY SEWER LINE

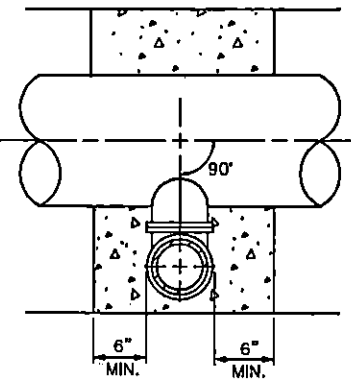
CONCRETE CRADLE SEE STD. DWG. 200

1'-0" MIN. TO PROVIDE BEARING FOR VERTICAL LOAD


NOTE:

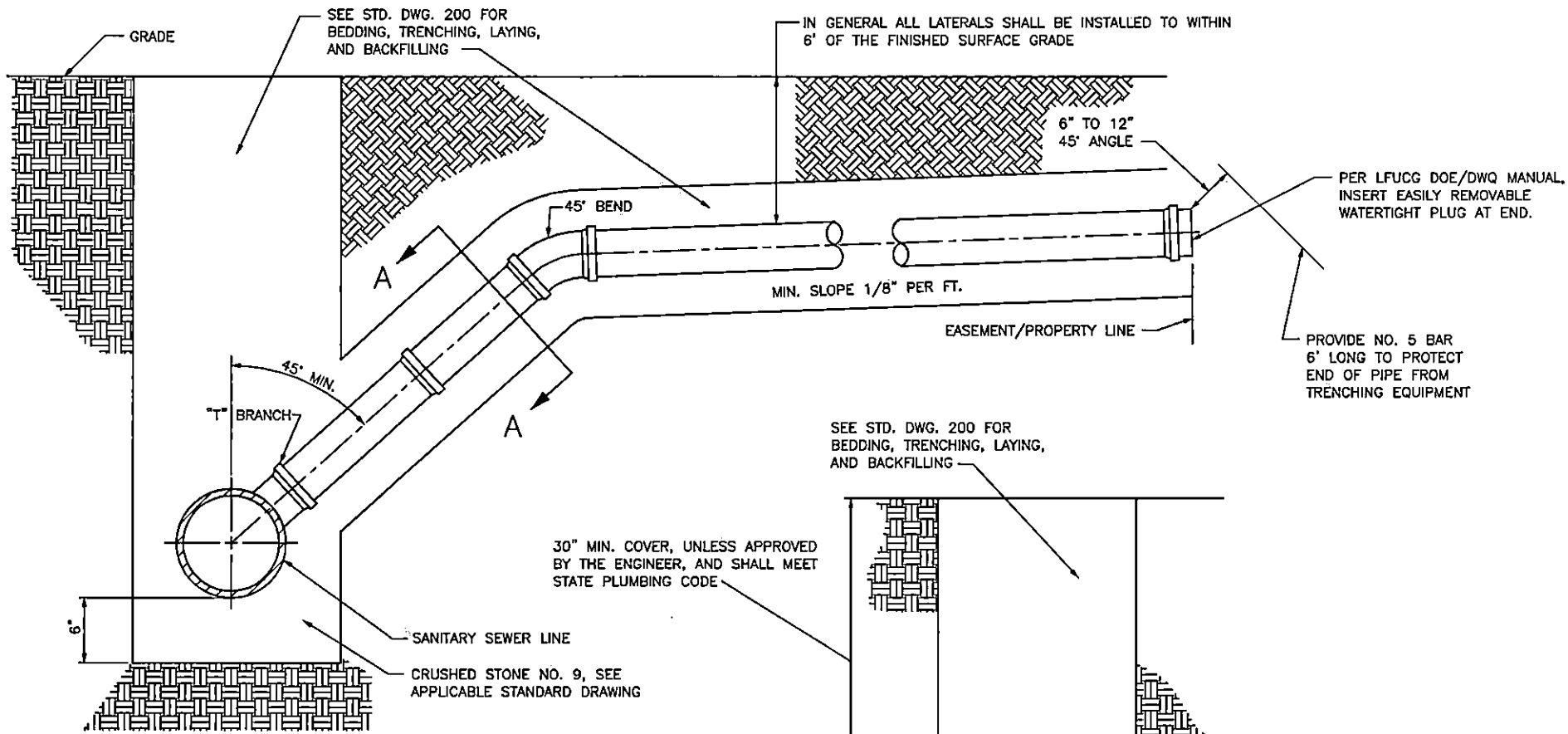
- LATERAL LENGTH REQUIREMENT IS THE GREATER OF:
 - 6'-0" AS PROJECTED ON THE HORIZ. PLANE
 - 1'-0" OUTSIDE THE EASEMENT
 - 1'-0" INSIDE THE PROPERTY LINE

LATERAL MATERIAL & INSTALLATION SHALL COMPLY WITH SANITARY SEWER AND PUMP STATION MANUAL, LFUGG, LATEST EDITION.



SECTION A-A

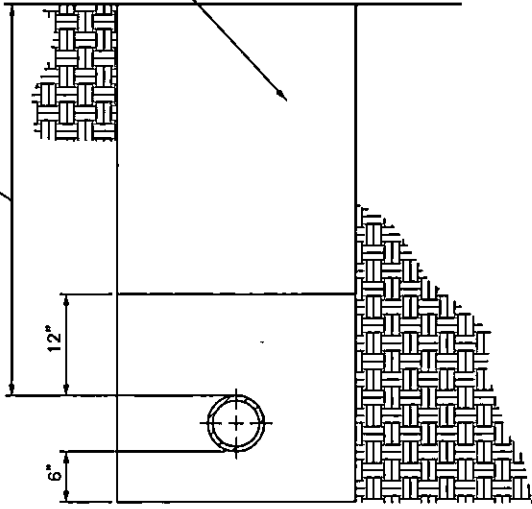
 LEXINGTON	
DIVISION OF ENGINEERING	
HOUSE LATERAL FOR GREATER THAN 6' DEEP SEWER IN SOIL & ROCK EXCAVATION	
STANDARD DRAWING NO.	230
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE




SEE STD. DWG. 200 FOR BEDDING, TRENCHING, LAYING, AND BACKFILLING

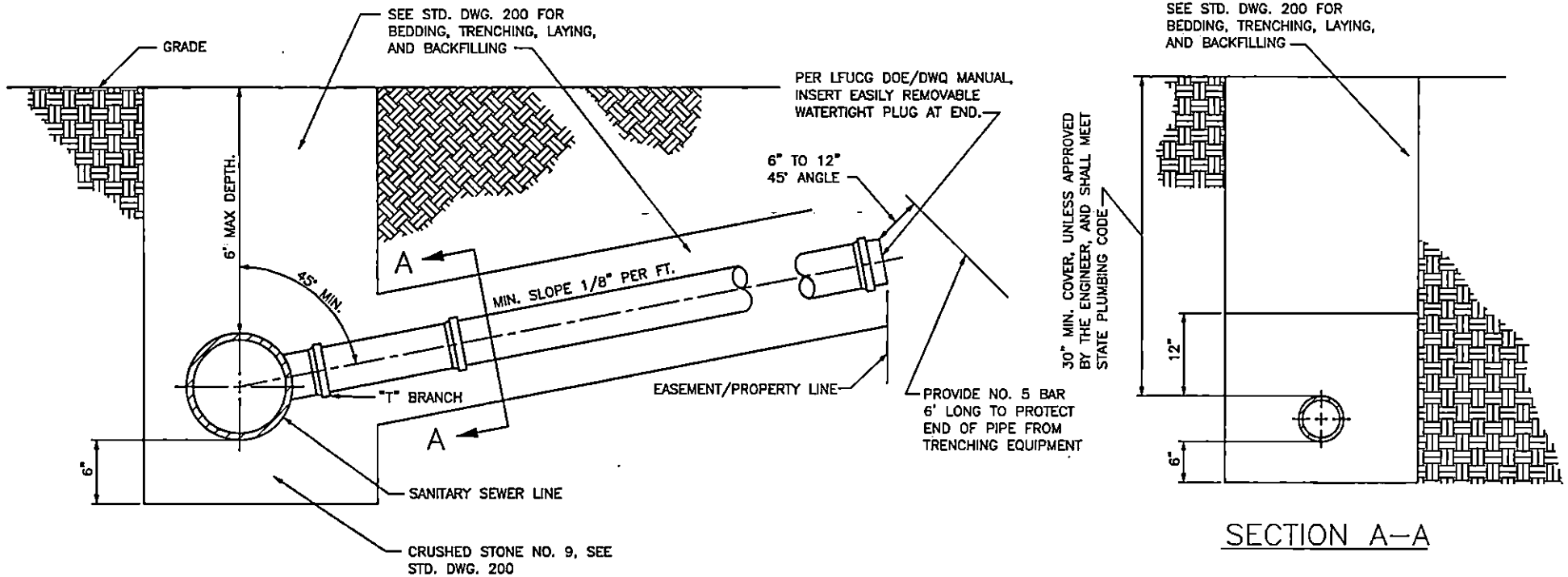
30" MIN. COVER, UNLESS APPROVED BY THE ENGINEER, AND SHALL MEET STATE PLUMBING CODE

NOTE:
 LATERAL LENGTH REQUIREMENT IS THE GREATER OF:
 6'-0" AS PROJECTED ON THE HORIZ. PLANE
 1'-0" OUTSIDE THE EASEMENT
 1'-0" INSIDE THE PROPERTY LINE
 LATERAL MATERIAL & INSTALLATION SHALL COMPLY WITH SANITARY SEWER AND PUMP STATION MANUAL, LFUCG, LATEST EDITION.



SECTION A-A

 LEXINGTON	
DIVISION OF ENGINEERING	
HOUSE LATERAL FOR GREATER THAN 6' DEEP SEWER IN SOIL	
STANDARD DRAWING NO.	231
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



NOTE:

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

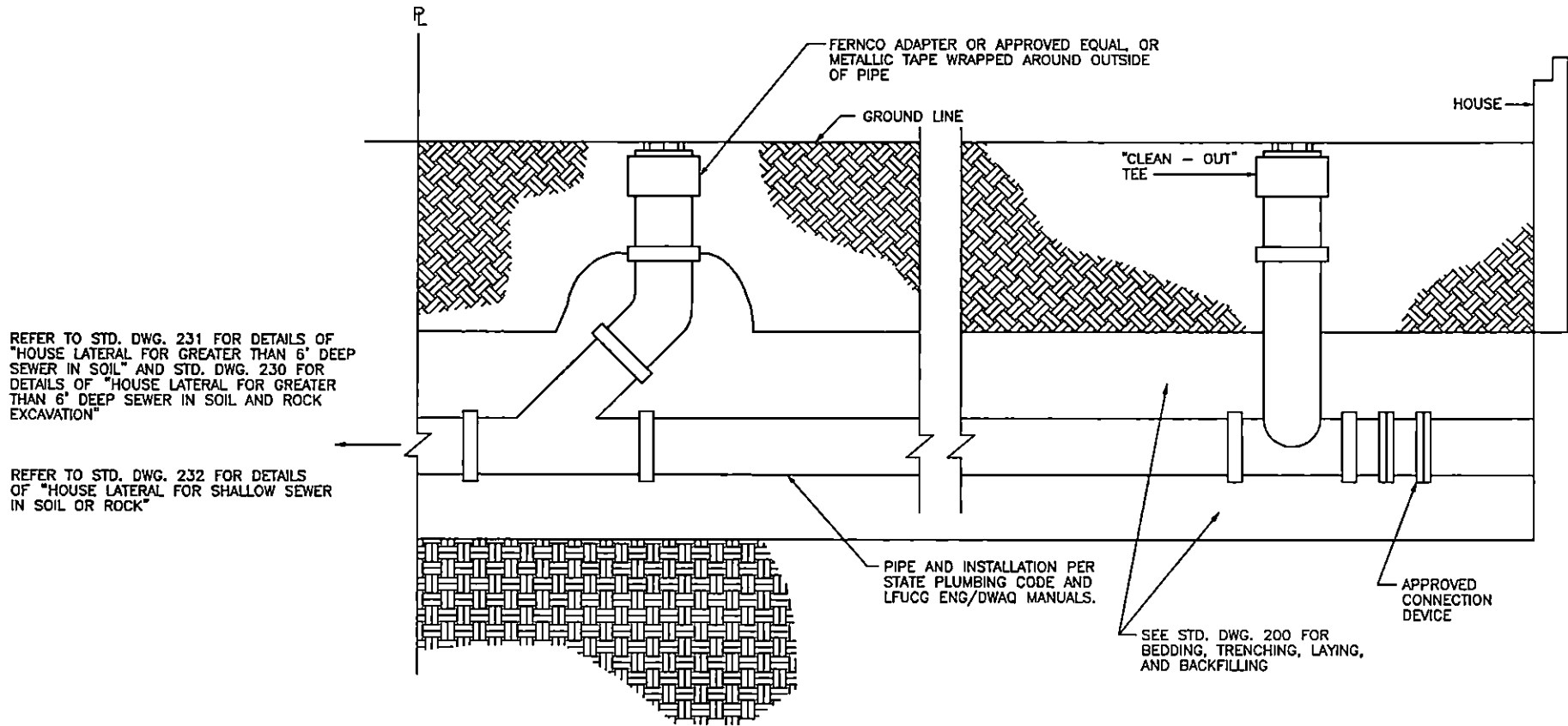
LATERAL MATERIAL & INSTALLATION SHALL COMPLY WITH SANITARY SEWER AND PUMP STATION MANUAL, LFUGG, LATEST EDITION.



DIVISION OF ENGINEERING

HOUSE LATERAL
 FOR SHALLOW SEWER
 IN SOIL OR ROCK




STANDARD DRAWING NO.	232
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

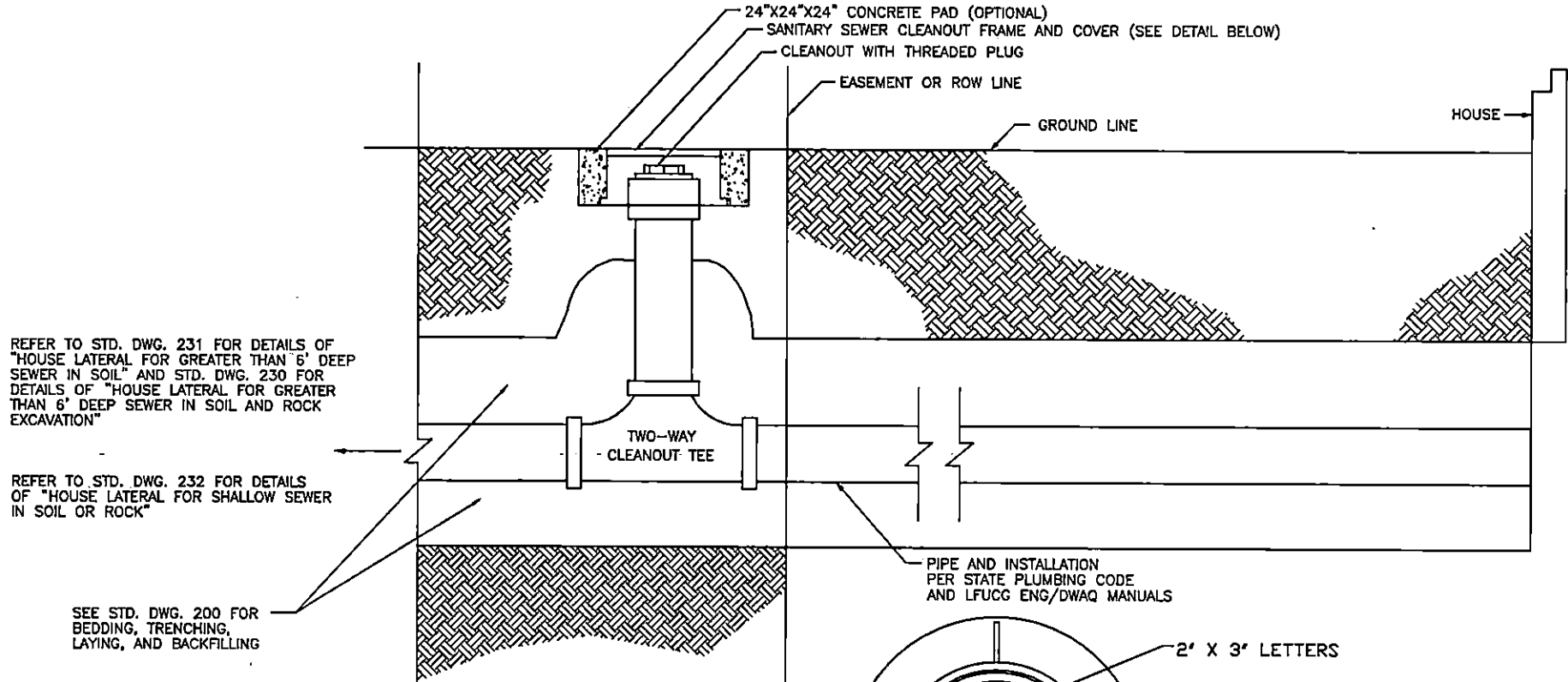


REFER TO STD. DWG. 231 FOR DETAILS OF "HOUSE LATERAL FOR GREATER THAN 6' DEEP SEWER IN SOIL" AND STD. DWG. 230 FOR DETAILS OF "HOUSE LATERAL FOR GREATER THAN 6' DEEP SEWER IN SOIL AND ROCK EXCAVATION"

REFER TO STD. DWG. 232 FOR DETAILS OF "HOUSE LATERAL FOR SHALLOW SEWER IN SOIL OR ROCK"

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

 LEXINGTON	
DIVISION OF ENGINEERING	
LATERAL CLEANOUT IN NON-PAVED AREAS AND YARDS	
STANDARD DRAWING NO.	233
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER 	DATE 9/22/17
COMMISSIONER 	DATE

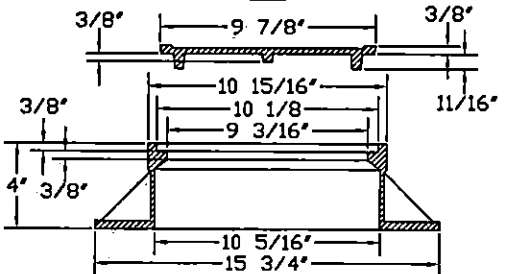
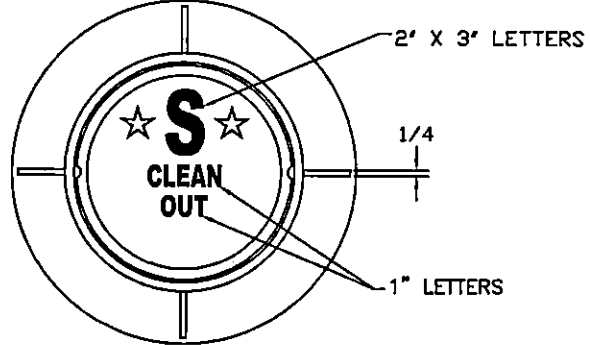


REFER TO STD. DWG. 231 FOR DETAILS OF "HOUSE LATERAL FOR GREATER THAN 6' DEEP SEWER IN SOIL" AND STD. DWG. 230 FOR DETAILS OF "HOUSE LATERAL FOR GREATER THAN 6' DEEP SEWER IN SOIL AND ROCK EXCAVATION"


REFER TO STD. DWG. 232 FOR DETAILS OF "HOUSE LATERAL FOR SHALLOW SEWER IN SOIL OR ROCK"

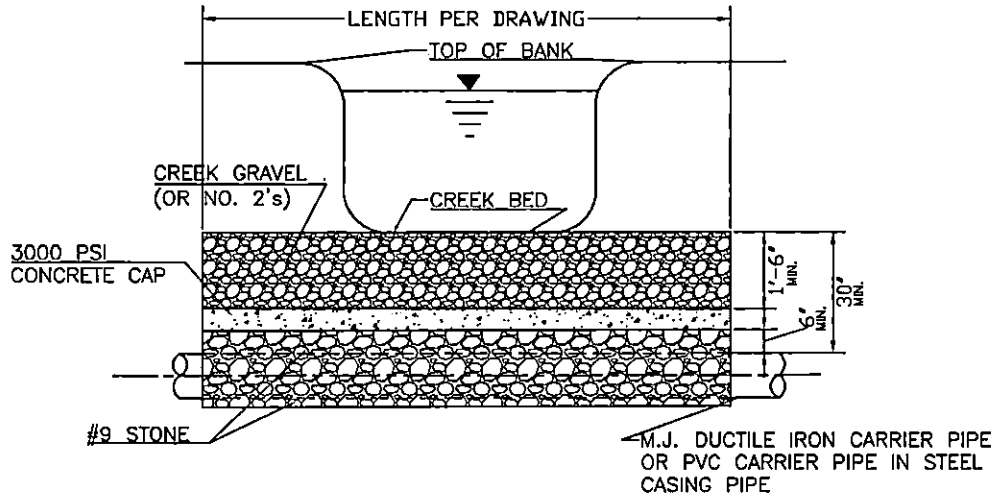
SEE STD. DWG. 200 FOR BEDDING, TRENCHING, LAYING, AND BACKFILLING

PIPE AND INSTALLATION PER STATE PLUMBING CODE AND LFUGG ENG/DWAQ MANUALS

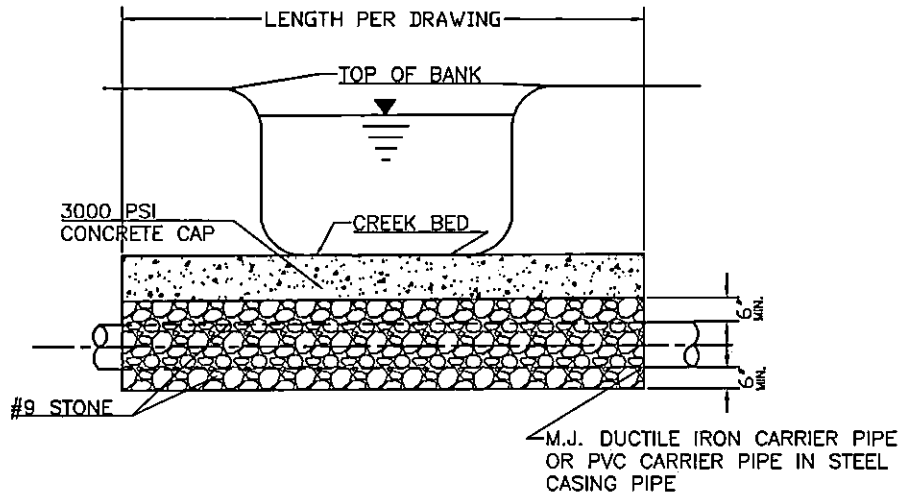
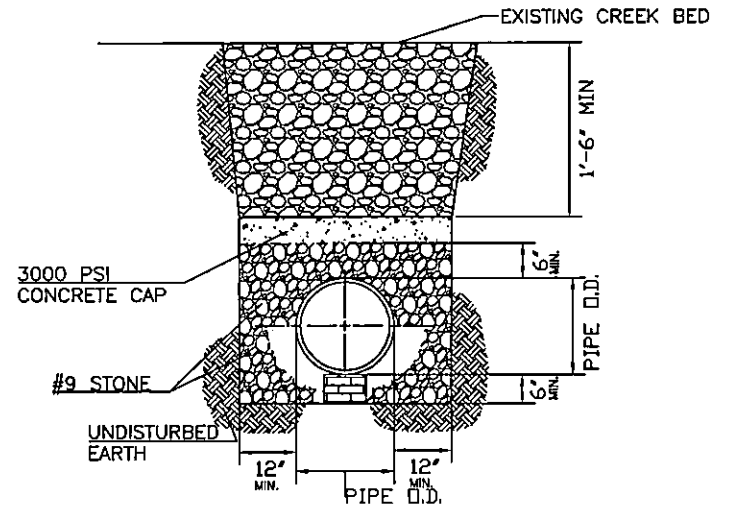


NOTES:
 SEWER PIPE FROM HOUSE TO CLEANOUT MUST BE IN ACCORDANCE WITH STATE PLUMBING CODE AND LFUGG ENG/DWAQ MANUALS.
 TWO-WAY CLEANOUT TEE IS TO BE INSTALLED BY THE PLUMBER AND OR CONTRACTOR PRIOR TO CONNECTION OF THE LATERAL TO PUBLIC SANITARY SEWER LINE.
 CLEANOUT TO BE INSTALLED AT THE END OF PUBLICLY MAINTAINED SEWER. POINT TO BE DETERMINED BY THE DIVISION OF ENGINEERING.

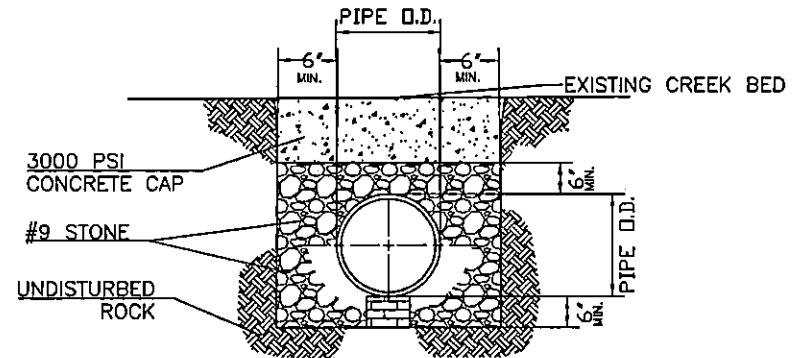
 LEXINGTON	
DIVISION OF ENGINEERING	
RIGHT OF WAY OR EASEMENT LATERAL CLEANOUT IN NON-PAVED AREAS AND YARDS	
STANDARD DRAWING NO.	234
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



CREEK CROSSING DETAIL FOR SOIL CREEKBED



CREEK CROSSING DETAIL FOR ROCK CREEKBED



NOTES:

1. A WATERSTOP SHALL BE PROVIDED ON THE UPSTREAM SIDE OF THE DOWNSTREAM MANHOLE.
2. PIPE TO BE DUCTILE IRON WHEN DEPTH OF COVER IS LESS THAN 4'.
3. SPECIAL DESIGN REQUIRED WHEN COVER IS 30" OR LESS.
4. CONTRACTOR SHALL USE THE CREEK CROSSING DETAIL THAT CORRESPONDS TO THE CHANNEL BED ENCOUNTERED.

CONCRETE CAP SHALL BE PLACED ACROSS CHANNEL BED AND EXTEND 10 FT. MIN. INTO EACH CHANNEL BANK, MEASURED FROM BOTTOM OF BANK.

SAWCUT EDGE OF TRENCH (4" MIN. DEPTH) TO PREVENT FRACTURING OF SURFACE BEDROCK BEYOND TRENCH EXCAVATION (TYP. EACH SIDE).

WHILE CROSSING THE CREEK WITH EQUIPMENT, PROVIDE NECESSARY MEANS TO PREVENT FRACTURING OF BEDROCK OUTSIDE THE TRENCH, BY USING GRAVEL, SWAMP MATS, OR OTHER APPROVED METHOD.



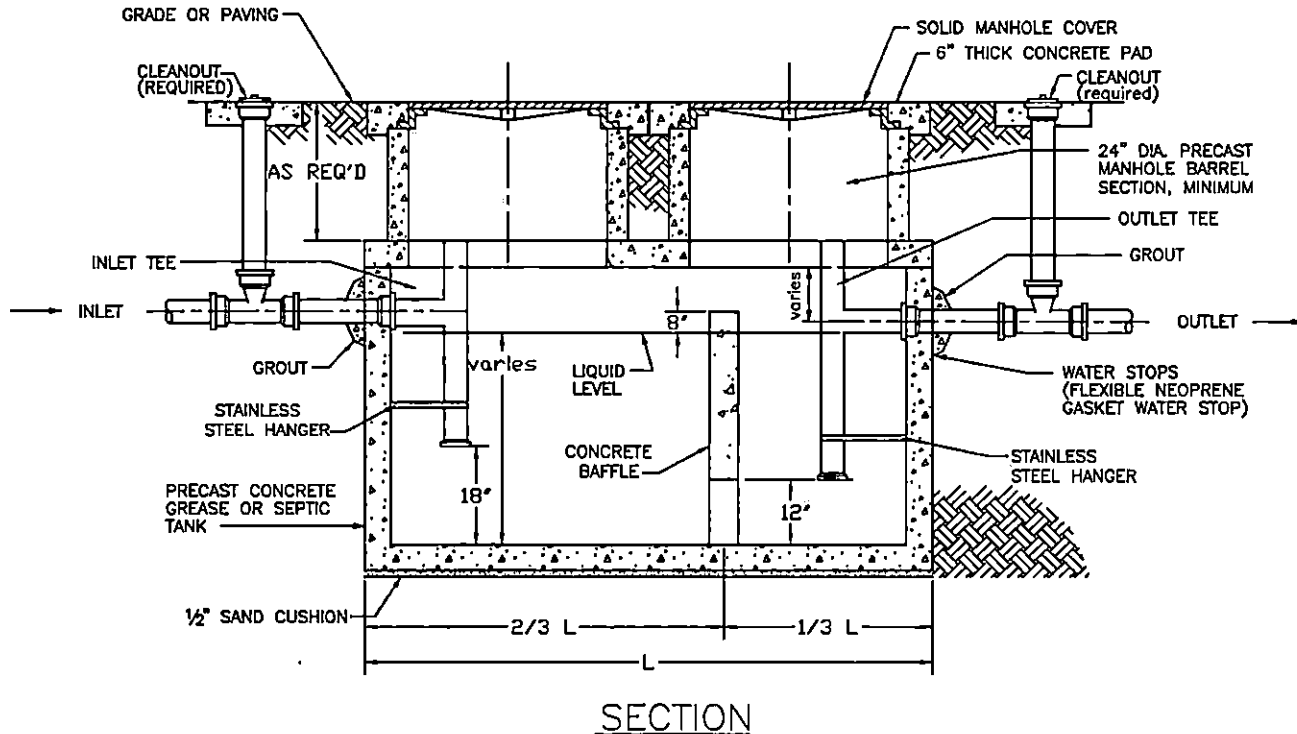
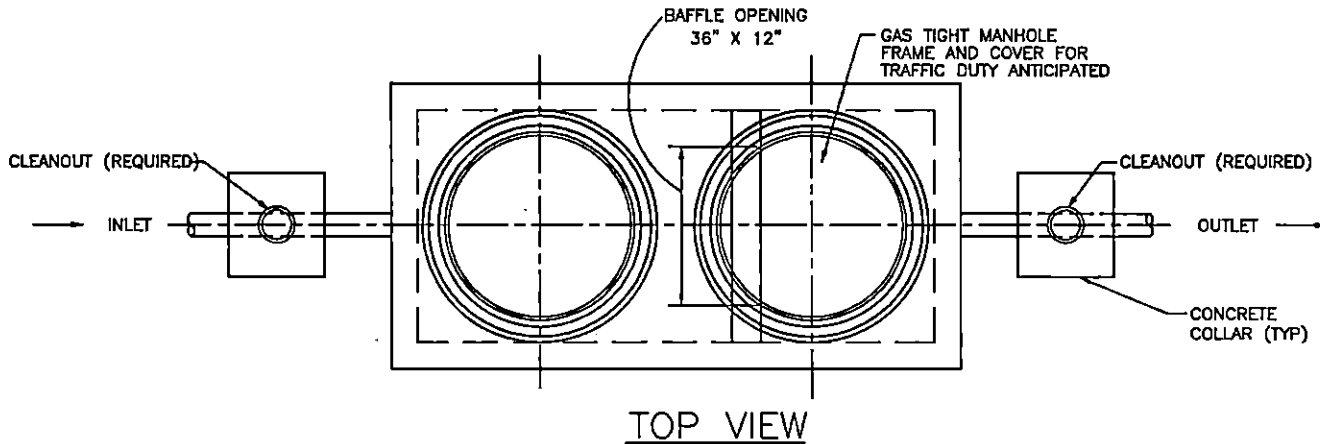
LEXINGTON

DIVISION OF ENGINEERING

SANITARY SEWER STREAM CROSSING AND STREAM BED RESTORATION DETAIL

STANDARD DRAWING NO. 240

APPROVAL:  9/22/17
 URBAN COUNTY ENGINEER / DATE
 COMMISSIONER  9/22/17
 / DATE



GENERAL NOTES:

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

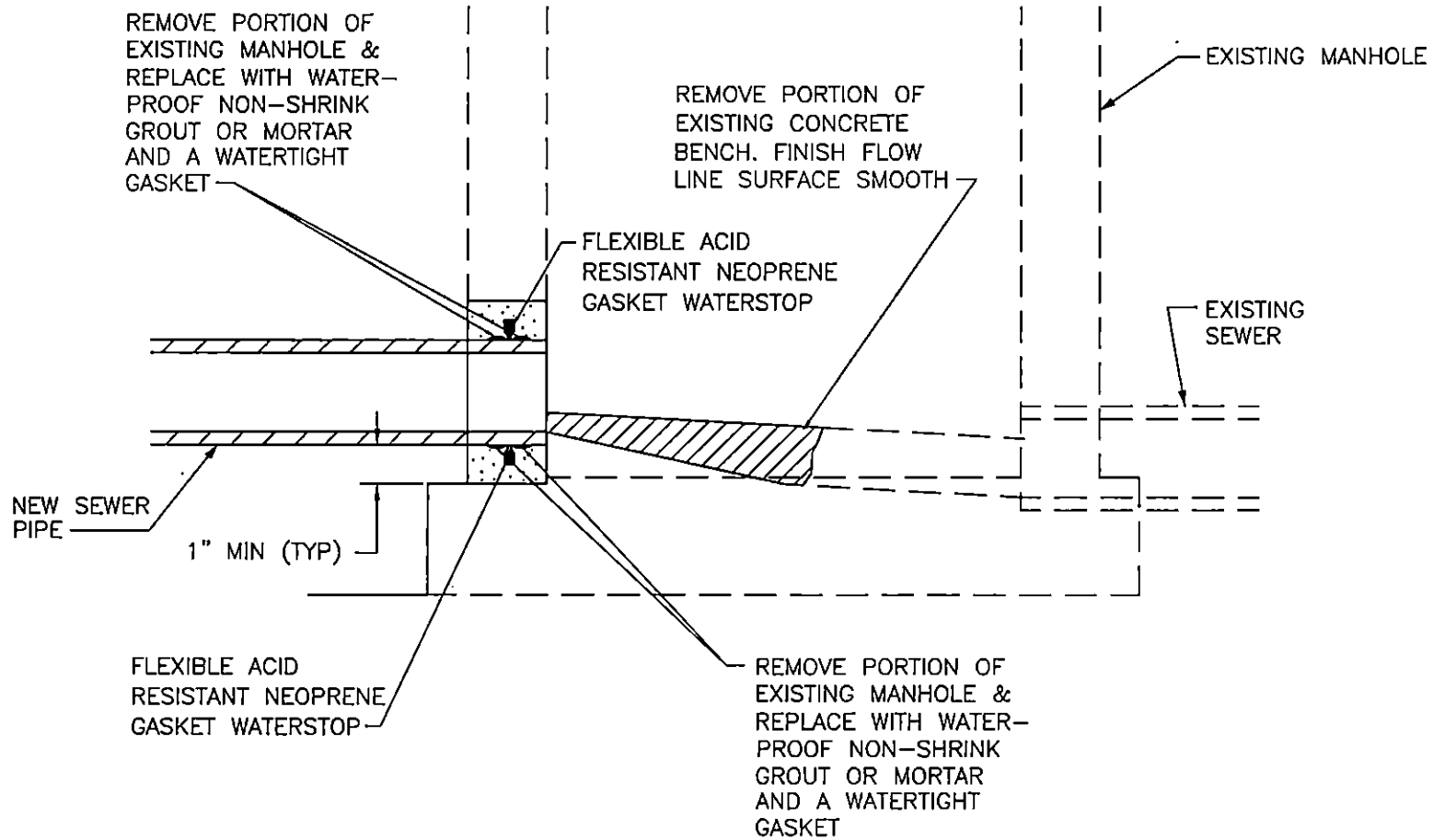


LEXINGTON

DIVISION OF ENGINEERING

GREASE INTERCEPTOR
TYPICAL
CONFIGURATION

STANDARD DRAWING NO.	250
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



ALL HOLES CUT INTO SEWER MANHOLES SHALL BE CORE DRILLED.

SEWER CONNECTION TO EXISTING MANHOLE



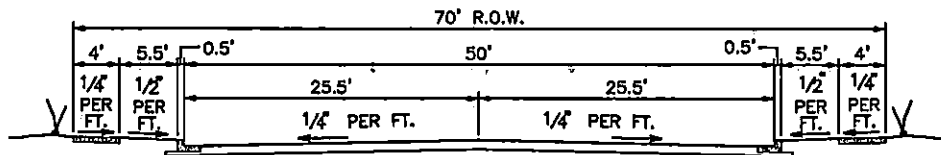
LEXINGTON

DIVISION OF ENGINEERING

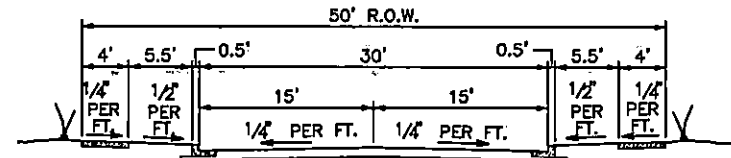
SEWER CONNECTION TO EXISTING CONCRETE MANHOLE

STANDARD DRAWING NO. 260

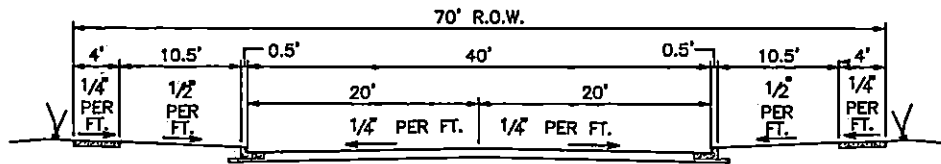
APPROVALS	<i>[Signature]</i>	9/22/17
URBAN COUNTY ENGINEER	<i>[Signature]</i>	DATE
COMMISSIONER		9/27/17
		DATE



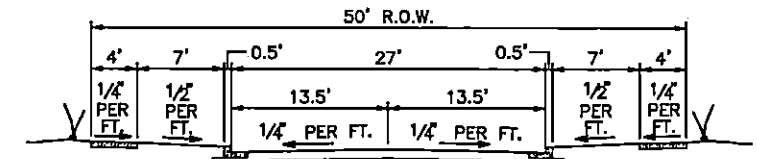
NON-RESIDENTIAL COLLECTOR



RESIDENTIAL CONTINUING LOCAL
OR COMMERCIAL SERVICE

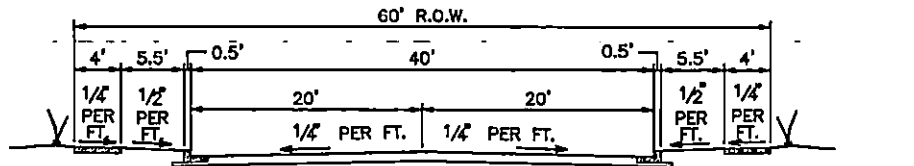


NON-RESIDENTIAL OR INDUSTRIAL COLLECTOR

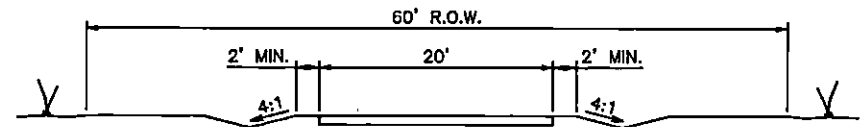


RESIDENTIAL CUL-DE-SAC
AND CONTINUING LOCAL

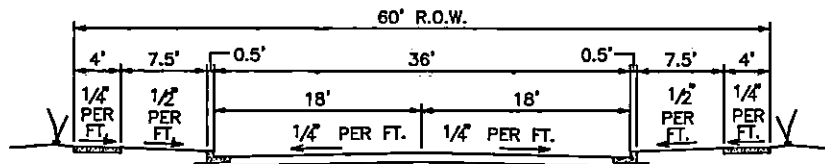
(SEE NOTE 3)



RESIDENTIAL COLLECTOR AND INDUSTRIAL LOCAL



RURAL LOCAL



RESIDENTIAL COLLECTOR

(OBSOLETE) - USED TO COMPLETE EXISTING STREETS

NOTES:

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

PENDING LAND SUBDIVISION REGULATIONS UPDATE

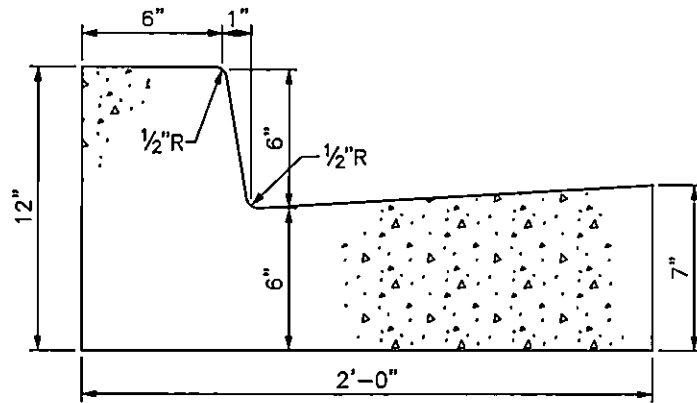


LEXINGTON

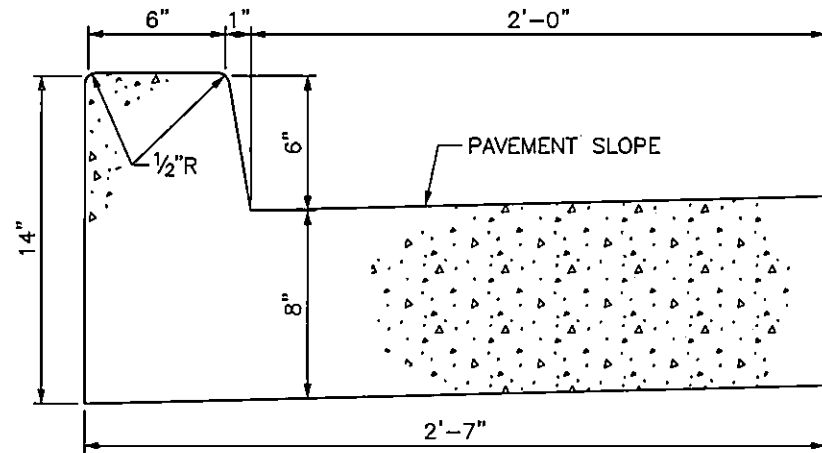
DIVISION OF ENGINEERING

TYPICAL STREET
SECTIONS

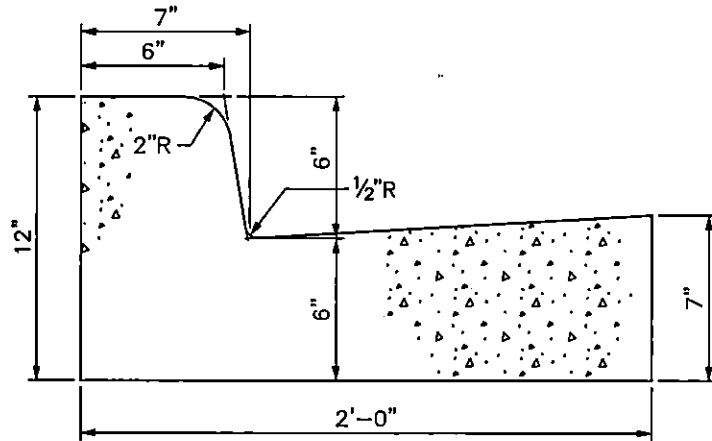
STANDARD DRAWING NO.	300
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



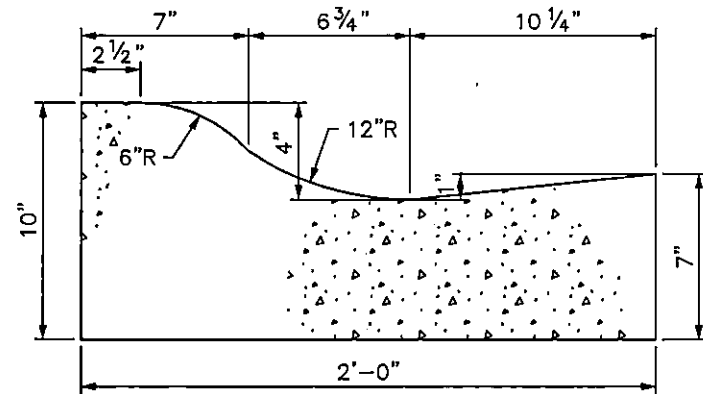
TYPE 1



TYPE 2



TYPE 3



TYPE 4

(RESIDENTIAL LOCAL STREETS ONLY)

NOTES:

1. CONCRETE SHALL BE KDOT CLASS "A".
2. SAWED CONTRACTION JOINTS SHALL BE CONSTRUCTED EVERY 20 FEET, WITH A MIN. DEPTH OF 3", IN ACCORDANCE WITH KDOT STANDARD SPECIFICATION.

3. FULL DEPTH EXPANSION JOINTS SHALL BE CONSTRUCTED AT ALL BREAKS IN ALIGNMENT, AT CONTACT WITH NEW OR EXISTING CONCRETE, AT ALL DRAINAGE INLETS, AT THE BEGINING AND ENDING POINTS OF CURVES, AND NOT TO EXCEED 200' MAXIMUM SPACING FOR SLIP FORM APPLICATION AND 30' MAXIMUM SPACING FOR HAND PLACED.
4. ALL CONCRETE SHALL BE CURED WITH WHITE PIGMENTED MEMBRANE FORMING COMPOUND (AASHTO M 148, TYPE 2).

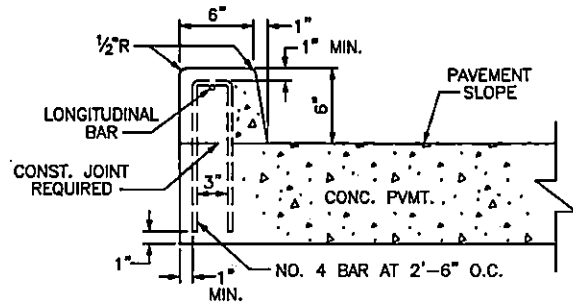


LEXINGTON

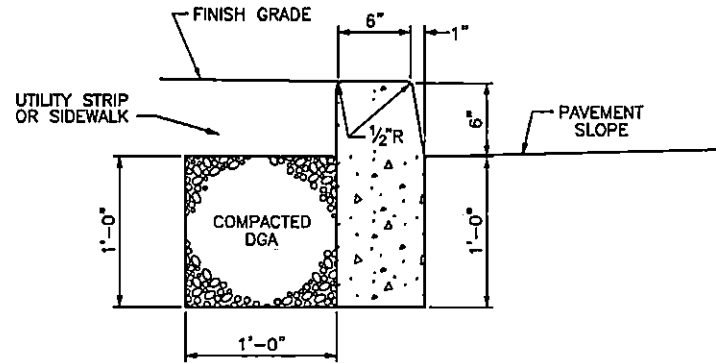
DIVISION OF ENGINEERING

CURB & GUTTER

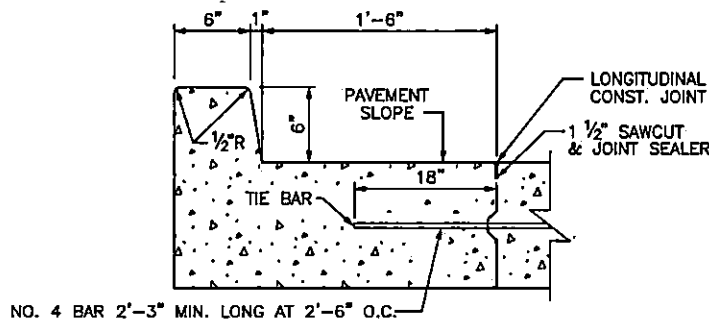
STANDARD DRAWING NO.	301
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



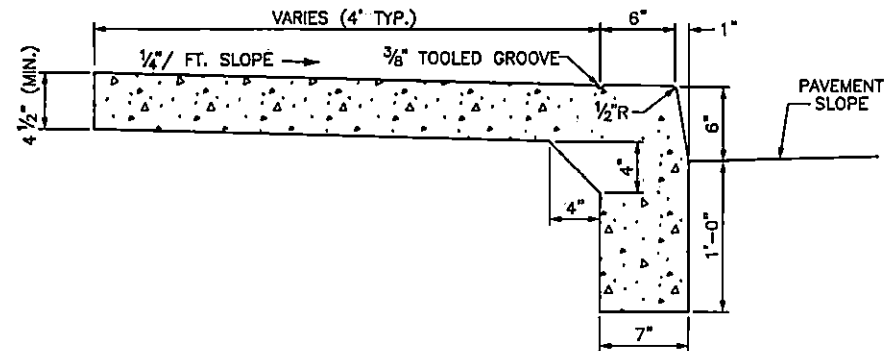
INTEGRAL CURB, TYPE 1



HEADER CURB



INTEGRAL CURB, TYPE 2



MONOLITHIC CURB AND SIDEWALK

NOTES:

1. CONCRETE SHALL BE KDOT CLASS "A".
2. SAWED CONTRACTION JOINTS SHALL BE CONSTRUCTED EVERY 20 FEET, 3" MINIMUM DEPTH.
3. THE CONTRACTOR HAS THE OPTION OF CONSTRUCTING THE STANDARD INTEGRAL CURB AS DETAILED IN EITHER TYPE 1 OR 2. IF TYPE 2 IS CHOSEN A LONGITUDINAL CONSTRUCTION JOINT SHALL BE REQUIRED AND THE REMAINING PAVEMENT AND CURB SHALL BE CONSTRUCTED MONOLITHIC WITHOUT A HORIZONTAL CONSTRUCTION JOINT AND ACCOMPANYING REINFORCING STEEL (TYPE 1).

4. FULL DEPTH EXPANSION JOINTS SHALL BE CONSTRUCTED AT ALL BREAKS IN ALIGNMENT, AT ALL DRAINAGE INLETS AND AT THE BEGINNING AND ENDING POINTS OF CURVES.
5. ALL CONCRETE, EXCEPT BONDING SURFACES, SHALL BE CURED WITH WHITE PIGMENTED MEMBRANE FORMING COMPOUND (AASHTO M 148, TYPE 2).



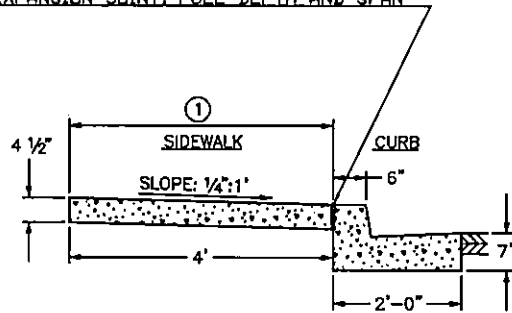
LEXINGTON

DIVISION OF ENGINEERING

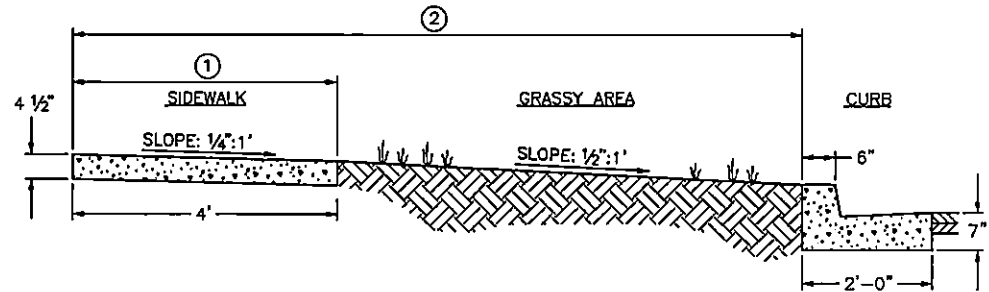
INTEGRAL CURB,
HEADER CURB,
MONOLITHIC CURB
& SIDEWALK

STANDARD DRAWING NO.	302
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

EXPANSION JOINT, FULL DEPTH AND SPAN



SIDEWALK/CURB AND GUTTER



SIDEWALK/CURB AND GUTTER WITH GRASS UTILITY STRIP

NOTES:

1. CONCRETE SIDEWALKS AND WALKWAYS SHALL BE CONSTRUCTED ON A THOROUGHLY COMPACTED SUB-GRADE AND SHALL BE FOUR AND ONE HALF (4 1/2) INCHES IN THICKNESS AND A MINIMUM WIDTH OF FOUR (4) FEET. CONCRETE SHALL MEET THE REQUIREMENTS FOR CLASS "A" AND SHALL BE COATED WITH WHITE PIGMENTED CURING COMPOUND TYPE 2, ALL AS SPECIFIED IN KYTC SPECIFICATION, SECTION 823.02.
2. FULL DEPTH EXPANSION JOINTS SHALL BE PLACED AT CONTACT WITH NEW OR EXISTING CONCRETE, EXISTING CONCRETE, AT ABUTTING RIGID STRUCTURES OR FEATURES SUCH AS BUILDINGS, DRIVEWAYS, UTILITY POLES FIRE HYDRANTS, ECT. AND NOT TO EXCEED 200' MAXIMUM SPACING FOR SLIP FORM APPLICATION AND 32' FOR HAND PLACED. EXPANSION MATERIAL SHALL BE 1/2" ASPHALTIC MATERIAL OR APPROVED EQUAL MEETING KYTC 807.04.03.
3. CONTROL JOINTS SHALL BE PLACED AT INTERVALS EQUIVALENT TO THE SIDEWALK WIDTH, WITH A DEPTH OF 1/4 THE SIDEWALK THICKNESS.
4. THE SIDEWALKS SHALL BE PLACED ADJACENT TO THE STREET RIGHT-OF-WAY LINE. SLOPE TOWARD CURB SHALL BE ONE QUARTER (1/4) OF AN INCH TO THE FOOT. CONSTRUCTION IN EXISTING NEIGHBORHOODS SHALL REQUIRE THE CONTRACTOR TO MATCH EXISTING GRADE AND SIDEWALK WIDTH UNLESS SPECIFIED OTHERWISE BY THE DIVISION OF ENGINEERING.
5. SIDEWALK REPAIR FOR ANY CUTS MADE FOR UTILITY WORK REPLACEMENT SHALL BE FULL PANEL MATCHING THE ORIGINAL DIMENSIONS.

SHEET NOTES:

- ① NORMAL SIDEWALK WIDTH SHALL BE 4' UNLESS CHANGE IS AUTHORIZED BY URBAN COUNTY ENGINEER'S OFFICE.
- ② DISTANCE WILL VARY WITH ROAD CROSS-SECTION.



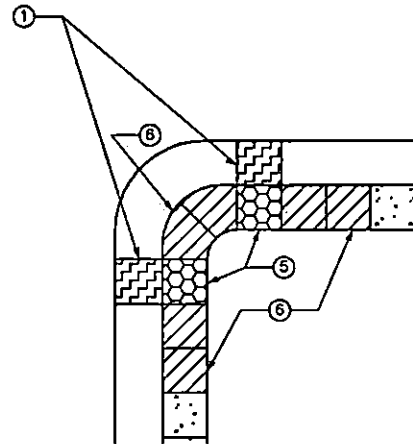
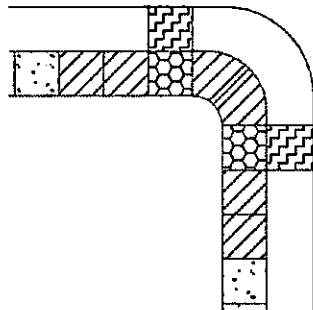
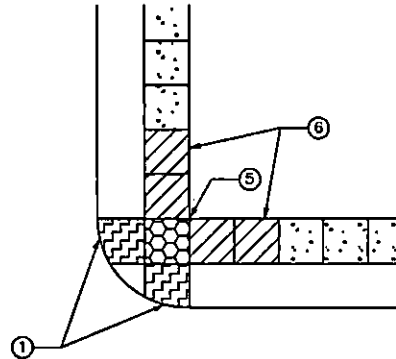
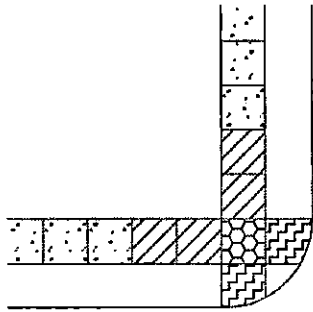
LEXINGTON

DIVISION OF ENGINEERING

SIDEWALK CONSTRUCTION SPECIFICATIONS

STANDARD DRAWING NO. 303

APPROVAL: *[Signature]* 9/22/17
 URBAN COUNTY ENGINEER / DATE
 COMMISSIONER *[Signature]* 9/22/17
 DATE



PLAN VIEW

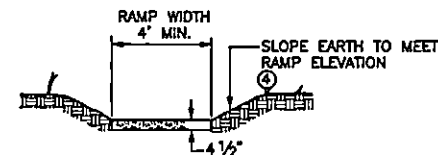
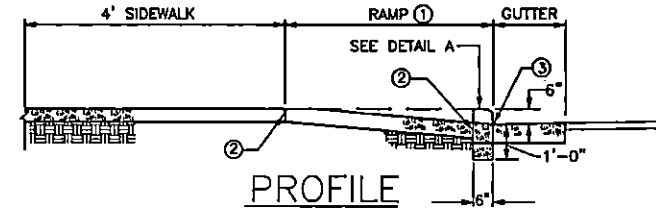
NORMAL TREATMENT FOR ARTERIALS
AND SIGNALIZED INTERSECTIONS

NOTES:

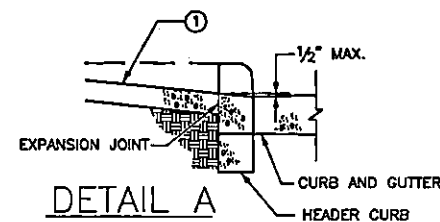
1. INLET LOCATIONS WILL VARY, DEPENDENT ON CROSSWALK AND RAMP LOCATION.
2. THE RAMP SHALL BE CONSTRUCTED OF CLASS "A" CONCRETE, AND SHALL UTILIZE CAST IN PLACE REPLACEABLE TACTILE WARNING TILE, SUCH AS ADA SOLUTIONS, INC., ACCESS TILE TACTILE SYSTEMS, ARMOR-TILE HERCULITE OR APPROVED EQUAL. TILE COLOR SHALL BE FEDERAL YELLOW.
3. THE NORMAL GUTTER LINE SHOULD BE MAINTAINED THROUGH THE RAMP.
4. RAMPS SHOULD BE LOCATED WITHIN MARKED LIMITS OF CROSSWALKS.
5. WHERE NO CURB EXISTS, STREET EDGE SHALL BE SAW CUT, OR AS DIRECTED BY L.F.U.C.G. ENGINEER.
6. MAXIMUM CROSS SLOPE OF SIDEWALK 1/4": 1'.
7. SIDEWALK REPAIR FOR ANY CUTS MADE FOR UTILITY WORK REPLACEMENT SHALL BE FULL PANEL MATCHING THE ORIGINAL DIMENSIONS.

SHEET NOTES:

- ① MAXIMUM RAMP SLOPE 1":1'.
- ② 1/2" EXPANSION JOINT AT BACK OF CURBLINE AND SIDEWALK LINE, FULL DEPTH.
- ③ NO BUMP PERMITTED.
- ④ SLOPE VARIES UNIFORMLY TO A MAXIMUM OF 1":1' AT GUTTER LINE.
- ⑤ MAXIMUM CROSS SLOPE OF LANDING 1/4": 1' IN ALL DIRECTIONS.
- ⑥ MAXIMUM LONGITUDINAL SLOPE 1/2": 1', OR ALONG THE CENTERLINE GRADE OF THE ADJACENT ROADWAY.



CROSS SECTION



DETAIL A



LEXINGTON

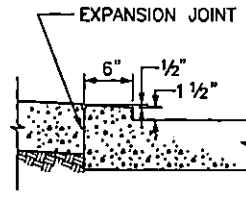
DIVISION OF ENGINEERING

SIDEWALK
RAMP

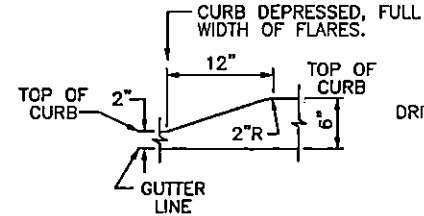
STANDARD DRAWING NO.	304
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

MAXIMUM ALLOWABLE APRON AND DRIVEWAY WIDTHS

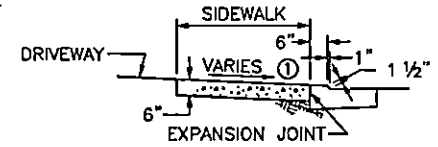
CLASSIFICATION	DRIVEWAY	APRON
SINGLE RESIDENTIAL	12'	18'
DOUBLE OR JOINT RESIDENTIAL	20'	26'



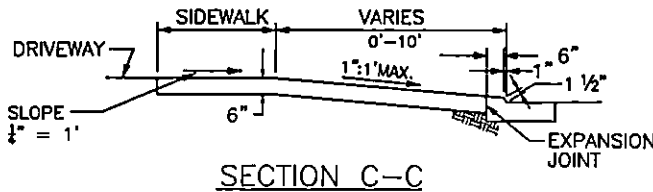
SECTION A-A



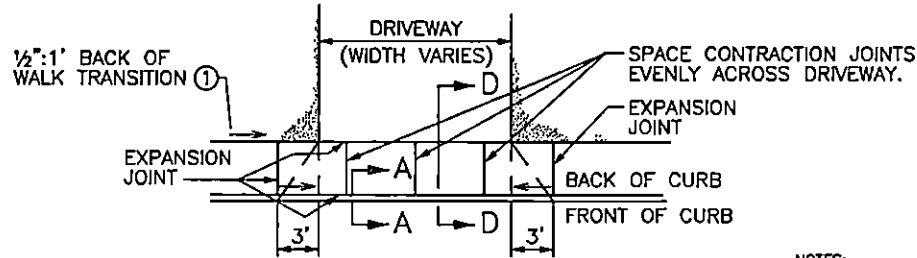
SECTION B-B



SECTION D-D



SECTION C-C



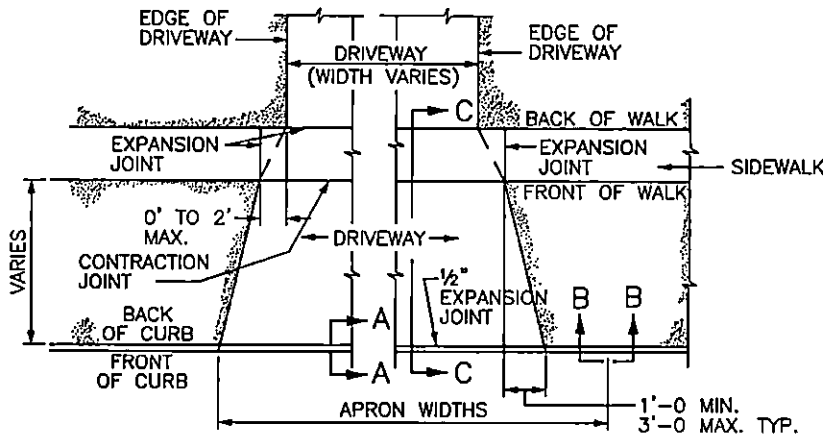
ENTRANCE WITHOUT UTILITY STRIP

NOTES:

- ① DROP BACK OF SIDEWALK GRADE 1 1/2" OVER 3' TO PROVIDE A MAXIMUM SLOPE OF 1":1'.
- PROVIDE A SAWED JOINT ALONG CENTER LINE OF APRON.
- MAXIMUM DROP AT BACK OF SIDEWALK SHALL NOT EXCEED 1 1/2".
- MAXIMUM CROSS SLOPE ON SIDEWALK SHALL NOT EXCEED 1/4" = 1".
- MAXIMUM SLOPE ON APRON SHALL NOT EXCEED 1":1' (8.33%).
- ENTIRE APRON FROM BACK OF CURB TO BACK OF SIDEWALK SHALL BE CONSTRUCTED WITH A SINGLE POUR.
- ALL EXPANSION JOINTS SHALL BE FULL DEPTH.

STREET WITH PARKING LANE

STREET WITHOUT PARKING LANE



ENTRANCE WITH UTILITY STRIP

NOTE:

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

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

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



LEXINGTON

DIVISION OF ENGINEERING

RESIDENTIAL
ENTRANCE DETAILS

STANDARD DRAWING NO. 307-1

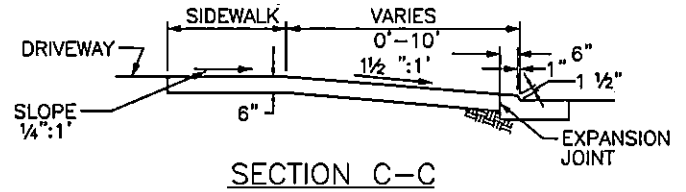
APPROVAL: *[Signature]* 9/22/17

URBAN COUNTY ENGINEER: *[Signature]* DATE: 9/22/17

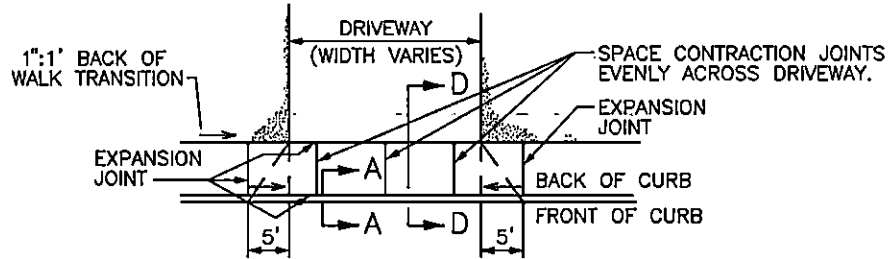
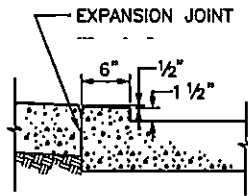
COMMISSIONER: *[Signature]* DATE:

MAXIMUM ALLOWABLE APRON AND DRIVEWAY WIDTHS

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

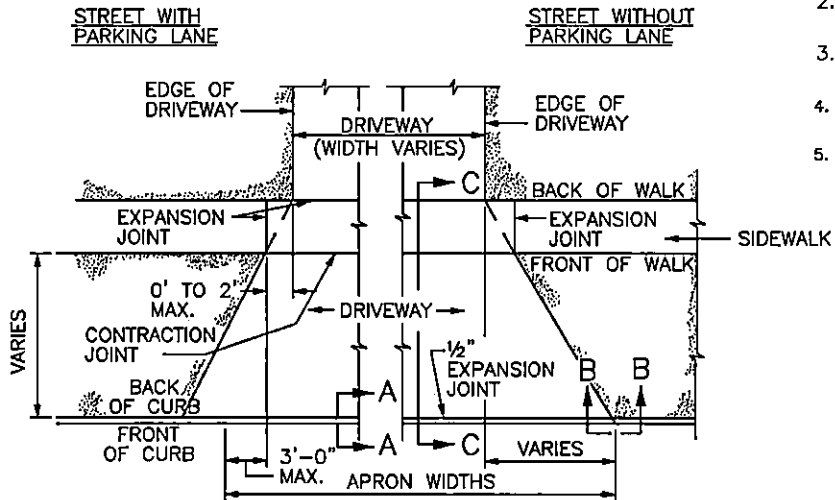
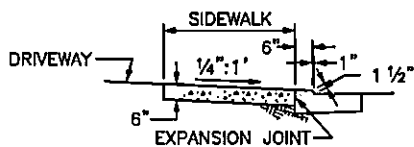
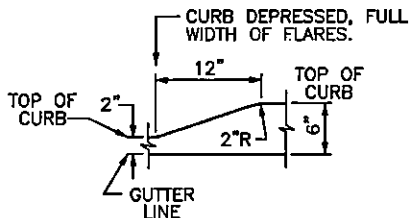



FRONT OF SIDEWALK ELEVATION DETERMINED BY ADDING 1/2" : 1" ACROSS UTILITY STRIP FROM TOP OF CURB. IF COMING OFF 1 1/2" LIP ADD ANOTHER 4 1/2" TO DETERMINE ELEVATION AT FRONT OF SIDEWALK.



NOTES:

1. PROVIDE A SAWED JOINT ALONG CENTER LINE OF APRON.
2. MAXIMUM CROSS SLOPE ON SIDEWALK SHALL NOT EXCEED 1/4" : 1"
3. MAXIMUM SLOPE ON APRON SHALL NOT EXCEED 1 1/2" : 1"
4. NO CATCH BASINS WILL BE PUT IN APRONS.
5. ALL EXPANSION JOINTS SHALL BE FULL DEPTH.





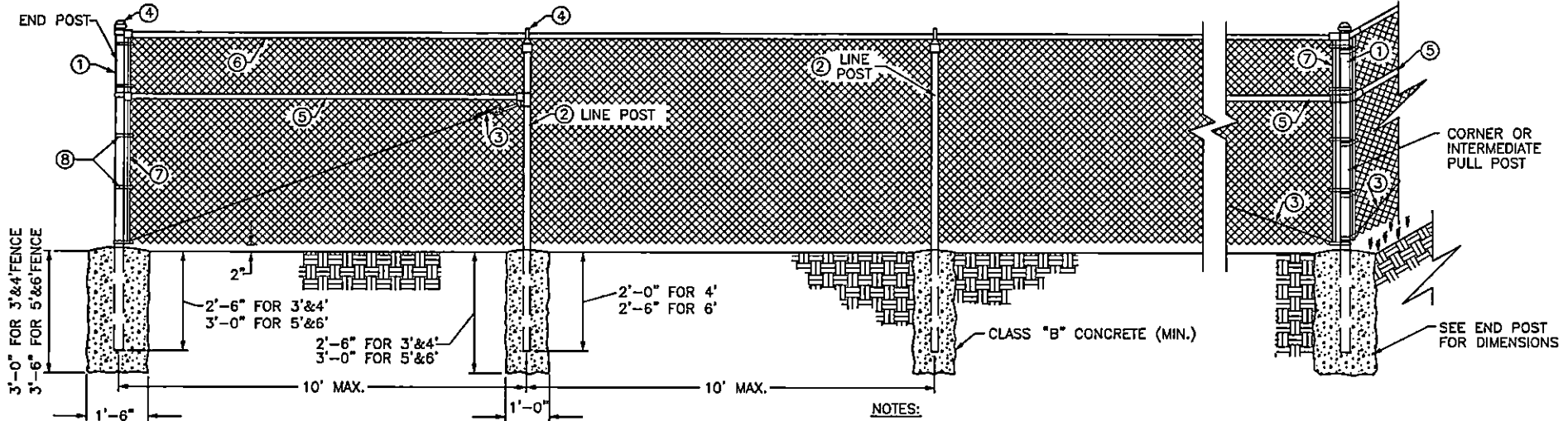
LEXINGTON

DIVISION OF ENGINEERING

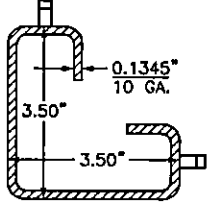
COMMERCIAL ENTRANCE DETAILS

STANDARD DRAWING NO. 307-2

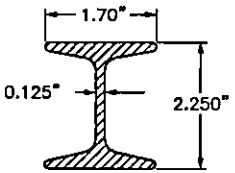
APPROVAL: *[Signature]* 9/23/17
 URBAN COUNTY ENGINEER DATE
 COMMISSIONER *[Signature]* 9/22/17
 DATE



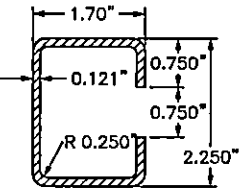
- NOTES:**
1. ALL POSTS SHALL BE SET IN CONCRETE TO THE DIMENSIONS AS INDICATED ON THIS DRAWING.
 2. 3' HIGH FENCE SHALL HAVE 3' FABRIC HEIGHT. 4' HIGH FENCE SHALL HAVE 4' FABRIC HEIGHT. 5' HIGH FENCE SHALL HAVE 5' FABRIC HEIGHT. 6' HIGH FENCE SHALL HAVE 6' FABRIC HEIGHT.
 3. BRACE BANDS SHALL BE 7/8"x1/8" GALVANIZED STEEL 5/16"x1 1/4" CARRIAGE BOLT.
 4. POST CAPS AND SOCKET TYPE BRACE END CONNECTIONS SHALL BE GALVANIZED MALLEABLE IRON OR OTHER TYPE AS APPROVED BY THE ENGINEER. THEY SHALL BE DESIGNED IN A MANNER TO EXCLUDE MOISTURE FROM INSIDE POSTS AND RAILS.
 5. O.D. DEPICTED FOR TUBULAR POSTS IS NOMINAL-ASTM A-120 SHALL GOVERN.
 6. STRUCTURAL SHAPES SHALL CONFORM TO STD. SPEC. 816.07.01 EXCEPT YIELD SHALL BE A MIN. 45,000 P.S.I.
 7. INDISCRIMINATE MIXING OF POSTS WILL NOT BE PERMITTED.
 8. CHAIN LINK FENCE FABRIC SHALL BE 0.148 INCH NOMINAL DIAMETER (NO. 9 GAGE) WIRE WOVEN IN 2 INCH MESH.



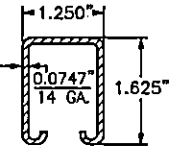
TERMINAL POST & CORNER POST



LINE POST H-COLUMN



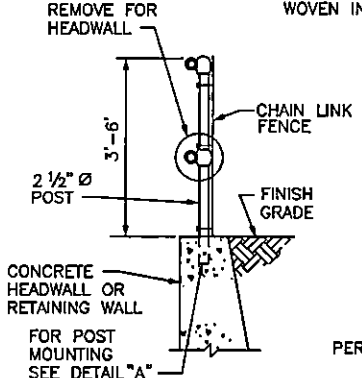
LINE POST HEAVY "C" ROLL FORM



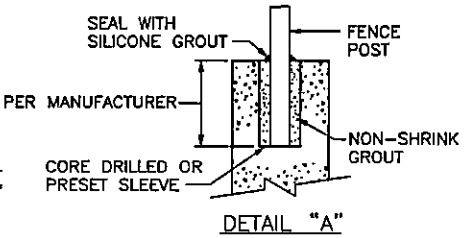
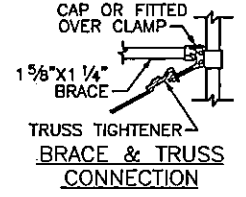
TOP & BRACE RAIL

LEGEND-(ALTERNATES)


	TUBULAR	ROLL FORMED
①	2 1/2" O.D. @ 3.65#/L.F.	3.5"x3.5" @ 5.14#/L.F.
②	2" O.D. @ 2.72#/L.F.	2.250" H-COL @ 3.26#/L.F. OR 2.250" C-COL @ 2.64#/L.F.
③	3/8" Ø TRUSS ROD & TIGHTENER	0.375" Ø TRUSS ROD & TIGHTENER
④	APPROVED CAPS	NOT REQUIRED
⑤	1 5/8" BRACE @ 2.27#/L.F.	1.250"x1.625" @ 1.35#/L.F.
⑥	1 5/8" O.D. @ 2.27#/L.F.	1.250"x1.625" @ 1.35#/L.F.
⑦	3/16"x3/4" FLAT STRETCHER BAR	NOT REQUIRED
⑧	BRACE BAND & TENSION BAND	NOT REQUIRED



CHAIN LINK FENCE MOUNTED TO CONCRETE HEADWALL OR RETAINING WALL



DETAIL "A"



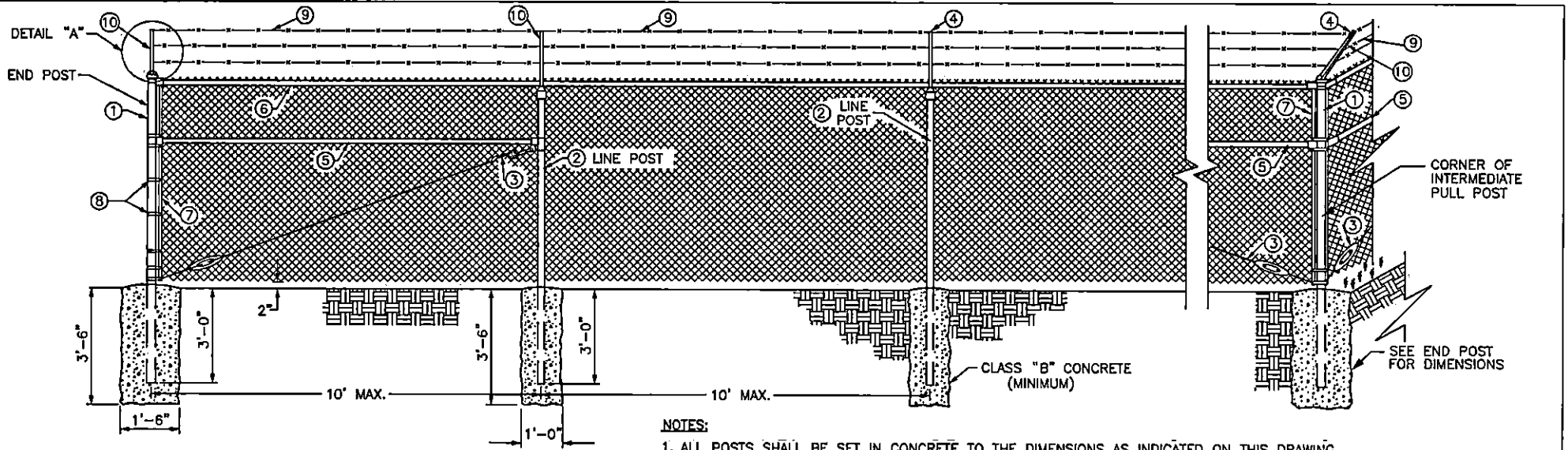
LEXINGTON

DIVISION OF ENGINEERING

CHAIN LINK FENCE
3'-6'

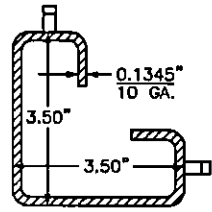
STANDARD DRAWING NO. **308**

APPROVAL: _____ 9/22/17
URBAN COUNTY ENGINEER _____ / DATE
COMMISSIONER _____ 9/22/17
DATE

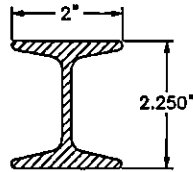


NOTES:

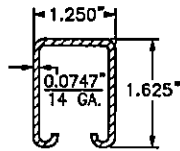
1. ALL POSTS SHALL BE SET IN CONCRETE TO THE DIMENSIONS AS INDICATED ON THIS DRAWING.
2. A 1 5/8" O.D. AT 2.27 LB. PER L.F. OR 1 1/4"x1 5/8" ROLL FORMED SECTION AT 1.35 LB. PER L.F. BOTTOM RAIL SHALL BE REQUIRED AROUND ALL UTILITY INSTALLATIONS AND AT OTHER LOCATIONS DESIGNATED BY THE ENGINEER.
3. 8' HIGH FENCE SHALL HAVE 7' FABRIC HEIGHT. 9' HIGH FENCE SHALL HAVE 8' FABRIC HEIGHT. 10' HIGH FENCE SHALL HAVE 9' FABRIC HEIGHT. 11' HIGH FENCE SHALL HAVE 10' FABRIC HEIGHT. 12' HIGH FENCE SHALL HAVE 11' FABRIC HEIGHT.
4. BRACE BAND SHALL BE 7/8"x1/8" GALVANIZED STEEL WITH 5/16"x1 1/4" CARRIAGE BOLTS. POST CAPS AND SOCKET TYPE BRACE END CONNECTION SHALL BE GALVANIZED MALLEABLE IRON OR OTHER TYPE AS APPROVED BY THE ENGINEER. THEY SHALL BE DESIGNED IN A MANNER TO EXCLUDE MOISTURE FROM INSIDE POSTS AND RAILS.
5. O.D. DEPICTED FOR TUBULAR POSTS IS NOMINAL - ASTM A-120 SHALL GOVERN.
6. CHAIN LINK FENCE FABRIC SHALL BE 0.148 INCH NOMINAL DIAMETER (NO.9 GAGE) WIRE WOVEN IN 2 INCH MESH.



TERMINAL POST & CORNER POST



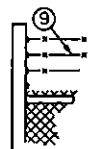
LINE POST



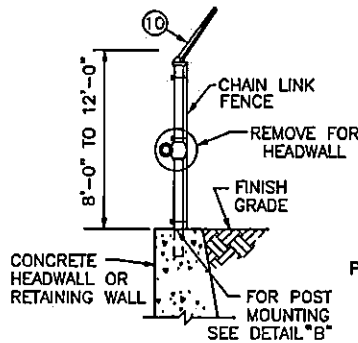
TOP & BRACE RAIL

LEGEND-(ALTERNATES)

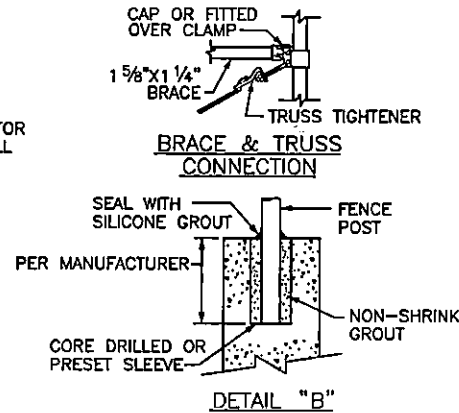
	TUBULAR	ROLL FORMED
①	2 1/2" O.D. @ 3.65#/L.F.	3.5"x3.5" @ 5.14#/L.F.
②	2" O.D. @ 2.72#/L.F.	2.250" H-COL. @ 3.26#/L.F. OR 2.250" C-COL. @ 2.64#/L.F.
③	3/8" Ø TRUSS ROD & TIGHTENER	0.375" Ø TRUSS ROD & TIGHTENER
④	APPROVED CAPS	NOT REQUIRED
⑤	1 5/8" BRACE @ 2.27#/L.F.	1.250"x1.625" @ 1.35#/L.F.
⑥	1 5/8" O.D. @ 2.27#/L.F.	1.250"x1.625" @ 1.35#/L.F.
⑦	3/16"x3/4" FLAT STRETCHER BAR	NOT REQUIRED
⑧	BRACE BAND & TENSION BAND	NOT REQUIRED
⑨	BARBED WIRE	BARBED WIRE
⑩	BARBED WIRE ARMS	BARBED WIRE ARMS



DETAIL "A"
ROLL FORMED



CHAIN LINK FENCE MOUNTED TO CONCRETE HEADWALL OR



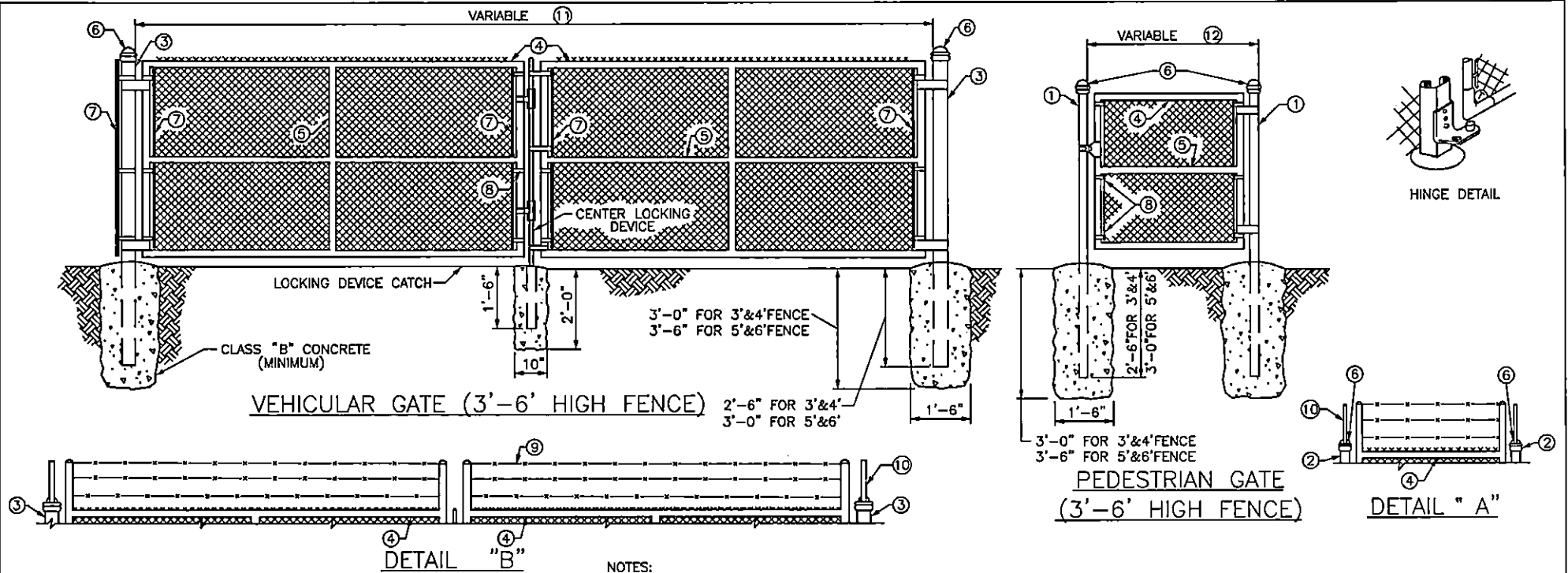
DETAIL "B"

LEXINGTON
DIVISION OF ENGINEERING

CHAIN LINK FENCE
8'-12'

STANDARD DRAWING NO. 309

APPROVAL: _____ DATE: 9/22/17
URBAN COUNTY ENGINEER _____ DATE: 9/22/17
COMMISSIONER _____ DATE: _____



NOTES:


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

LEGEND - (ALTERNATES)

	TUBULAR	ROLL FORMED
①	END POST 2½" O.D. @ 3.65#/L.F.	3½"X3½" @ 5.14#/L.F.
②	END POST 3" O.D. @ 3.65#/L.F.	3½"X3½" @ 5.14#/L.F.
③	4" O.D. @ 9.1#/L.F. GATE POST	NO ALTERNATE
④	2" O.D. @ 2.72#/L.F. GATE FRAME	NO ALTERNATE
⑤	1½" O.D. @ 2.27#/L.F.	NO ALTERNATE
⑥	APPROVED CAPS	NOT REQUIRED
⑦	¾"X½" FLAT STRETCHER BAR	NOT REQUIRED
⑧	BRACE BAND & TENSION BAND	NOT REQUIRED
⑨	BARBED WIRE	BARBED WIRE
⑩	BARBED WIRE ARMS	BARBED WIRE ARMS

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

⑫ 4' TO 6' WIDTH

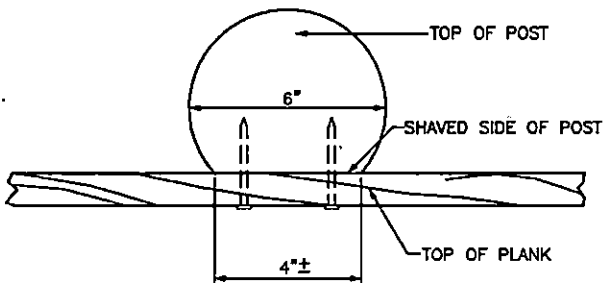
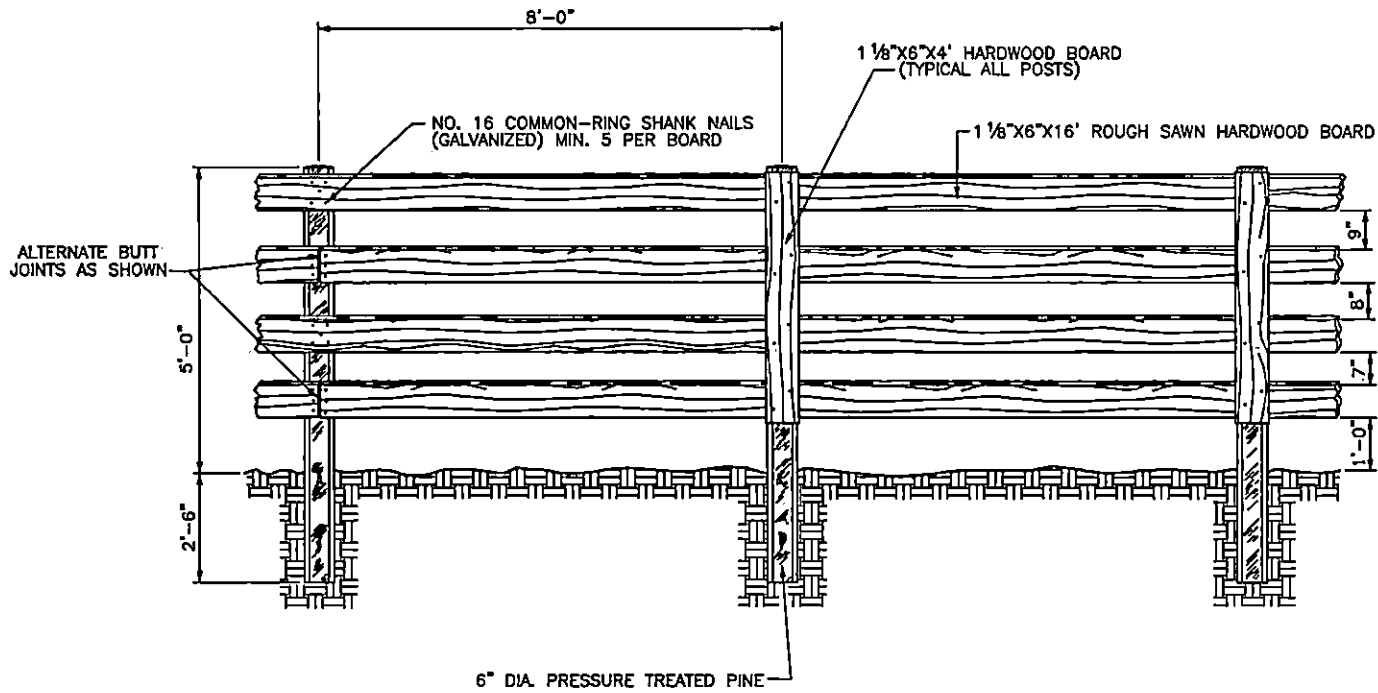


LEXINGTON

DIVISION OF ENGINEERING

CHAIN LINK GATE

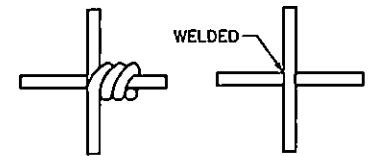
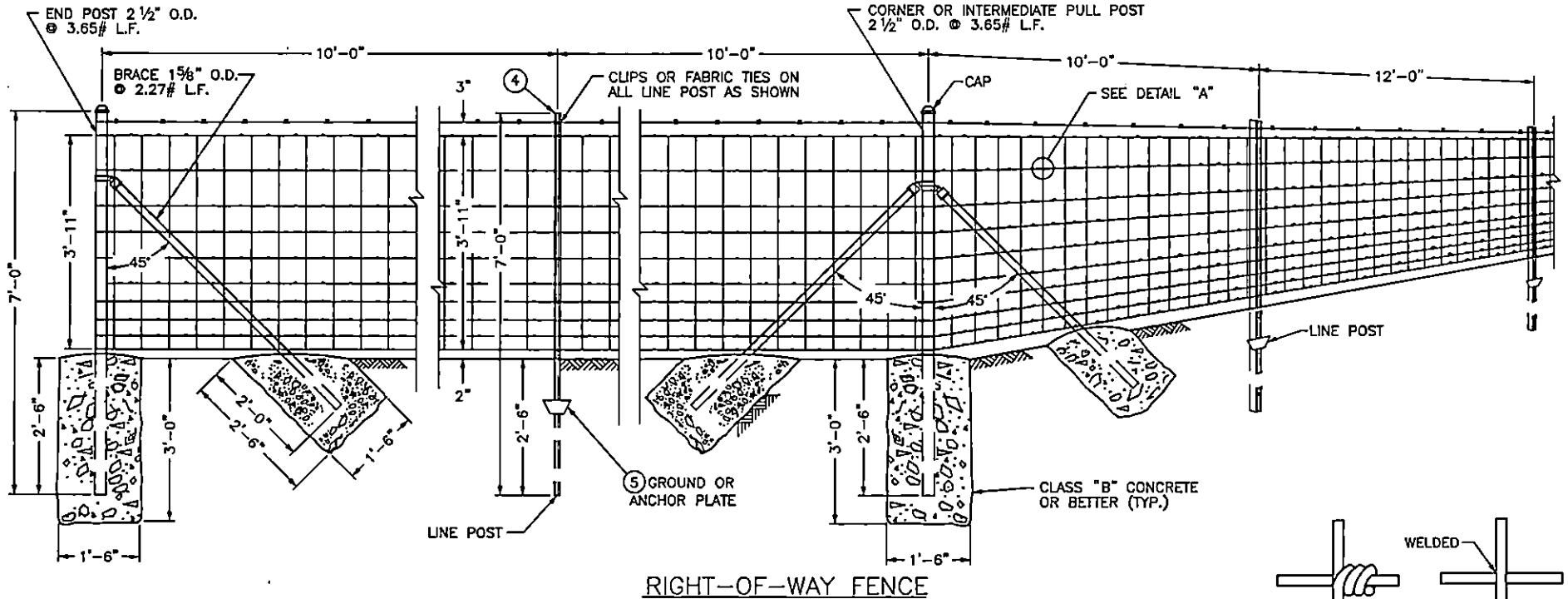
STANDARD DRAWING NO.	310
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



NOTES:

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

LEXINGTON
DIVISION OF ENGINEERING
PLANK FENCE
STANDARD DRAWING NO. 311
APPROVAL: 9/22/17 URBAN COUNTY ENGINEER DATE COMMISSIONER 9/22/17 DATE

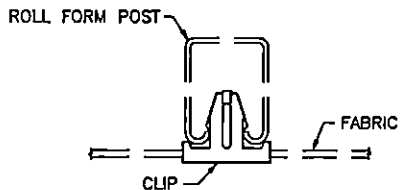


ALTERNATE METHODS OF SECURING VERTICAL STAY WIRE TO THE HORIZONTAL WIRE OF THE FABRIC.

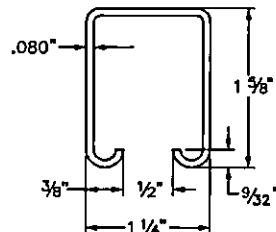
DETAIL "A"

NOTES:

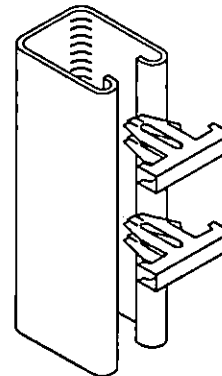
1. WOVEN-WIRE USED FABRIC IN RIGHT-OF-WAY FENCE SHALL BE EITHER ALUMINUM-COATED STEEL NO. 1047-6-9 OR ZINC-COATED STEEL NO. 1047-6-9.
2. ALL FENCE FITTINGS SHALL COMPLY WITH ASTM F 626.
3. O.D. DEPICTED FOR TUBULAR POSTS IS NOMINAL - ASTM F 1083 SHALL GOVERN.
4. STUDDED "T" POST AT 1.33 LBS. PER FOOT.
- OR -
ROLL FORM POST AT 1.35 LBS. PER FOOT. (SEE DETAIL)
5. NOT REQUIRED FOR ROLL FORM POST.



PLAN VIEW OF CLIP INSTALLED IN ROLL FORM POST



PLAN VIEW OF ROLL FORM POST



ISOMETRIC EXPLODED VIEW OF ROLL FORM POST AND CLIPS
CLIPS SHALL BE SPRING STEEL ALUMINUM - FINISHED



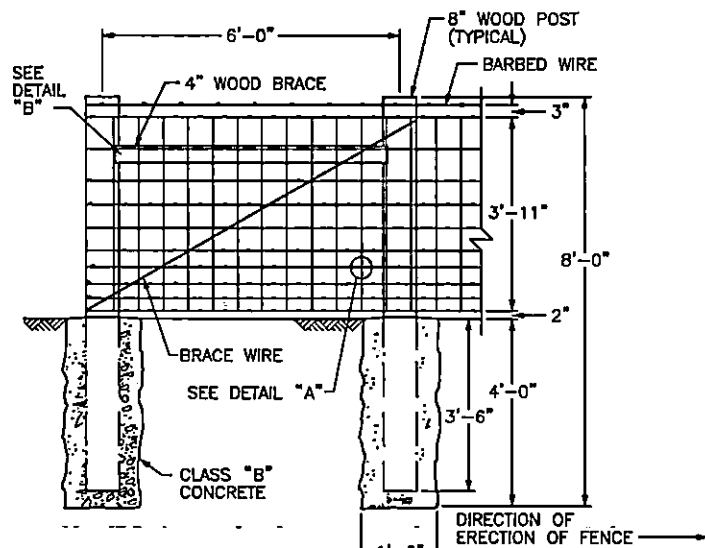
LEXINGTON

DIVISION OF ENGINEERING

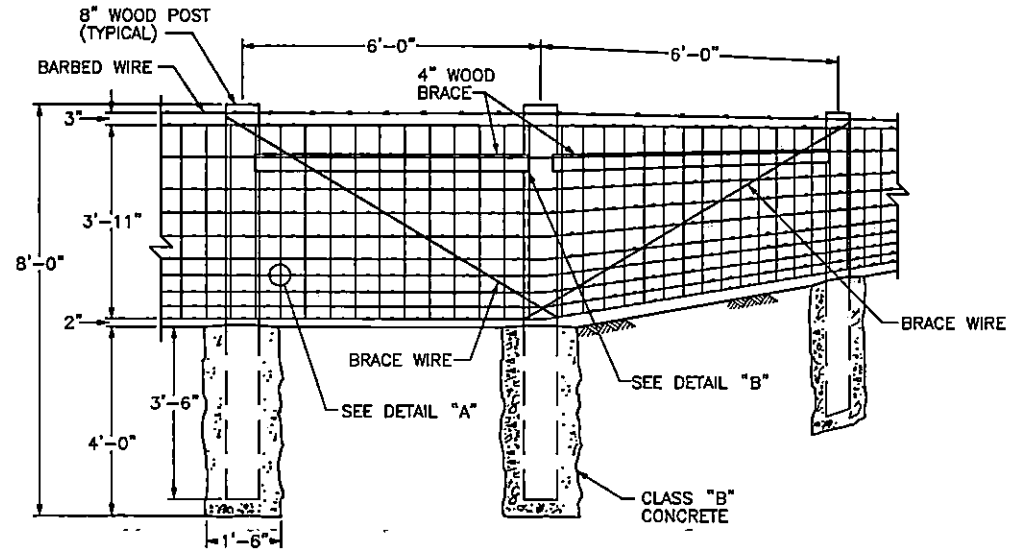
WOVEN WIRE
RIGHT-OF-WAY FENCE
TYPE 1

STANDARD DRAWING NO. 312

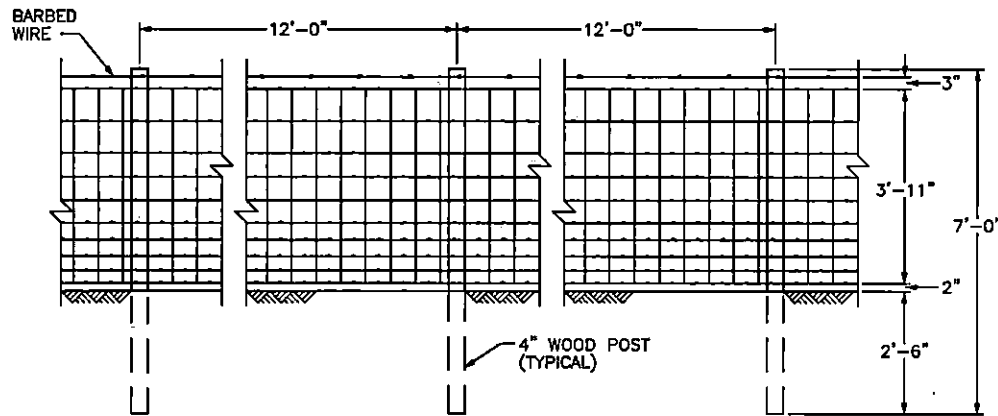
APPROVAL: URBAN COUNTY ENGINEER DATE 9/22/17
COMMISSIONER DATE 9/22/17



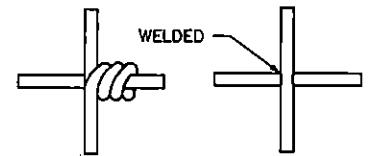
PULL OR END POST ASSEMBLY



CORNER POST ASSEMBLY

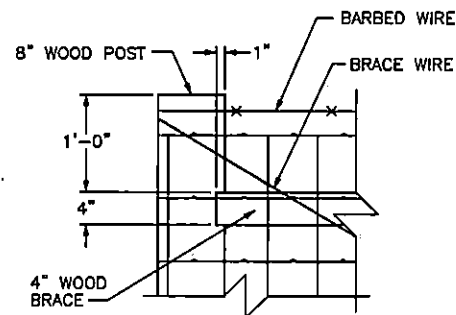


LINE POST



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

DETAIL "A"



DETAIL "B"

NOTES:

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

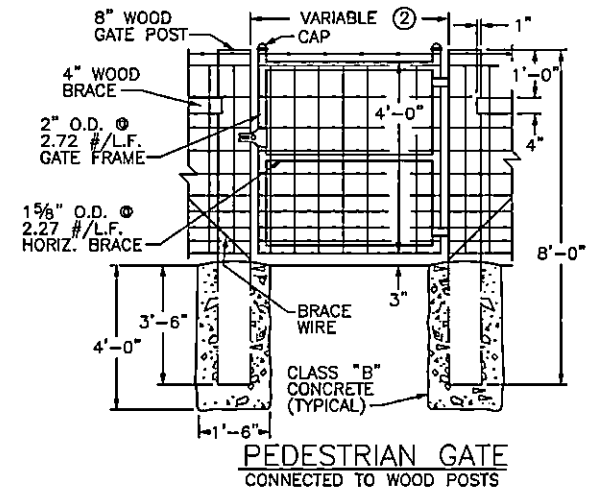
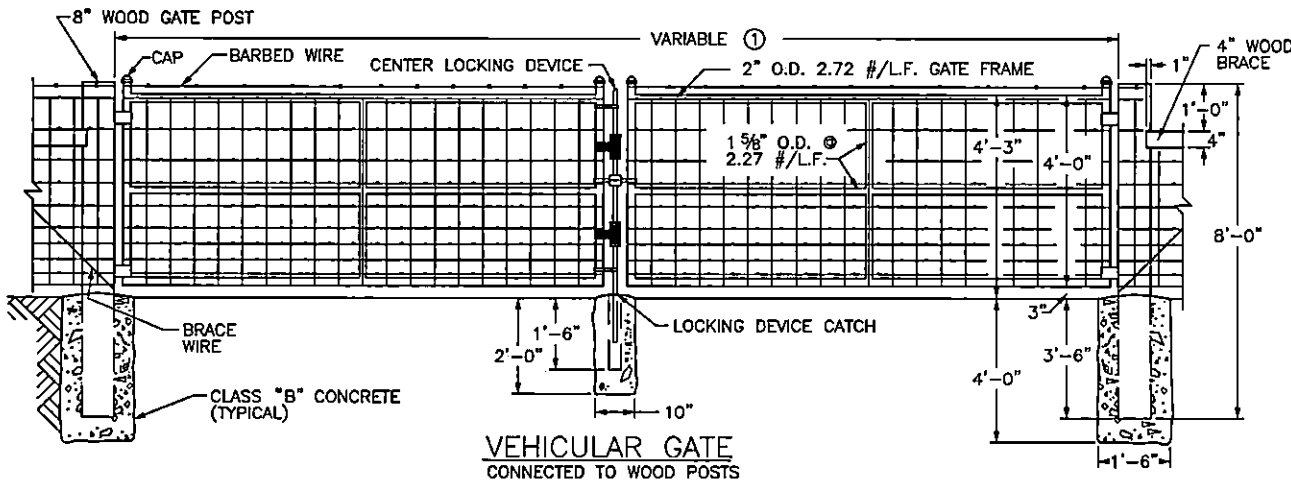
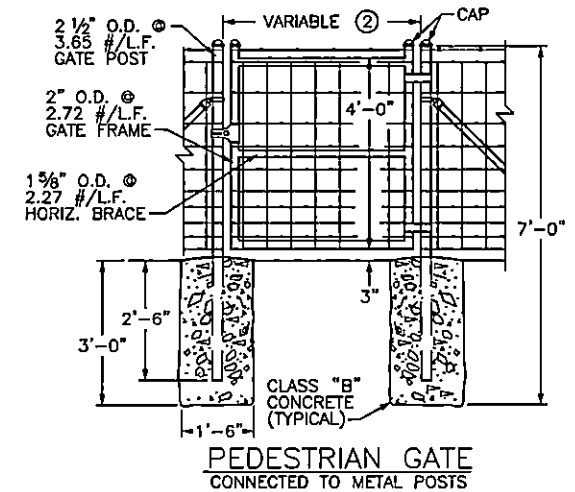
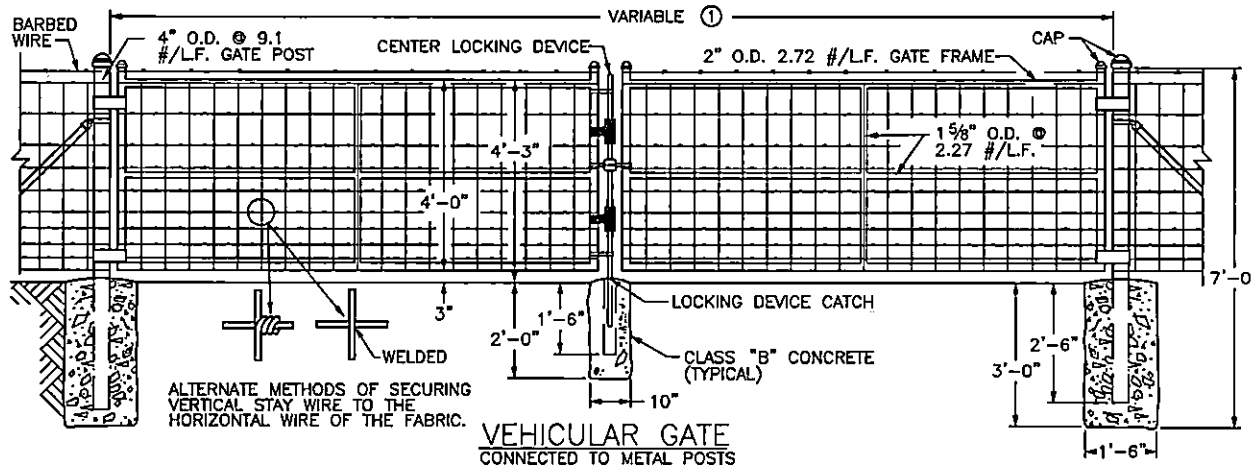


LEXINGTON

DIVISION OF ENGINEERING

WOVEN WIRE
RIGHT-OF-WAY FENCE
TYPE 2

STANDARD DRAWING NO.	313
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	GATE



NOTES:

BASIS OF PAYMENT:

THE CONTRACT UNIT PRICE FOR WOVEN WIRE GATES SHALL BE:

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

CONSTRUCTION REQUIREMENTS:

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

MATERIALS:


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

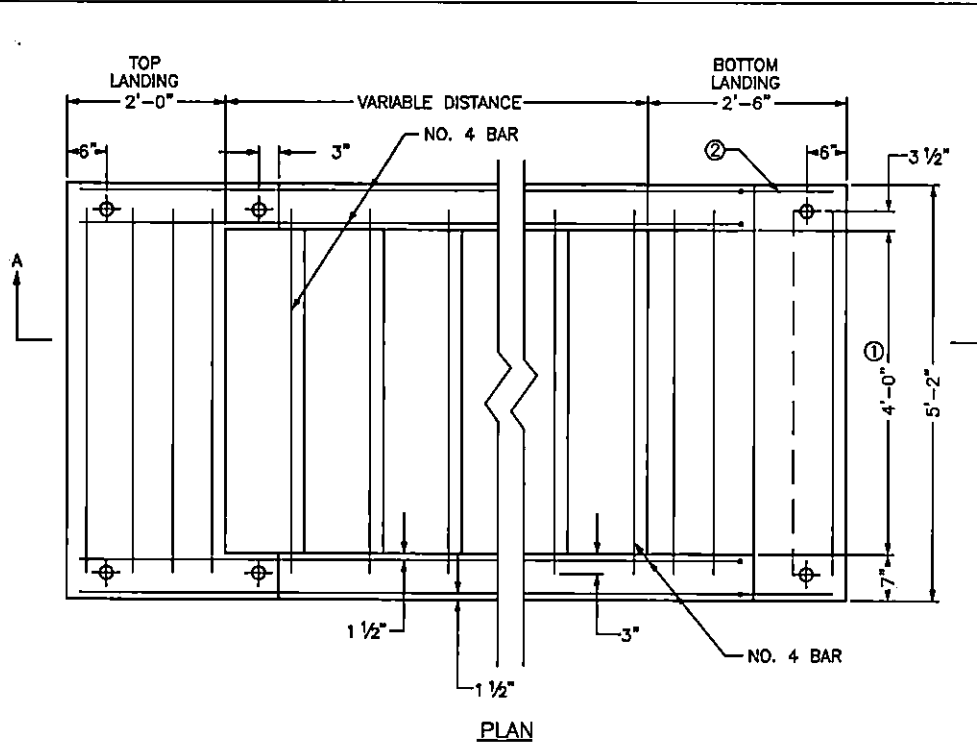
O.D. DEPICTED FOR TUBULAR POSTS IS NOMINAL - ASTM F 1083 SHALL GOVERN.

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

GENERAL:

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

 LEXINGTON	
DIVISION OF ENGINEERING	
WOVEN WIRE GATES	
STANDARD DRAWING NO.	314
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	9/22/17
	DATE



PLAN

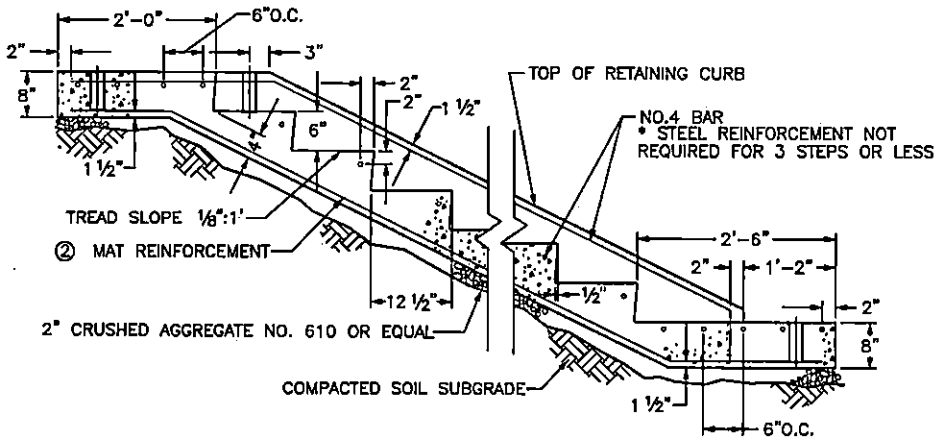
NOTES:

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

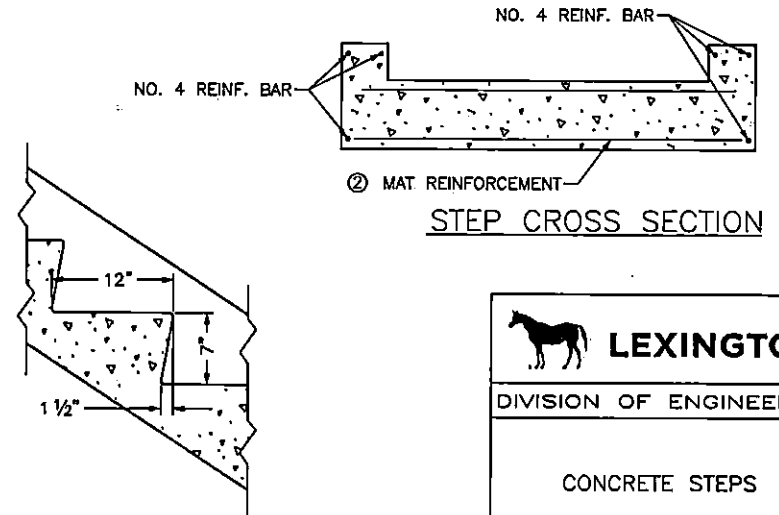
TABLE OF QUANTITIES

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

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



SECTION A-A 2:1 SLOPE



STEP CROSS SECTION

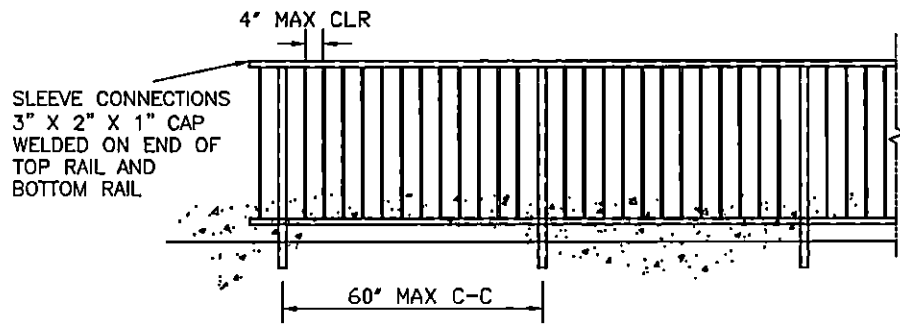
STEP DETAIL FOR 1 1/2:1 SLOPE

LEXINGTON
DIVISION OF ENGINEERING

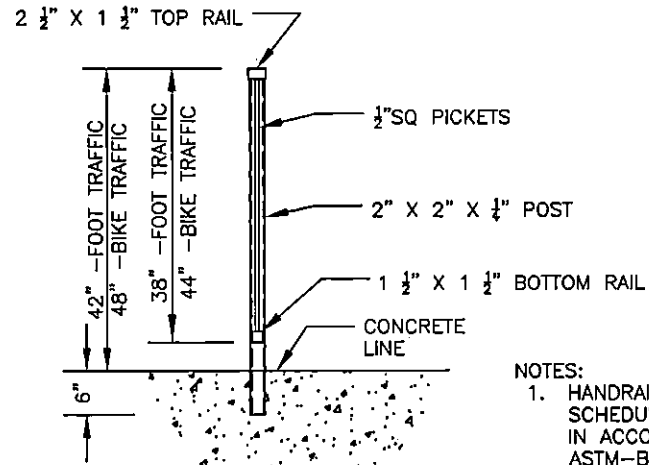
CONCRETE STEPS

STANDARD DRAWING NO. **315**

APPROVAL: 9/22/17
URBAN COUNTY ENGINEER DATE
COMMISSIONER 9/22/17 DATE



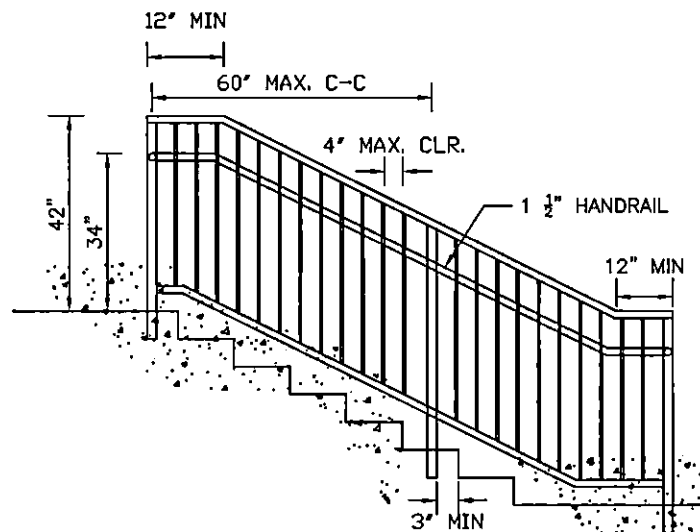
TOP RAIL FOR RETAINING WALLS



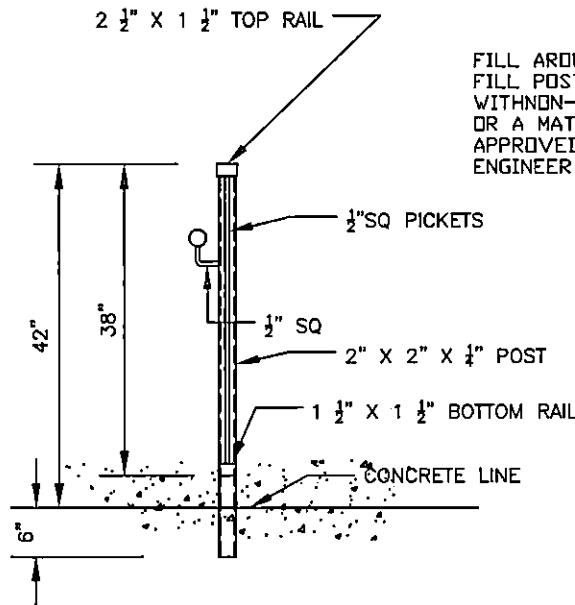
SECTION

NOTES:

1. HANDRAILS SHALL BE DN 40 SCHEDULE 40 ALUMINUM PIPE IN ACCORDANCE WITH ASTM-B221 OR B210 ALLOY 6061-T6.
2. SQUARE BARS SHALL BE DN 40 SCHEDULE ALUMINUM IN ACCORDANCE WITH ASTM-B221 OR B210 ALLOY 6061-T6.
3. ALL METAL TO BE POWDER COATED BLACK IN ACCORDANCE WITH AAMA 2605.
4. GROUT POSTS TO CONCRETE - SEE POST SETTINGS DETAIL THIS SHEET.
5. ANCHOR POSTS IN CORED OR FORMED HOLES.
6. ALUMINUM SURFACES, SUCH AS EXPOSED ENDS, IN CONTACT WITH CONCRETE, GROUT, OR DISSIMILAR METALS SHALL BE PROTECTED WITH A COAT OF BITUMINOUS PAINT.

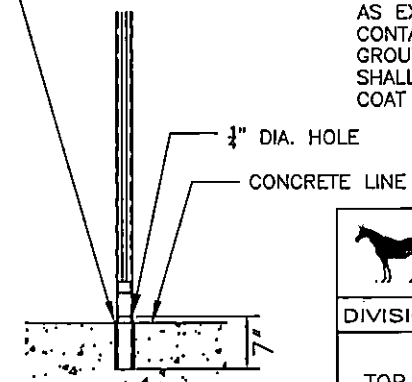


HANDRAIL FOR STEPS



SECTION

FILL AROUND POST AND FILL POST TO HOLE WITH NON-SHRINK GROUT OR A MATERIAL APPROVED BY THE ENGINEER



POST SETTING DETAIL

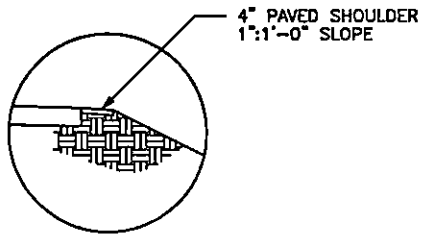


LEXINGTON

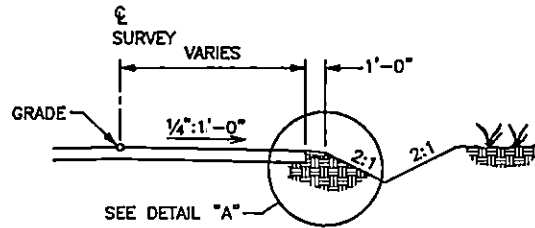
DIVISION OF ENGINEERING

TOP RAIL FOR RETAINING WALLS HANDRAIL FOR STEPS

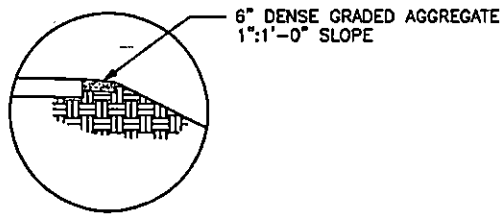
STANDARD DRAWING NO.	316
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



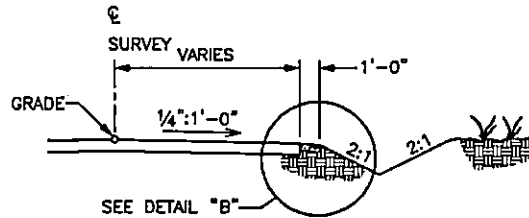
DETAIL "A"



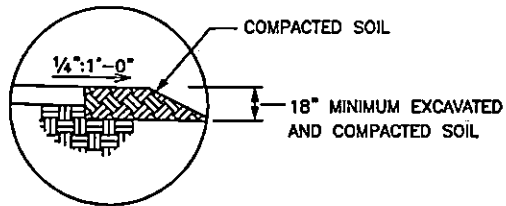
PAVED SHOULDER



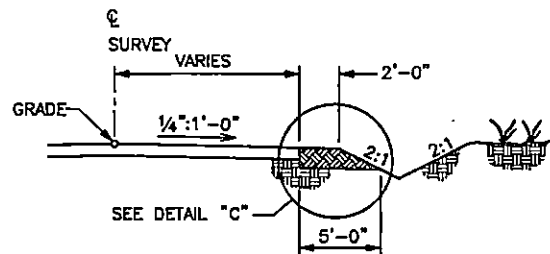
DETAIL "B"



ROCK SHOULDER




DETAIL "C"

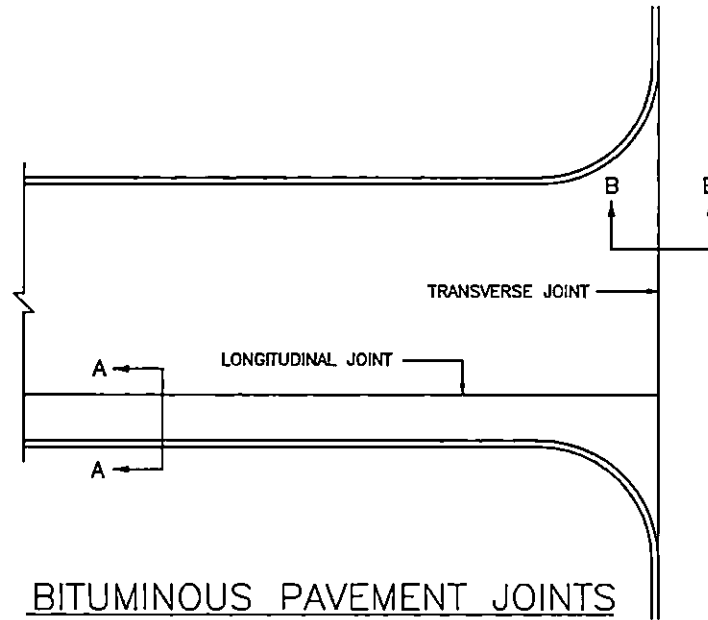


SOIL SHOULDER

NOTES:

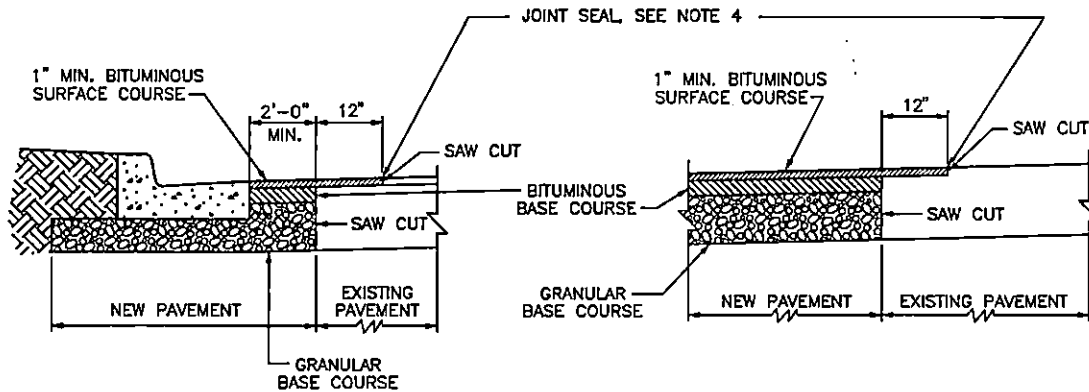
1. SLOPES AND DRAINAGE DITCHES OUTSIDE THE R/W SHALL BE APPROVED BY THE ENGINEER.
2. DRAINAGE DITCH SIDE SLOPES SHALL BE 2:1 MAXIMUM.

 LEXINGTON	
DIVISION OF ENGINEERING	
COUNTY ROAD TYPICAL SHOULDER SECTIONS (MINIMUM REQUIREMENTS)	
STANDARD DRAWING NO.	317
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



NOTES:

1. ALL SAW-CUTS SHALL BE NEAT AND STRAIGHT.
2. IMMEDIATELY BEFORE LAYING NEW BITUMINOUS COURSES, ALL SAW CUT EDGES SHALL BE CLEANED OF DUST AND DEBRIS AND SPRAYED WITH A BITUMINOUS TACK COAT.
3. EDGE KEY SHALL NOT BE REQUIRED IF BOTH EXISTING AND NEW PAVEMENT ARE TO RECEIVE AN OVERLAY AS PART OF THIS CONTRACT.
4. SEAL PERIMETER OF CUT PAVEMENT WITH CRACK SEALANT THAT MEETS ASTM D6690, TYPE 2.



SECTION A-A
LONGITUDINAL EDGE KEY

SECTION B-B
TRANSVERSE EDGE KEY

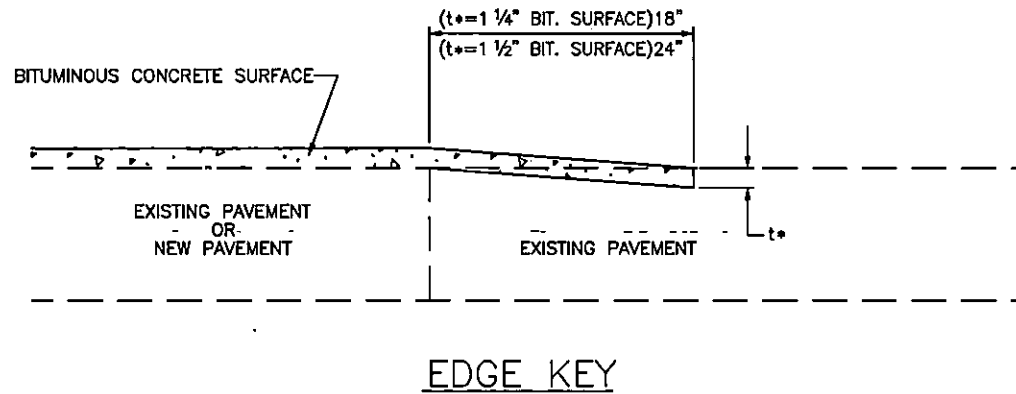


LEXINGTON

DIVISION OF ENGINEERING

EDGE KEY

STANDARD DRAWING NO.	318
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



LEXINGTON

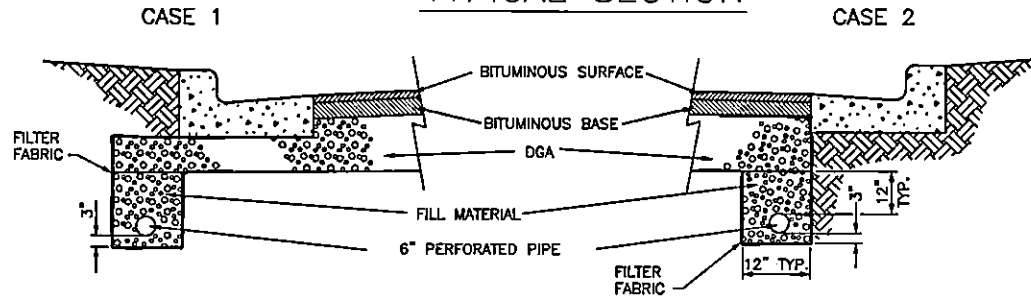
DIVISION OF ENGINEERING

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

STANDARD DRAWING NO. 319

APPROVAL: *[Signature]* 9/22/17
URBAN COUNTY ENGINEER DATE
COMMISSIONER *[Signature]* 9/22/17
DATE

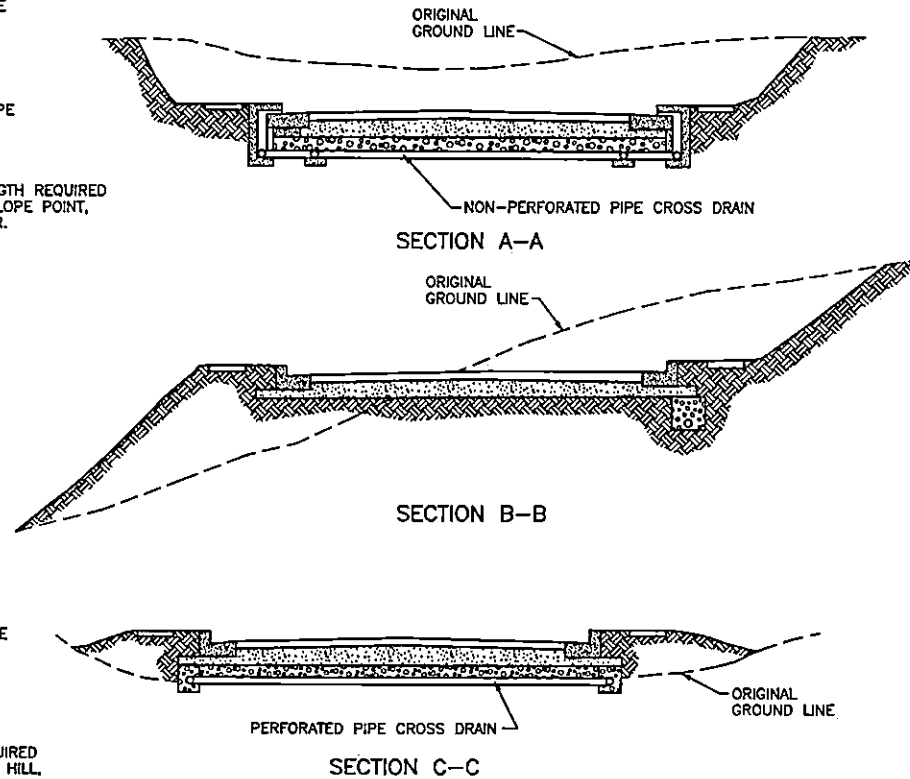
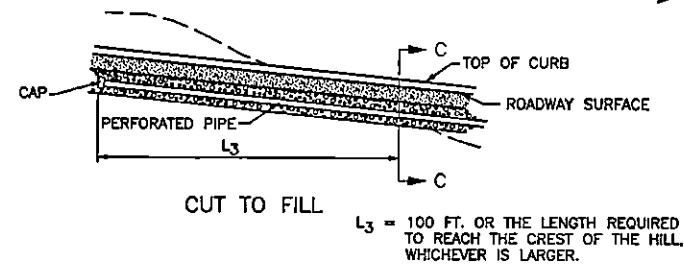
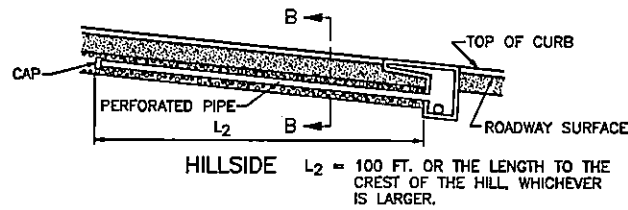
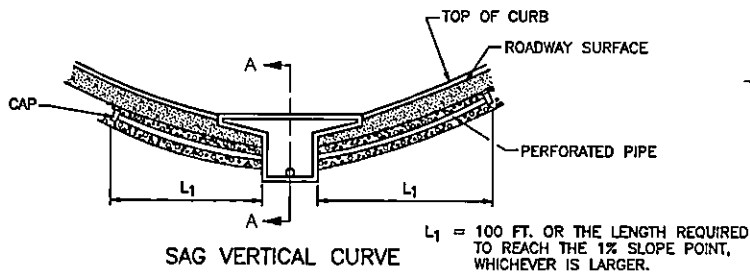
TYPICAL SECTION



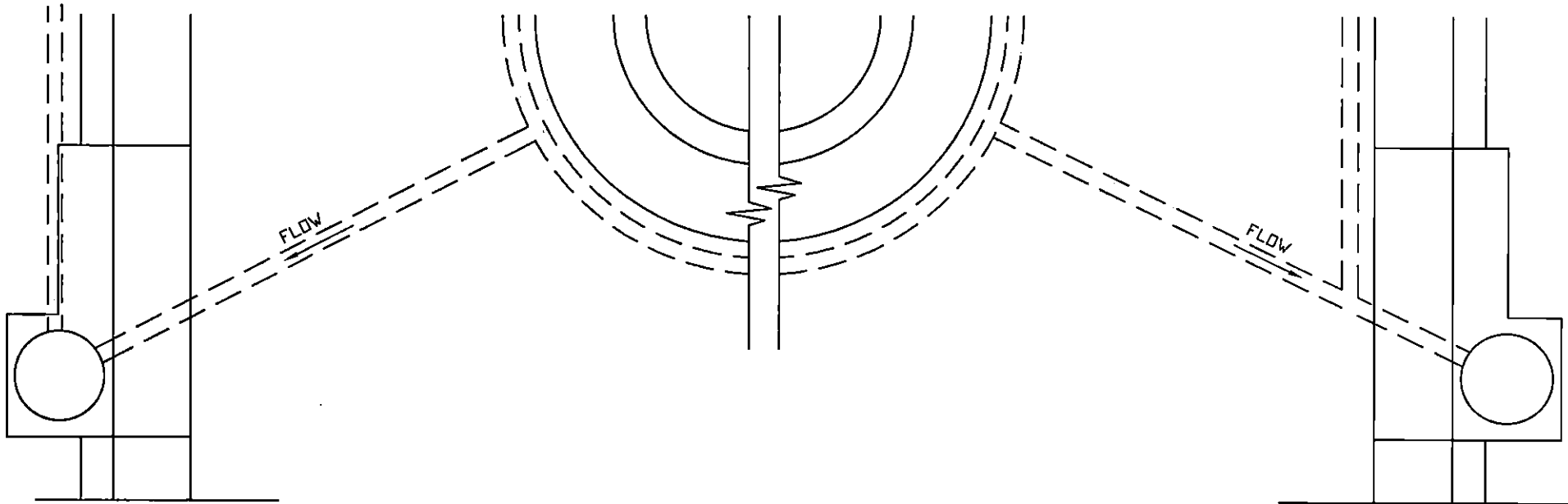
NOTES:

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

TYPICAL SUBGRADE DRAINAGE LOCATIONS

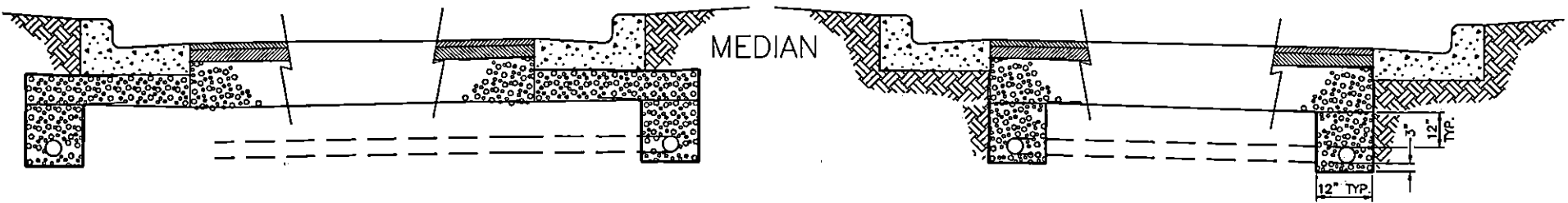


LEXINGTON
DIVISION OF ENGINEERING
PERFORATED PIPE SUBGRADE DRAINAGE ALONG ROADWAY
STANDARD DRAWING NO. 320-1
APPROVAL: 9/22/17
URBAN COUNTY ENGINEER: DATE
COMMISSIONER: DATE



CURB ON PAVEMENT

CURB ON SOIL



TYPICAL SECTION

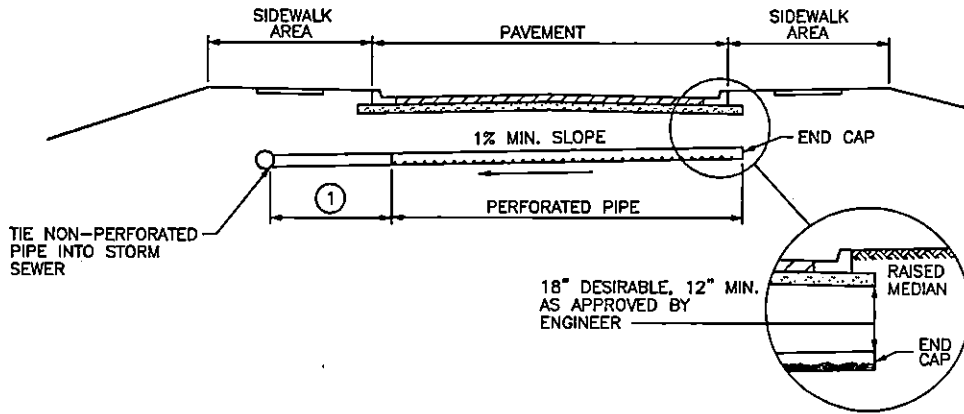
1. For installation of perforated pipe see Detail Sheet #320
2. Perforated pipe shall completely surround all islands
3. For islands greater than 50" long or wide, perforated pipe surrounding island and leading to the curb inlet shall be 6" diameter.



DIVISION OF ENGINEERING

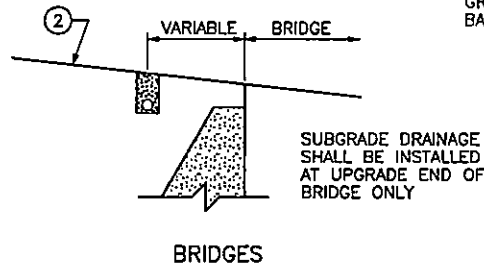
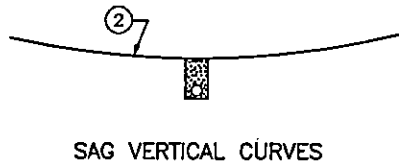
PERFORATED PIPE
SUBGRADE DRAINAGE
FOR RAISED
NON-PAVED MEDIANS

STANDARD DRAWING NO.	320-2
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE

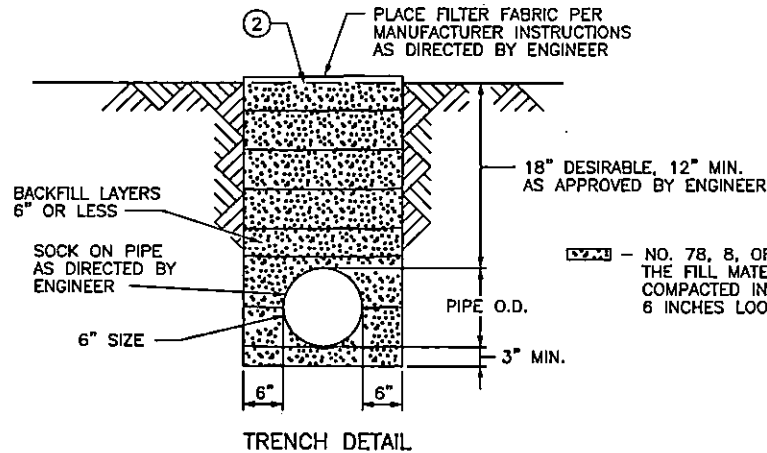
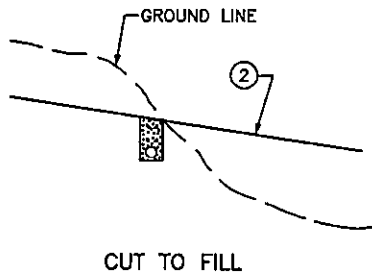


NOTES:

1. SUBGRADE DRAINAGE, AS DEPICTED, IS INTENDED FOR USE WITH THE ROADWAY CONSTRUCTION PHASE AND SHALL BE INSTALLED ONLY AFTER THE SUBGRADE HAS BEEN COMPLETED, AND PRIOR TO PLACING PAVING MATERIALS.
2. SUBGRADE DRAINAGE WILL NOT BE REQUIRED WHEN:
 - A. AGGREGATE SUBGRADE OR NATURAL BANK GRAVEL IS SPECIFIED.
 - B. POROUS OR FREE DRAINING SUBGRADES ARE EVIDENT.
 - C. DIRECTED BY THE LFUGC ENGINEER.
3. THE END CAP SHALL BE A STANDARD MANUFACTURED ITEM FURNISHED BY THE PIPE SUPPLIER.
4. FLOW SHALL BE DIRECTED TOWARD THE FILL SIDE OF THE ROADWAY WHEN POSSIBLE.
5. IF ROCK IS ENCOUNTERED WITHIN 24" OF SUBGRADE, PERFORATED PIPE IS REQUIRED THE FULL LENGTH OF ROCK. POSITIVE OUTLET IS REQUIRED.
6. A MIN. OF 100' OF PERFORATED PIPE IS REQUIRED UPHILL FROM BASINS ON GRADE AND 100' OF PERFORATED PIPE IS REQUIRED EACH WAY FROM SAG BASINS.




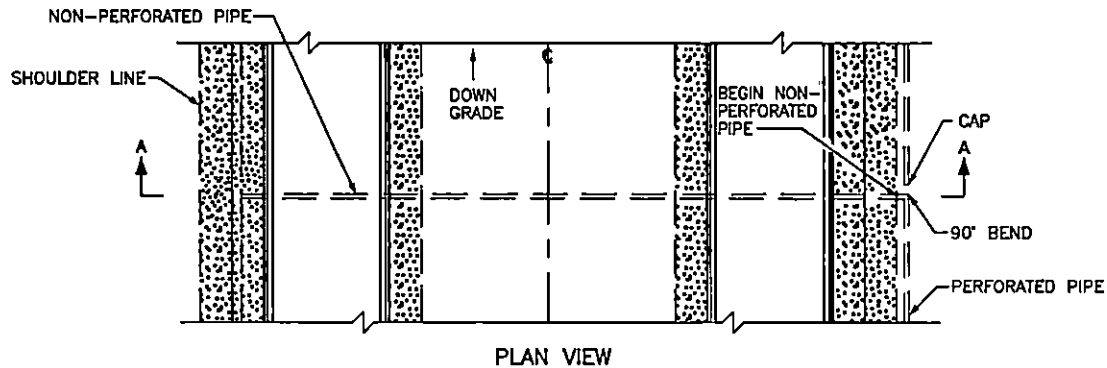
- ① APPROXIMATELY 8 TO 12 FEET OF PIPE AT THE OUTLET SHALL BE NON-PERFORATED PIPE MEETING THE REQUIREMENTS OF THE PERFORATED PIPE, EXCEPT FOR PERFORATIONS.
- ② SUBGRADE ELEVATION



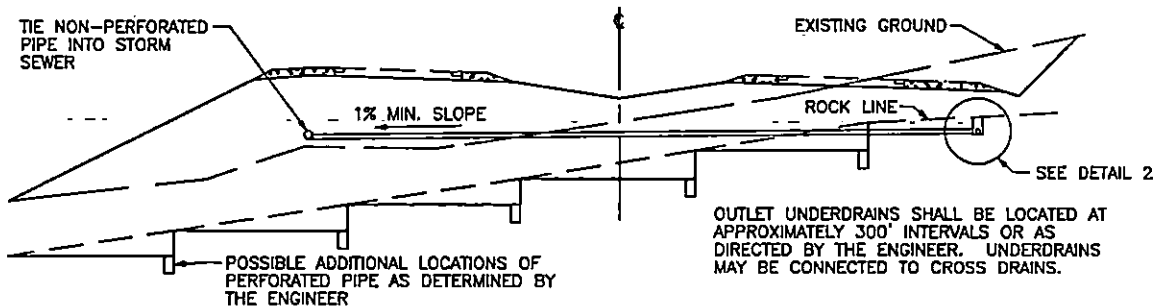
NO. 78, 8, OR 9M COARSE AGGREGATE. THE FILL MATERIAL SHALL BE THOROUGHLY COMPACTED IN LAYERS NOT EXCEEDING 6 INCHES LOOSE MEASUREMENT.

TYPICAL SUBGRADE DRAINAGE LOCATIONS

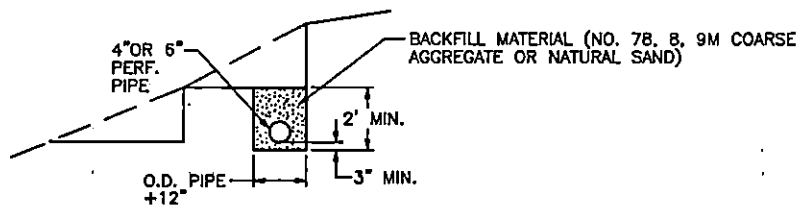
	
LEXINGTON	
DIVISION OF ENGINEERING	
PERFORATED PIPE FOR SUBGRADE DRAINAGE	
STANDARD DRAWING NO.	321
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



PLAN VIEW



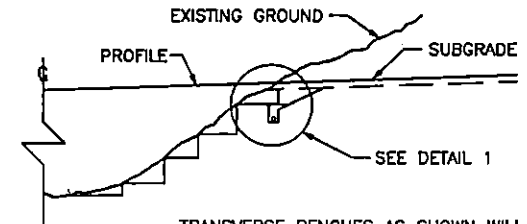
SECTION A-A



DETAIL 2

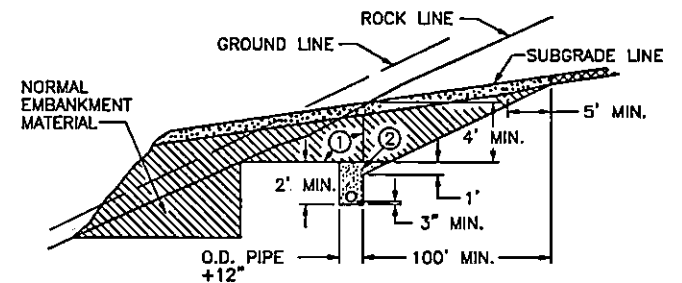
DETAIL FOR LONGITUDINAL UNDERDRAINS

DETAIL FOR TRANSVERSE UNDERDRAIN CUT TO FILL CONDITION



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

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



DETAIL 1

SHEET NOTES: ○

- ① LIMITS OF FIRST BENCH.
- ② BACKFILL MATERIAL

NOTE:

1. ALL PERFORATED AND NON-PERFORATED PIPE SHALL COMPLY WITH ASTM & KOOT SPECIFICATIONS.

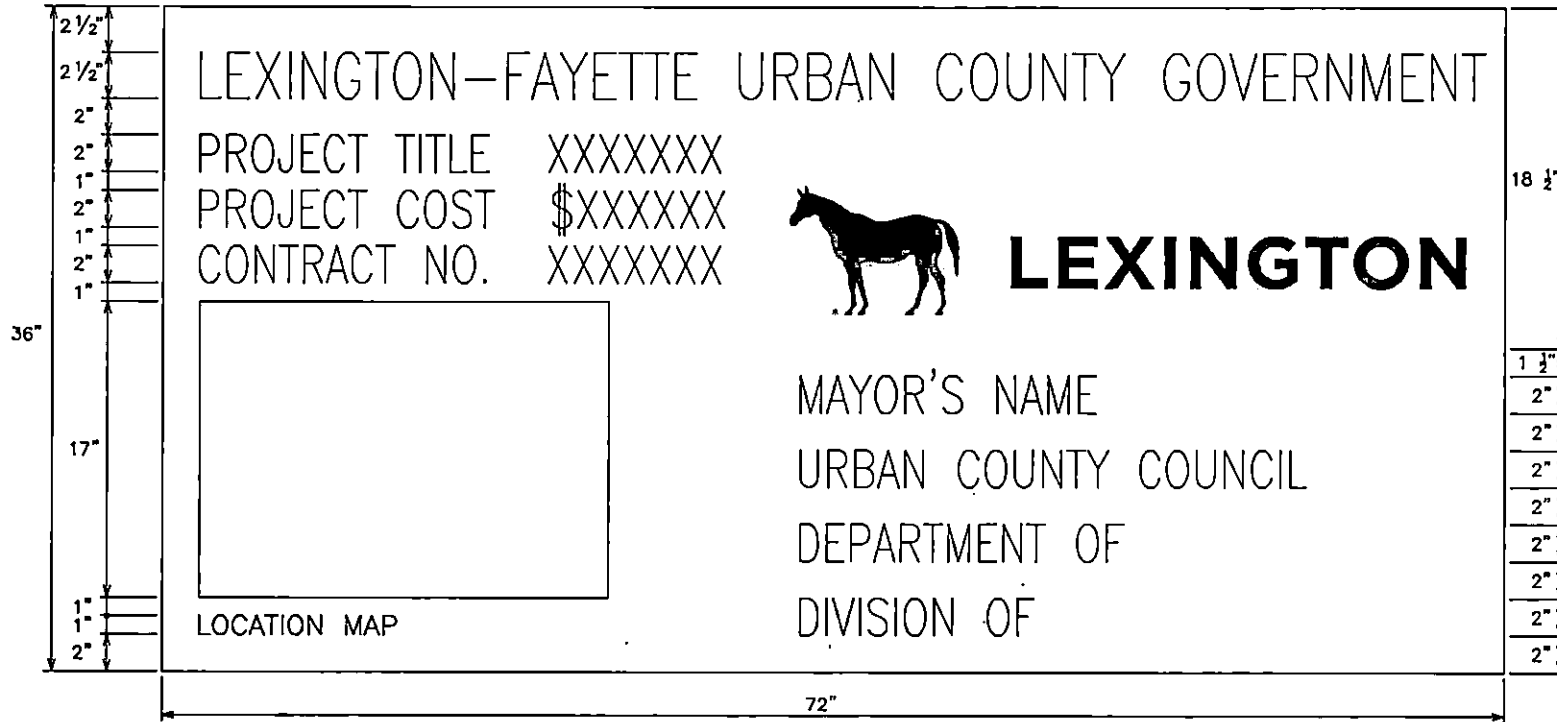


LEXINGTON

DIVISION OF ENGINEERING

PERFORATED PIPE UNDERDRAINS

STANDARD DRAWING NO.	322
APPROVAL:	9/22/17
URBAN COUNTY ENGINEER	DATE
COMMISSIONER	DATE



NOTES:

THIS SIGN SHALL BE:

1. FURNISHED AND ERECTED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE, IN ADDITION TO THE NORMAL WARNING AND REGULATORY SIGNS.
2. OF GOOD QUALITY EXTERIOR PLYWOOD OR OTHER APPROVED MATERIAL.
3. PAINTED WITH SOLID BLUE LETTERS ON A WHITE BACKGROUND.
4. UPDATED AS NEEDED TO INDICATE THE APPROPRIATE MAYOR'S NAME.
5. FRAMED AND BRACED SO AS TO REMAIN VERTICAL AND PLAINLY VISIBLE TO THE TRAVELING PUBLIC.
6. ERECTED PRIOR TO STARTING CONSTRUCTION WORK.
7. ERECTED AT EACH END OF THE PROJECT AT LOCATIONS DIRECTED BY THE ENGINEER AND AT OTHER LOCATIONS SPECIFIED ON THE PLANS OR IN THE PROPOSAL.
8. KEPT CLEAN AND IN GOOD CONDITION FOR THE DURATION OF THE CONSTRUCTION AS DIRECTED BY THE ENGINEER.
9. THE COST SHOWN APPLIES ONLY TO THE PORTION OF PROJECT UNDER CONSTRUCTION IN A CONTINUOUS SECTION. IN THE EVENT THE PROJECT CONSISTS OF MORE THAN ONE CONTINUOUS SECTION THE COST SHOWN SHALL BE FOR THE PARTICULAR SECTION WHERE WORK IS IN PROGRESS.
10. NOT TO BE USED ON FEDERAL AID TRANSPORTATION PROJECTS

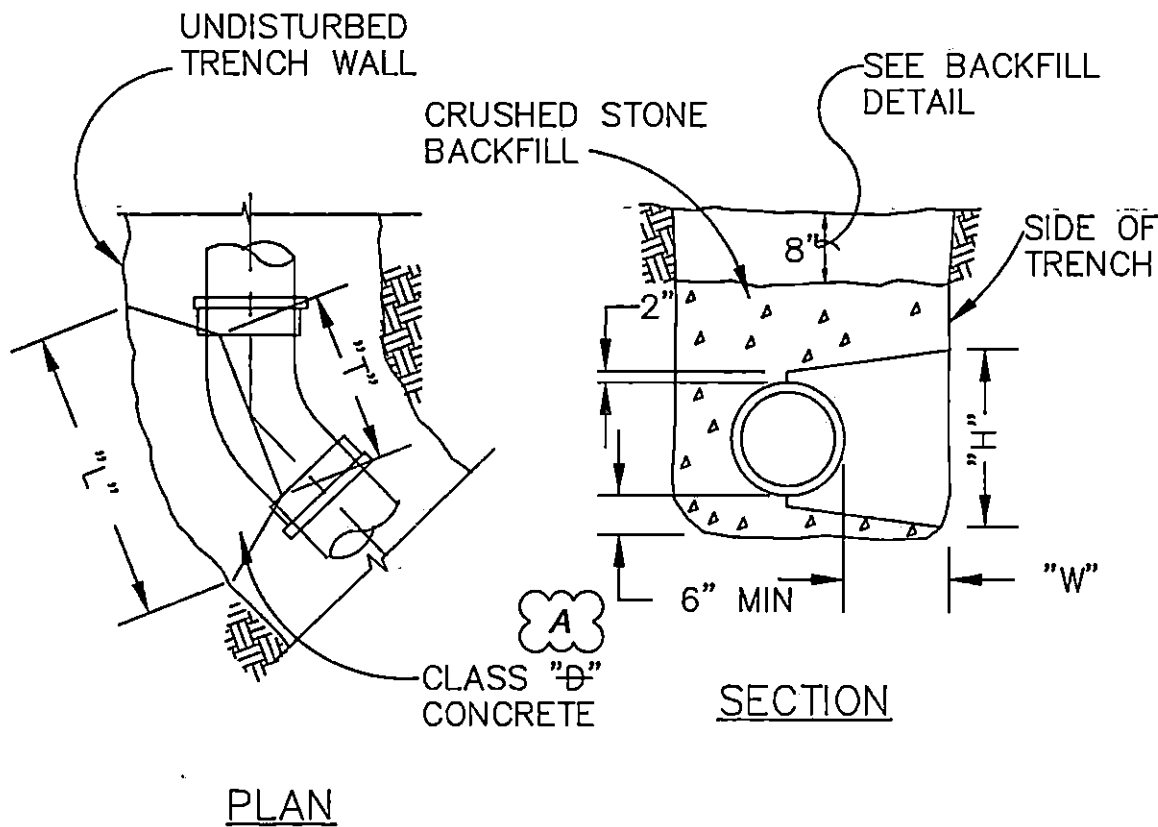
LEXINGTON
DIVISION OF ENGINEERING
PUBLIC IMPROVEMENT SIGN
STANDARD DRAWING NO. 323
APPROVAL: 9/22/17
URBAN COUNTY ENGINEER: DATE: 9/22/17
COMMISSIONER: DATE

APPENDIX B

**LFUCG SANITARY SEWER & PUMPING STATION STANDARD
DRAWINGS 2009**

**Excerpt from:
LFUCG Sanitary Sewer and Pump Station Manual,
Appendix B - Drawings**

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

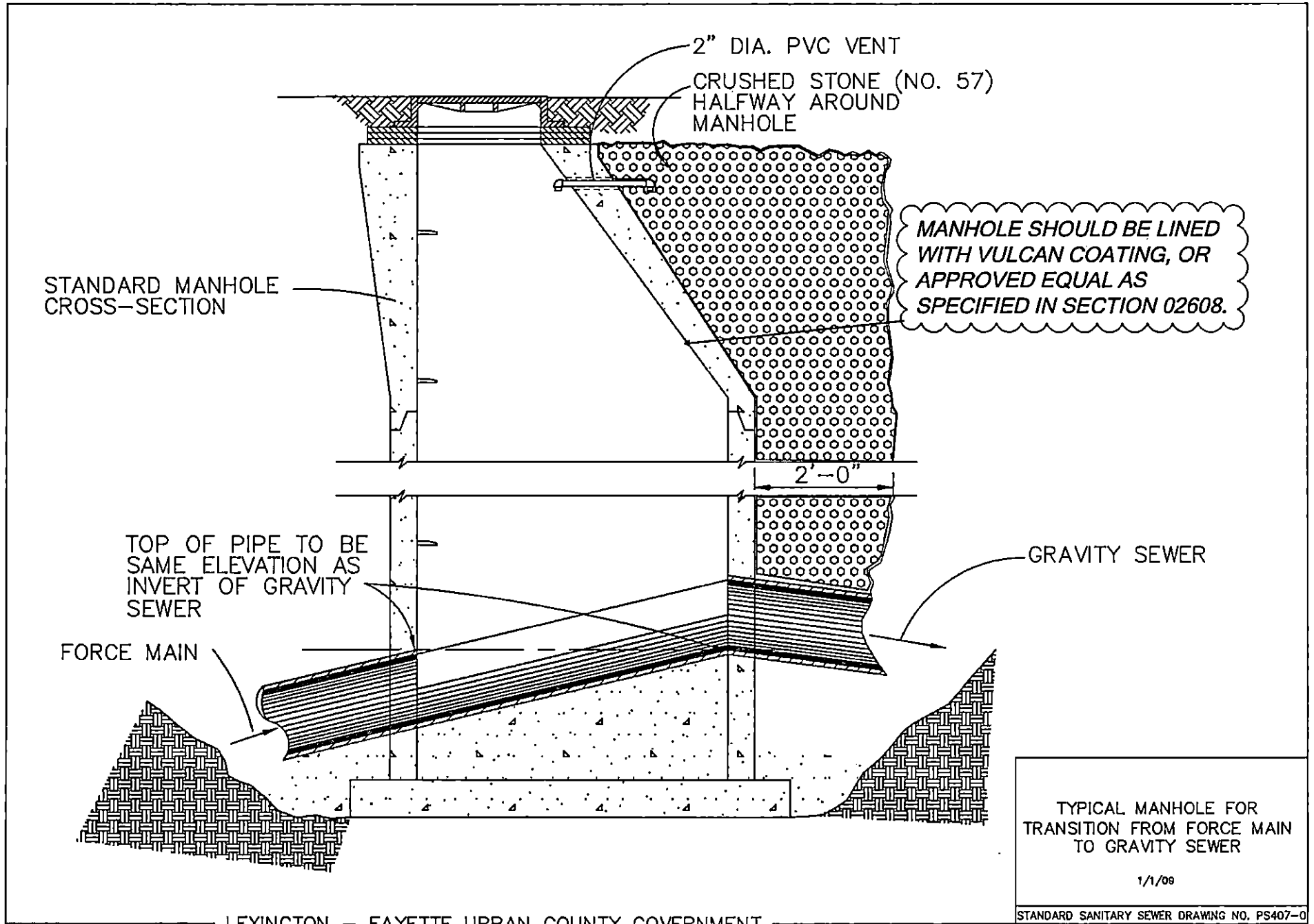


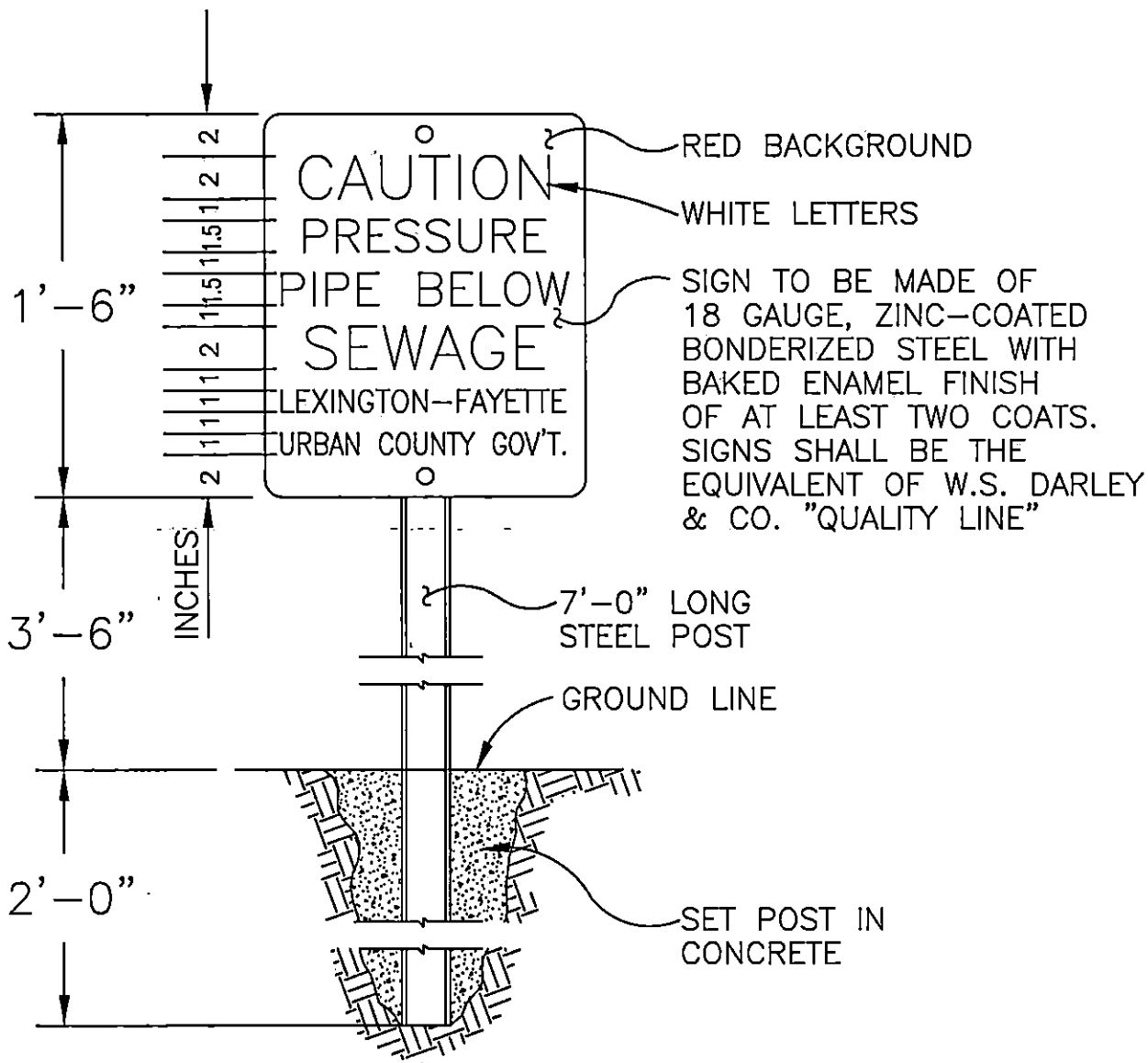
45° BEND					
SIZE D	4"	6"	8"	10"	12"
W	8"	8"	10"	12"	12"
L	14"	18"	20"	22"	27"
H	14"	16"	18"	20"	24"
T	13"	15"	16"	18"	18"

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

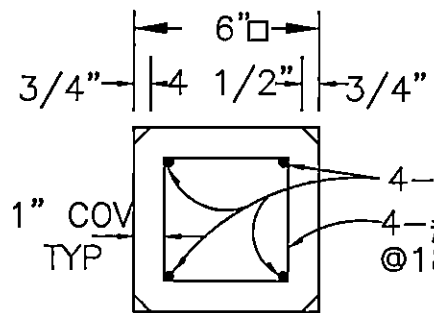
HORIZ. & VERT. BENDS &
CONCRETE BACKING

1/1/09



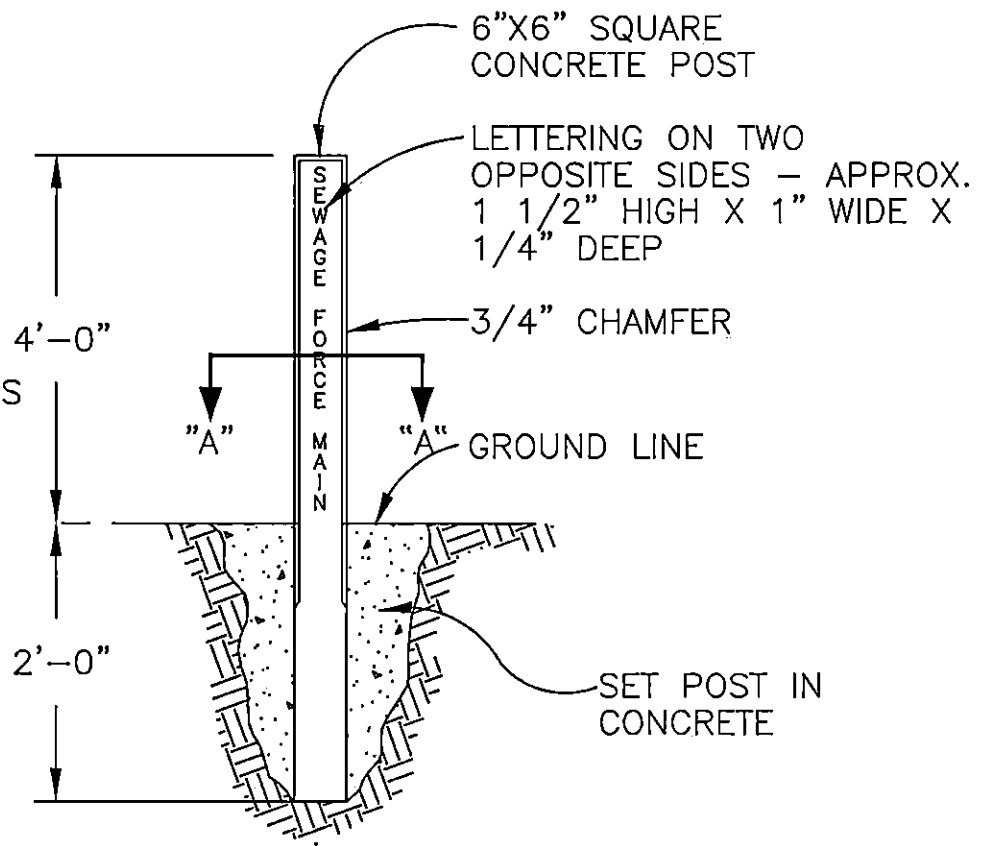


STEEL POST AND
LINE MARKER
1/1/09

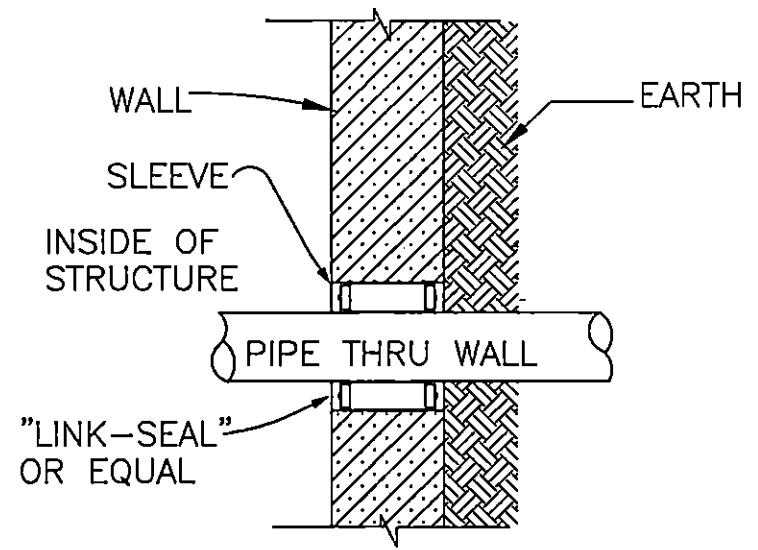
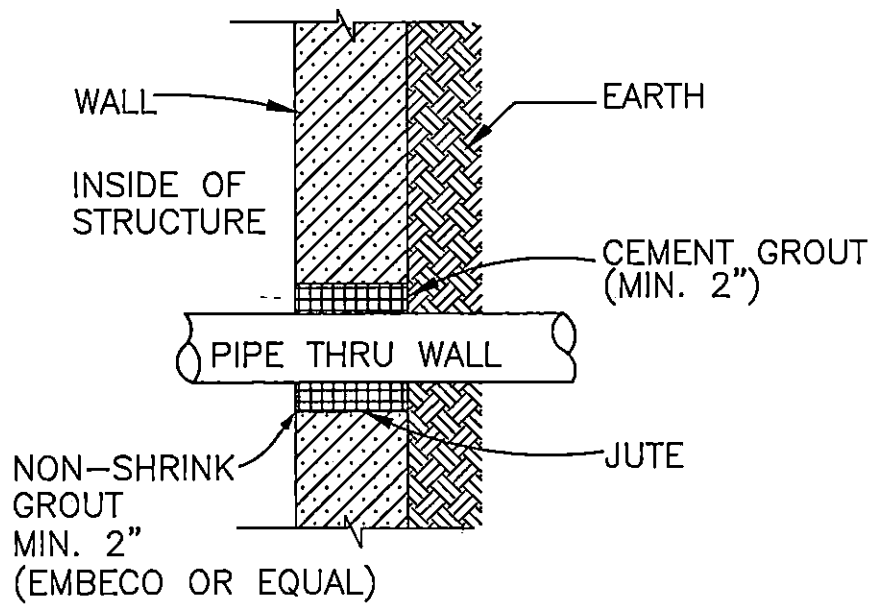


SECTION "A"

4-#3X6'-0"
4-#3 STIRRUPS
@18" CTRS.



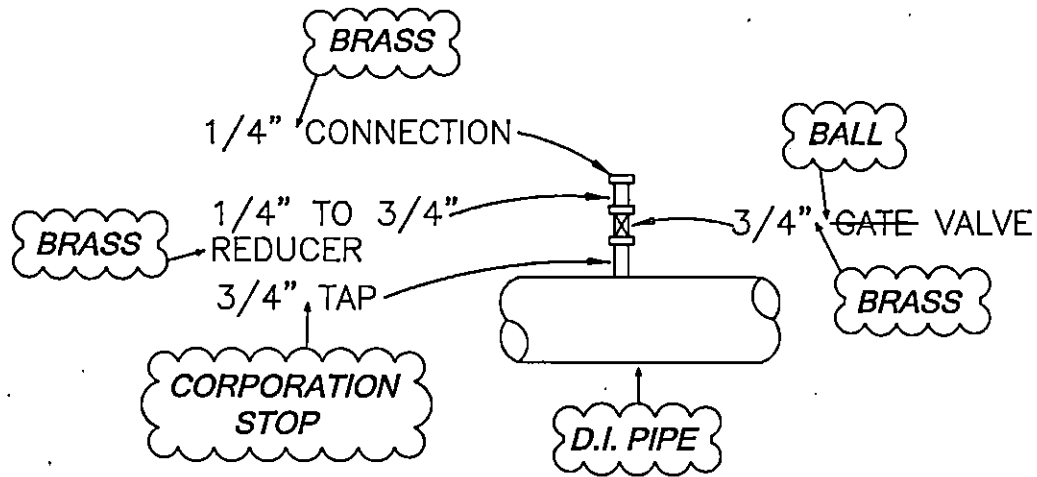
CONCRETE LINE MARKER
1/1/09
STANDARD SANITARY SEWER DRAWING NO. PS409-0



WALL PENETRATION DETAIL

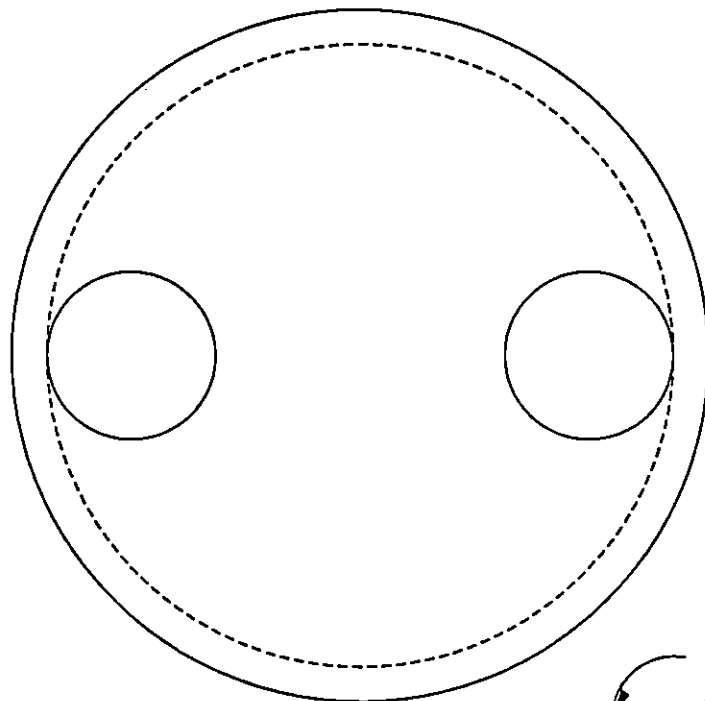
1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS410-0



GAUGE TAP DETAIL

1/1/09



NO. 57
CRUSHED STONE —
HALFWAY
AROUND
MANHOLE

STAINLESS STL.
WIRE SCREEN
CLAMPED OVER
END OF PIPE

CAST IRON
VALVE W/
BOLTED BONNET
(3"Ø VALVE FOR
3"Ø FORCE MAIN,
4"Ø VALVE FOR
4"Ø FORCE MAIN

BOLTED
FLANGED
FITTINGS

EARTH
FILL

1" P.V.C.

2" TAP

BACKFLUSH HOSE
"APCO-400"
SEWAGE AIR
RELEASE VALVE
(OR EQUIV.) W/
2" CONN.



HIGH POINT ALONG
FORCE MAIN

MANHOLE FRAME
AND LID

1'-6" 8" 6"
MIN.

EARTH
FILL

AS REQ'D

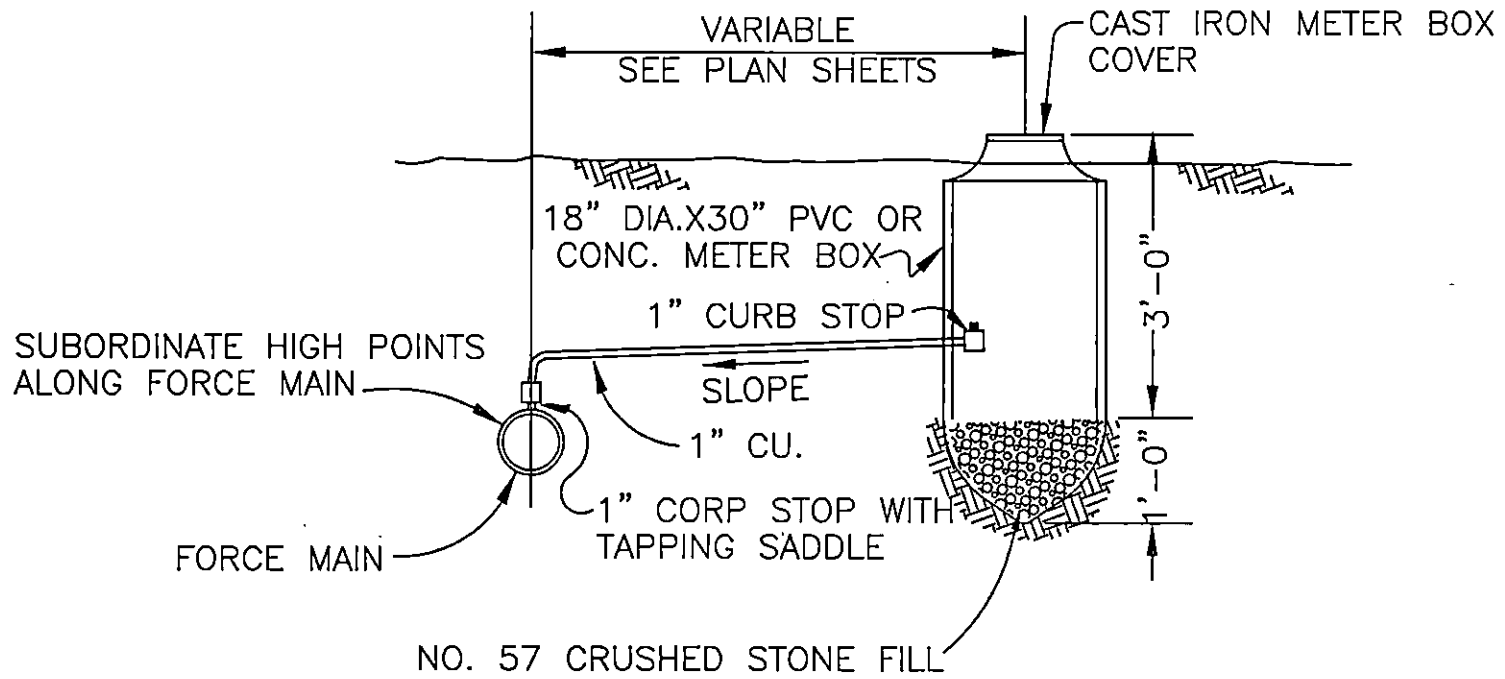
1'-0" 6'-0" 1'-0"

CRUSHED STONE BASE (NO. 57)

AUTOMATIC AIR
RELEASE ASSEMBLY

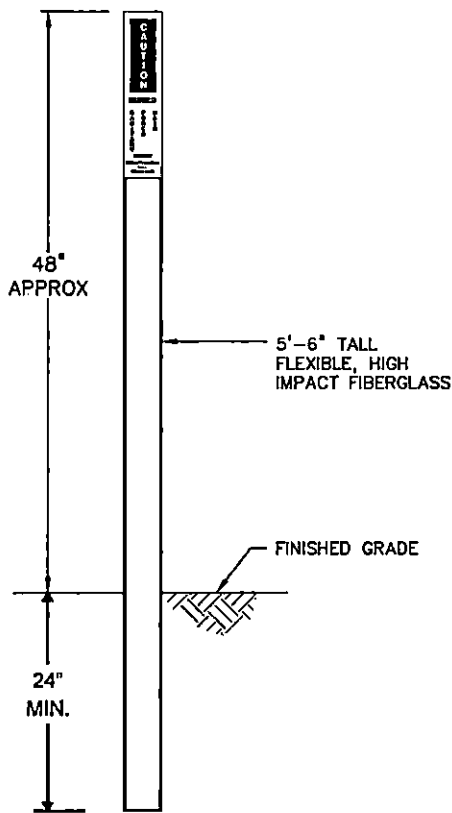
1/1/09

STANDARD SANITARY SEWER DRAWING NO. PS415-0



MANUAL AIR RELEASE
ASSEMBLY

1/1/09



BROWN

CAUTION

REFLECTIVE
WHITE

BURIED

17 1/4"

**S
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R
Y**

**F
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R
C
E**

**M
A
I
N**

NEARBY

**FOR INFORMATION
CALL
859-425-2255**

3.5"-4"

**FIBERGLASS FORCE MAIN
LINE MARKER**