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August 15, 2014

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AUG 15 2014
PUBLIC SERVICE
COMMISSION

Jeff Derouen
Executive Director
Kentucky Public Service Commission
211 Sower Boulevard
Frankfort, KY 40602

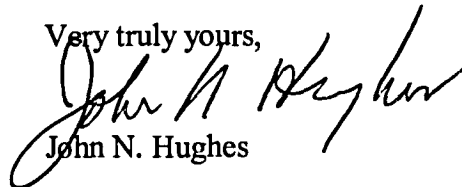
Re: Natural Gas of Kentucky, Inc.
Case No. 2014-000257

Dear Mr. Derouen:

Natural Gas of Kentucky, Inc. (NGK) submits its response to the Commission's letter of July 25, which includes the engineering plans, maps and specifications for the proposed project.

If there are any questions about this matter, please contact me.

Very truly yours,



John N. Hughes

Attorney for Natural Gas of Kentucky, Inc.

KENVIRONS

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PUBLIC SERVICE
COMMISSION

TECHNICAL SPECIFICATIONS

NATURAL GAS OF KENTUCKY, LLC
HARDIN COUNTY, KENTUCKY

UPTON NATURAL GAS PIPELINE PROJECT

PREPARED BY:

KENVIRONS, INC.
452 VERSAILLES ROAD
FRANKFORT, KY 40601

PROJECT No. 2014105

AUGUST 2014

Kenvirons, Inc.

Civil & Environmental Engineering and Laboratory Services

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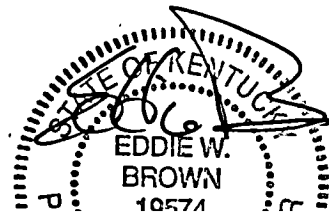


TABLE OF CONTENTS

<u>Section</u>	<u>Section Description</u>	<u>Pages</u>
Technical Specifications		
02072	Horizontal Directional Drilling	6
02326	Steel Cover Pipe	5
02610	Pressure Pipe	20
02740	Pavement Replacement	3
02930	Sodding and Seeding	7
15100	Natural Gas Valves and Gas Main Accessories	4
15123	Free Bore	1

SECTION 02072

HORIZONTAL DIRECTIONAL DRILLING

1.0 GENERAL

1.1 WORK INCLUDED

The work specified in this section consists of furnishing and installing underground utilities using the directional boring (horizontal directional drilling, HDD) method of installation, also commonly referred to as guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

1.2 QUALITY ASSURANCE

The requirements set forth in this document specify a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the Engineer's approval of any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

1.3 SUBMITTALS

A. **WORK PLAN:** Prior to beginning work, the Contractor must submit to the Engineer a general work plan outlining the procedure and schedule to be used to execute the project. Plan should document the thoughtful planning required to successfully complete the project. At a minimum, the Plan shall cover general construction activities, job safety, emergency response, and scheduling.

B. **EQUIPMENT:** Contractor will submit specifications on directional boring equipment to be used to ensure that the equipment will be adequate to complete the project. Spares inventory shall be included.

C. **MATERIAL:** Specifications on material to be used shall be submitted to Engineer. Material shall include the pipe, fittings and any other item which is to be an installed component of the project.

D. **PERSONNEL:** Documentation of training and relevant experience of personnel shall be submitted.

2.0 EQUIPMENT REQUIREMENTS

2.1 GENERAL

The directional boring equipment shall consist of a directional boring rig of sufficient capacity to perform the bore and pullback the pipe, a boring fluid mixing and delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

2.2 BORING SYSTEM

A. **BORING RIG:** The directional boring machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power boring operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during boring and pull-back operations. Sufficient spares shall be kept on hand for any break-downs which can be reasonably anticipated.

B. **BORE HEAD:** The bore head shall be steerable by changing it's rotation and shall provide the necessary cutting surfaces and boring fluid jets.

C. **MUD MOTORS (if required):** Mud motors shall be of adequate power to turn the required boring tools.

D. **DRILL PIPE:** Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

2.3 GUIDANCE SYSTEM

The Guidance System shall be of a proven type and shall be setup and operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

2.4 BORING FLUID (MUD) SYSTEM

A. **MIXING SYSTEM:** A self-contained, closed, boring fluid mixing system shall be of sufficient size to mix and deliver boring fluid composed of bentonite clay, water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. Mixing system shall continually agitate the boring fluid during boring operations.

B. **Boring FLUIDS:** Drilling fluid shall be composed of clean water and an appropriate additive. Water shall be from a clean source with a pH of 8.5 - 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No hazardous additives may be used. Boring fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall.

C. **DELIVERY SYSTEM:** The mud pumping system shall have an adequate flow and pressure for the directional bore. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used boring fluid and boring fluid spilled during boring operations shall be contained and properly disposed of. A berm, minimum of 12" high, shall be maintained around boring equipment, boring fluid mixing system, entry and exit pits and boring fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps of sufficient size shall be in place to convey excess boring fluid from containment areas to storage facilities.

2.5 OTHER EQUIPMENT

A. **PIPE ROLLERS:** Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe while being tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

B. **PIPE RAMMERS/PULLERS:** Hydraulic or pneumatic pipe rammers or pullers may only be used if necessary and with the authorization of Engineer.

3.0 OPERATIONS

3.1 GENERAL

The Engineer shall be notified 7 days in advance of starting work. The Directional Bore shall not begin until the Engineer is present at the job site and agrees that proper preparations for the operation have been made. The Engineer approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the

Contract. It shall be the responsibility of Engineer to provide inspection personnel at such times as appropriate without causing undue hardship by reason of delay to the Contractor.

3.2 PERSONNEL REQUIREMENTS

All personnel shall be fully trained in their respective duties as part of the directional boring crew and in safety. Training shall be provided specific to the project if any potential hazards may be encountered which has not already been included in personnel's training.

3.3 BORING PROCEDURE

A. **SITE PREPARATION:** Prior to any alterations to work-site, Contractor shall photograph or video tape entire work area, including entry and exit points. One copy of which shall be given to the Engineer and one copy to remain with Contractor for a period of one year following the completion of the project. Work site, as indicated on drawings and within right-of-way, shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.

B. **BORE PATH SURVEY:** Entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for any surface geo-magnetic variations or anomalies.

C. **ENVIRONMENTAL PROTECTION:** Contractor shall place silt fence between all boring operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or boring fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations. Fuel or oil may not be stored in bulk containers within 200' of any water-body or wetland.

D. **UTILITY LOCATES:** Contractor shall notify all companies with underground utilities in the work area via the state or local "one-call" (BUD) to obtain utility locates. Once the utilities have been located Contractor shall physically identify the exact location of the utilities by vacuum or hand excavation, when possible, in order to determine the actual location and path of any underground utilities which might be within 20 feet of the bore path. Contractor shall not commence boring operations until the location of all underground utilities within the work area have been verified.

E. SAFETY: Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner. Safety meetings shall be conducted at least weekly with a written record of attendance and topic submitted to Engineer. The Contractor shall implement the safety guidelines and practices established by:

1. Occupational Safety and Health Act (OSHA).
 - (a) In particular, Subpart P, Excavations of 29 CFR 1926.650, .651, 652, and OSHA Publication 2226, "Excavation, Trenching & Shoring"
2. American Gas Association, Directional Drilling Damage Prevention Guidelines for the Natural Gas Industry

F. BORE PIT: The boring pit shall be solid sheeted, braced, and shored as necessary to provide a safe work environment. The Contractor shall take all precautions, and comply with all requirements as may be necessary to protect employees, and private and public property. As required by federal and/or state regulations, bore pit excavation and shoring shall be designed by a professional engineer registered in Kentucky. Tabulated data, calculations, and/or drawings shall be signed and sealed by the bore pit design professional engineer and submitted for review.

G. PIPE: Pipe shall be connected together in one length prior to pull-back operations, if space permits. Steel pipe welds will be X-rayed prior to being placed in bore hole. Pipe will be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe.

H. PILOT HOLE: Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100'. In the event that pilot does deviate from bore path more than 5% of depth in 100', Contractor will notify Engineer and Engineer may require Contractor to pull-back and re-drill from the location along bore path before the deviation.

In the event that a boring fluid fracture, inadvertent returns or returns loss occurs during pilot hole boring operations, Contractor shall cease boring, wait at least 30 minutes, inject a quantity of boring fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor will cease operations and notify Engineer. Engineer and Contractor will discuss additional options and work will then proceed accordingly.

I. REAMING: Upon successful completion of pilot hole, Contractor will ream bore hole to a minimum of 25% greater than outside diameter of pipe using the appropriate tools. Contractor will not attempt to ream at one time more than the boring equipment and mud system are designed to safely handle.

J. **PULL-BACK:** After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull pressure at any time.

In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify Engineer. Engineer and Contractor will discuss options and then work will proceed accordingly.

3.4 PIPE TESTING

Following successful pull-back of pipe, Contractor will pressure test pipe using nitrogen gas for a period of 24 hours at the pressure rating of the pipe. A calibrated pressure recorder will be used to record the pressure during the test period. This record will be presented to Engineer. After successful completion of the pressure test, the pipe will be pigged dry.

3.5 SITE RESTORATION

Following boring operations, Contractor will de-mobilize equipment and restore the work-site to original condition. All excavations will be backfilled and compacted to 95% of original density. Landscaping will be restored to original.

3.6 RECORD KEEPING, AS-BUILTS

Contractor shall maintain a daily project log of boring operations and a guidance system log with a copy given to Engineer at completion of project. As-built drawings shall be certified as to accuracy by the Contractor. Third-party verification of as-built drawings may be done at Owner's expense.

SECTION 02326

STEEL COVER PIPE

1.0 GENERAL

1.1 SCOPE OF WORK

A. Steel cover pipe shall be furnished and installed as shown on the Drawings and specified herein.

1.2 RELATED WORK

A. Pressure pipe is specified in Section 02610.

2.0 PRODUCTS

2.1 STEEL COVER PIPE

A. Steel cover or jack pipe shall be plain end steel pipe with minimum yield strength of 35,000 psi and tensile strength of 60,000 psi per API-5L Grade B material. The steel pipe supplied shall be manufactured by the seamless, electric-weld, submerged-arc weld or gas metal-arc weld process as specified in API-5L. Certification of 35,000 psi minimum yield strength shall be furnished by the supplier through the Contractor to the Owner in sufficient copies before pipe is shipped to job to permit the Owner to retain three copies.

B. Used pipe shall be acceptable if it meets the minimum requirements for size, thickness and strength for new pipe. Supplier shall furnish through the Contractor to the Owner 3 copies of certification of test results of strength tests conducted on the used pipe prior to shipment to job site. Used pipe with excessive corrosion and pitting present shall not be supplied.

C. The inside diameter of steel cover pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings, except for carrier pipe 6 inches or greater in diameter the difference shall be 4 inches instead of 2 inches.

D. Cover pipe shall have a **minimum** wall thickness as shown in the following table:

Diameter (Inches)	Wall Thickness (Inches)	Diameter (Inches)	Wall Thickness (Inches)
Under 10	0.188	24	0.438
10 & 12	0.250	26	0.438
14 & 16	0.281	28 & 30	0.500
18	0.312	32	0.500
20	0.344	34 & 36	0.562
22	0.375	38 & 42	0.562

3.0 EXECUTION

3.1 TUNNELING, BORING OR JACKING

A. Boring or jacking as specified herein will be allowed at locations other than those noted on the Drawings, where advantageous to lay pipe under streets, driveways, and sidewalks, without their monolithic structure being destroyed.

B. Tunneling under paving, railroads, buildings and underground structures is included as an alternate to boring or repaving required by open cut trenching. Bore and cover pipe is also included as an alternate to tunneling. Backfilling of tunnels shall be mechanically tamped in not more than 3 inch layers and with materials rendered suitable for tamping before being placed in tunnel unless otherwise shown on the Drawings.

C. In tunneling under buildings, the Contractor will be held responsible for all damage by his operations and methods of excavation and backfilling.

D. Boring or jacking under highways, railroads, sidewalks, pipelines, etc., shall be done at the locations shown on the Drawings. It shall be performed by mechanical means and accurate vertical and horizontal alignment must be maintained. When shown on the Drawings, cover pipe shall be used and shall be installed inside bored holes concurrently with boring, or jacking.

3.2 STEEL COVER PIPE INSTALLATION

A. Steel cover pipe shall be of the size and wall thickness as shown on the Drawings.

B. When cover pipe is jacked, concurrent with boring, all joints shall be solidly welded. The weld shall be such that the joint shall be of such strength to withstand the forces exerted from the boring and jacking operation as well as the vertical loading imposed on the pipe after installation. The weld shall also be such that it provides a smooth, non-obstructing joint in the interior of the pipe

which will allow easy installation of the carrier pipe without hanging or abrasion to the carrier pipe upon installation.

C. When cover pipe is installed in open trench or permanent tunnel, it shall be bedded and backfilled per Specifications applying to gas line pipe in such locations. When cover pipe is installed in temporary tunnel, it shall be laid accurately to alignment of proposed gas line and at an elevation below gas line necessary to support it at the planned elevation. Bedding and backfill for cover pipe in temporary tunnel shall be per Specifications for gas line in temporary tunnel.

D. Cover pipe in open trench, permanent tunnel and temporary tunnel shall be joined in such manner that they will not be moved out of alignment or grade and that will prevent backfill material from entering joint. Where cover pipes are shown on the Drawings to be equipped with vent pipes, vents shall be installed as shown on the Drawings.

3.3 CARRIER PIPE IN COVER PIPE INSTALLATION

A. Pipeline Spacers

1. High density polyethylene (HDPE) casing spacer shall be non-metallic and molded in segments for easy field assembly with a supplied ball tip Allen wrench. Individual segments shall have a solid core with runners extending to within 1.5" from the casing pipe. The runners shall essentially center the carrier pipe within the casing. Plastic casing spacers shall be located within two feet of both ends of the casing. Casing Spacers shall be installed along the carrier pipe length at the spacing indicated in the table below. All casing spacers shall be supplied with a molded TPR (Thermo Plastic Rubber) non-slip button comprised of pliable material having a high coefficient of friction that is designed to grip all types of pipe materials. All mounting hardware shall be constructed from 304 or 316 stainless steel. The casing spacers shall be Cascade Phoenix Gold Series, as manufactured by Cascade Waterworks Mfg. Co., Yorkville, Illinois, or approved equal.
2. Spacers shall be of such dimensions to provide 1) full supportive load capacity of the pipe and contents; 2) of such thickness to allow installation and/or removal of the pipe; and 3) to allow no greater than 1/2 inch movement of the carrier pipe within the cover pipe after the carrier pipe is installed.

3. Spacers shall be located immediately behind each bell and at a maximum spacing distance as shown below unless a lesser maximum spacing distance is recommended by the pipe manufacturer:

Diameter (inches)	Max. Spacing (feet)
2 – 2 – ½	4
3 – 8	7
10 – 26	10
28	9
30	8
32	7
34	6
36 – 38	5.5
40 – 44	5
46 – 48	4

The materials and spacing to be used shall be accepted by the Engineer prior to installation. The pipeline spacers shall be manufactured by Cascade Waterworks Manufacturing Co., of Yorkville, Illinois, Pipeline Seal and Insulator, Inc., of Houston, Texas, or equal. Installation shall be in accordance with manufacturer's recommendations.

B. Cover Pipe End Seals

1. Upon completion of installation of the carrier pipe, the annular space at the ends of the cover pipe shall be sealed to prevent the entrance of groundwater, silt, etc., into the cover pipe. The seal shall be a manufactured product specially made for this purpose. The seal shall be Link Seal - PL as manufactured by the Thunderline Corporation, Wayne, Michigan, or equal.

C. Cover Pipe Vents

1. Vent pipes shall be installed on the ends of cover pipes in the following numbers and at the following locations:
 - a. U.S. routes and interstate routes—each end of cover pipe.
 - b. Kentucky state routes and other major streets—one end of cover pipe.
 - c. At locations as directed by the Owner.

2. Vent pipes shall be installed at a distance from the end of the cover pipe sufficient not to interfere with the installation or removal of the cover pipe end seals. Vent pipes shall be extended to the street, road, highway, or railroad right-of-way line(s) or as directed by the Owner.
3. Vent pipes shall be constructed of 2-inch coated steel pipe, same as for main line steel pipe, with return bend and bug screen. Vent pipes return bend to be 6 feet above ground elevation or as directed by the Owner.
4. Steel coating of vent pipe shall extend 6 inches above ground surface with the remaining above ground portion to be painted with 2 coats of white.

SECTION 02610

PRESSURE PIPE

1.0 GENERAL

1.1 SUMMARY

A. For Cover Pipe and Boring and/or Jacking see Section 02326.

1.2 SUBMITTALS

A. Prior to the shipment of any pressure pipe to the project site, the Contractor shall submit to the Owner a bill of materials and shop drawings for all, in the number of copies listed in Special Conditions.

B. Supplemental Submittal Requirements

1. Shop drawings are required for metering and regulating facilities only.
2. All testing and certification requirements and descriptive literature remain as described.

1.3 SAFETY

A. Natural gas pressure pipe shall be installed and inspected in compliance with the requirements of the Pipeline Safety Regulations, 49 CFR, Part 192, Minimum Federal Safety Standards.

2.0 PRODUCTS

2.1 MATERIALS - GAS PIPE

A. High Density Polyethylene Pipe for Gas Service

1. Pipe

a. General

- (1) All polyethylene pipe and tubing furnished under this Specification shall meet or exceed all applicable requirements of ASTM D2513, "Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings." In addition to complying with the

above standard, the pipe, tubing and fittings shall meet, be equivalent to or exceed the additional requirements herein specified.

- b. Material Qualification
 - (1) The plastic compound shall be of virgin quality and have been listed by the Plastic Pipe Institute as a PE 4710 designated compound.
- c. Pipe Size, Dimensions and Tolerances
 - (1) The polyethylene pipe 3 inches in diameter and higher shall meet all applicable dimensional requirements of ASTM D 2513 for SDR 11.0 rated pipe. Polyethylene service tubing 2 inches in diameter and less shall be rated as SDR 11.0.
- d. Marking
 - (1) Marking of the tubing shall conform to the requirements listed in ASTM D 2513.
- e. Packaging
 - (1) Tubing shall be delivered in cardboard disposable reels or coils standard to the supplier.
 - (2) Reels to be sequentially marked numerically as extruded with reference to quality control.

2. Fittings

- a. Fittings furnished under this Specification shall meet all applicable requirements of ASTM D 2683-80 "Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe" for use with SDR 11 polyethylene pipe.
- b. Fittings furnished for this project shall be manufactured by the same manufacturer as the pipe.

2.2 SOURCE QUALITY CONTROL

A. High Density Polyethylene Pipe for Gas Service

02610-2

1. General

- a. A nominal physical properties list for the base compound shall be submitted and accepted as part of this Specification. Manufacturer shall certify that production materials used are in conformance with the published properties.

2. Quality Tests

- a. The P.E. tubing shall be subjected to the applicable quality control tests outlined in Appendix X4, ASTM D 2513-81, "Recommended In-plant Quality Control Program for Plastic Pipe and Fittings Intended for Use in Natural Gas Distribution Systems."
- b. The polyethylene pipe and fittings shall also be tested for "Time-to-Failure of Plastic Pipe Under Constant Internal Pressure," ASTM D 98-81, "Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings," ASTM D 1599-81 and the long-term pressure test as noted in Appendix X2.2 of ASTM D 2513-81 using test method per ASTM D 2837-76 (1981).

3. Inspection

- a. The Owner reserves the right to inspect the product at the place of manufacture, or at the point of delivery and to reject any shipment which does not conform to these Specifications. Defective tubing shall be replaced by the Contractor, at no cost to the Owner. Upon request, the manufacturer shall allow access to the OWNER during the extrusion of the specific lot purchased.

4. Qualification of Manufacturer

- a. The manufacturer shall have adequate equipment and quality control facilities to continually produce finished tubing that will have the properties indicated herein.

3.0 EXECUTION

3.1 TRENCH EXCAVATION - PRESSURE PIPE

A. General

1. Trenching shall include all clearing and grubbing, including all weeds, briars, trees and stumps encountered in the trenching, regardless of size. The Contractor shall dispose of any such material by burning, burial or hauling away or as noted on the Drawings.
2. Trenching also includes such items as railroad, street, road, sidewalk, pipe and small creek crossings; cutting, moving or repairing damage to fences, poles or gates and other surface structures, regardless of whether shown on the Drawings. The Contractor shall protect existing facilities against danger or damage while pipeline is being constructed and backfilled or from damage due to settlement of the backfill.
3. All excavation shall be open trenches, except where the Drawings call for tunneling, boring or jacking under structures, railroads, sidewalks, roads or highways. No extra payment for rock excavating or bedding.

B. Trees and Shrubs

1. Where pipelines run through wooded terrain, cutting of trees within limits of maximum permissible trench widths, as set forth in this article, will be permitted. However, cutting of additional trees on sides of trench to accommodate operating of trenching machine will not be permitted.

C. Highways, Streets and Railroads

1. Construction equipment injurious to paving encountered shall not be used. Curbs, sidewalks, and other structures shall be protected by the Contractor from damage by his construction equipment.
2. Where trenching is cut through paving which does not crumble on edges, trench edge shall be cut to at least 2 inches deep to straight and neat edges, before excavation is started, and care taken to preserve the edge to facilitate neat repaving.
3. The Contractor shall so coordinate his work as to produce a minimum of interference with normal traffic on highways and streets. He may, with the approval of the governing agency, close a street to traffic for such length of time considered necessary, provided persons occupying property abutting the street have an alternate route of access to the property which is suitable for their needs during the time of closure. It shall be the responsibility of the Contractor to give 24 hours advance notice to fire and police

departments and to occupants of a street which will be closed, in a manner approved by the governing body.

4. The Contractor shall maintain road crossings in a passable condition for traffic until the final acceptance of the work.
5. Railroad and Highway Department requirements in regard to trenching, tunneling, boring and jacking shall take precedence over the foregoing general specifications and the following tunneling and boring or jacking specifications, where they are involved.
6. Uneven surfaces or humps in the ground encountered and high driveways and road crossings shall be dug through to such depth that pipe may be laid to a reasonably even grade and have minimum cover at the low places.

D. Existing Utilities

1. The Contractor shall determine, as far as possible in advance, the location of all existing sewer, culvert, drain, water, electric, telephone conduits, and gas pipes, and other subsurface structures and avoid disturbing same in opening his trenches. In case of sewer, water and gas services and other facilities easily damaged by machine trenching, same shall be uncovered without damage ahead of trenching machine and left intact or removed without permanent damage ahead of trenching and restored immediately after trenching machine has passed. The Contractor shall protect such existing facilities, including power and telephone poles and guy wires, against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of his backfill. It shall be the responsibility of the Contractor to inform the customers of utilities of disruption of any utility service as soon as it is known that it has been or will be cut off.

E. Pipelines in Same Trench

1. Pipelines, force mains, and sewers laid in same trench shall, in all cases, be bedded on original earth, or other specified bedding materials, regardless of divergence in their elevations, unless otherwise specified. They shall never be laid in unsupported backfill or one above the other.

F. Location of Proposed Pipelines

1. The location of pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may

present themselves before construction on any line is started that would indicate desirable changes in location. Also, development of property traversed may require location changes. In such cases, the Owner reserves the right to make reasonable changes in line and structure locations. The Owner is under no obligation to locate pipelines so that they may be excavated by machine.

G. Trench Requirements

1. All trenches must be dug neatly to lines and grades.
2. The opening of more than 500 feet of trench ahead of pipe laying and more than 500 feet of open ditch left behind pipe laying, before backfilling, will not be permitted, except upon written consent of the Owner. No trench shall be left open or work stopped on same for a considerable length of time. In case of objectionable delay trench shall be refilled according to backfill specifications.
3. Where subgrade of trench has insufficient stability to support the pipeline and hold it to its original grade, the Owner may order stabilization by various means. Exclusive of dewatering normally required for construction and instability caused by neglect of the Contractor, such items as extra excavation, crushed rock for pipe bedding, concrete cradle or piling may be required.
4. Excavation for pipe laying must be made of sufficient width to allow for proper jointing and alignment of the pipe, but not greater than the maximums permitted in the following table:

MAXIMUM TRENCH WIDTH

Pipe Size (inches)	Trench Width (inches)	Pipe Size (inches)	Trench Width (inches)
4	28	20	44
6	30	24	48
8	32	30	54
10	34	36	60
12	36	42	66
14	38	48	72
16	40	54	78
18	42		

5. Trenches in earth or rock shall be dug as shown on the Drawings and be sufficiently deep to insure a 30 inch minimum cover over gas lines, or as noted on the Drawings. Depths of trenching shall also be adequate for at least 1 foot minimum cover over valve nuts. In order to insure an earth cushion under the pipe for uniform bearing, trench depth shall be the cover requirement plus outside

diameter of barrel of pipe plus the required bedding cushion. The cushion construction requirement shall also apply to tunnels.

6. Trench line stations and locations of accessories will be set ahead of the trenching. These will be set at least each 100 feet of pipeline. Trenches must be dug true to alignment of stakes. Alignment of trenches or pipes in trench must not be changed to pass around obstacles such as poles, fences and other evident obstructions without the permission of the Owner. Lines will be laid out to avoid obstacles as far as possible, contingent with maintenance of alignment necessary to finding pipeline in the future and avoiding obstruction to future utilities.

H. Damage to Existing Structures

1. Hand trenching is required, at no extra payment, where undue damage would be caused to existing structures and facilities by machine trenching.
2. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before. Where there is the possibility of damage to existing utility lines by trenching machine, the Contractor shall make hand search excavation ahead of machine trenching to uncover same.

I. Dewatering of Trenches

1. Dewatering of trenches shall be considered a part of trenching. Dewatering of trenches shall include groundwater and storm or sanitary sewage. Suitable pumping and other dewatering equipment is to be provided by the Contractor, to insure the installation of the pipeline structure in a dewatered trench and under the proper conditions. Dewatering shall include all practical means available for prevention of surface runoff into trenches and scouring against newly laid pipe.
2. Piles of excavated materials shall be trenched or temporarily piped to prevent, as far as practical, blockage of drainage ditches and gutters, and water carriage of excavated materials over street and highway surfaces.

3.2 LAYING PRESSURE PIPE

A. General

1. Inspection of Materials

- a. All pipe, fittings and accessories shall be subject to an inspection by the Owner at the job site. Any damaged materials shall be repaired or replaced to the satisfaction of the Owner. Should repairs to the piping materials be necessary, then same shall be made in the presence of the Owner using proven methods prescribed by the pipe manufacturer.
- b. The Owner's inspection of materials shall in no way relieve the Contractor of his responsibility.

2. Laying Requirements

- a. Pressure pipe shall be laid to lines, cover or grades shown on the Drawings.
- b. Pipes must be swabbed out before lowering into trench. In the case of pipelines 4 inch through 20 inch, a swab must also be dragged through the pipe after it is in place. Larger size pipe shall be visually inspected for cleanliness and proper jointing.
- c. The points insisted upon in the laying of pipe will be: Proper alignment, evenness of width and depth of joints, perfection in jointing, and care of the pipe in handling. For gas lines, proper coating and wrapping, electrical inspection and blow-down (purging of air in case of gas lines) of pipes are also essential and will be required.
- d. Precautions must be taken to prevent flotation of the pipe should water enter the trench prior to putting the pipeline into operation.
- e. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or alignment, or where the backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective.

- f. Whenever pipe laying is stopped, the end of the pipe shall be securely plugged with the manufacturer's standard expandable pipe plug, or similar conical plug, held in place by proper bracing or backing is required.
- g. No pipe shall be laid resting on solid rock, blocking or other unyielding objects. Jointing before placing in the trench and subsequent lowering of more than one section jointed together may be allowed, subject to the Owner's permission.

3. Installing Gas Pipe in Cover Pipe

- a. Installation of gas pipe in cover pipe is covered in Section 02326 of these specifications.

B. Laying Plastic Pipe

1. Installing Polyethylene Pipe for Gas Service

- a. The pipe shall be bedded in 4 inches minimum of Class I sand with the haunching and initial backfill lightly consolidated to a depth of 12 inches above the top of the pipe with Class I sand. The machined placed backfill may contain rock no larger than 12 inches in any dimension and to an extent no greater than 2 the volume of backfill materials used. The top 12 inches of backfill shall contain no rocks over 1-1/2 inches in diameter nor pockets of crushed rock.
- b. Polyethylene pipe shall be joined by the heat fusion welding process. Welding equipment may be either electric or electrofusion as the Contractor may select. The welding equipment must be capable of attaining the temperature recommended by the manufacturer for the particular polyethylene extrusion used on the project. Pouring of water on completed joints to speed cooling will not be allowed.
- c. Care shall be taken in lowering the pipe onto the earth bedding. The pipe shall be snaked into the trench, employing the natural snaking tendency of the pipe. Sharper bends shall be made with fittings rather than bending the pipe alone. The pipe will be rejected if it contains kinks and gouges.
- d. After the pipe is placed in the trench on the required bedding, Class I sand shall be placed to a minimum depth of

12 inches over the pipe. The remainder of the trench may then be machine backfilled with material excavated from the trench, except in no case shall rock spalls over 8 inches be permitted.

- e. All polyethylene pipe installed shall have in the trench with the pipe #10 solid copper tracing wire. The wire shall be buried directly over the pipe in the 12 inch covering of earth.
- f. Where tie-in to existing steel main is made, the connection shall be made with special factory molded transition fittings. The polyethylene end of the polyethylene to steel transition shall be of the same material as that of the polyethylene pipe supplied. Compression type transition fittings for polyethylene gas mains will be allowed only for unusual conditions encountered during construction.
- g. Compression type fittings will be allowed for use on polyethylene service lines at locations such as curb valves and meter risers. It is the intent of this requirement that all other joining of polyethylene service line be accomplished by heat fusion.

C. Supplemental Backfilling Information

1. General

- a. Excavated materials from trenches and tunnels, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. It shall be the responsibility of the Contractor to obtain location or permits for its disposal.
- b. Where sod is destroyed in areas maintained equivalent to residence yards, it shall be replaced on slightly ridged backfill on trench, and where destroyed in areas adjacent to the trench, it shall be replaced by the Contractor with fresh sod. The timing of resodding shall be controlled by the Owner. Ground shall be prepared and fertilized as herewith specified for seeded areas. In small patches, supplying of 3 inches of topsoil and raking may be substituted for disking.
- c. Where pastures, thin grass or cover crops are destroyed by trenching, laying, backfilling, or tunneling operations, surface shall be prepared by disking, fertilizing, and seeding, as specified in Section 02930. The timing of this operation shall be controlled by the Owner. Requirements of the

Department of Highways for reseeding shall take precedence over these Specifications.

- d. Before completion of the Contract, all backfills shall be reshaped, holes filled, and surplus materials hauled away and all permanent walks, street, driveways, and highway paving and sod replacement and reseeding performed.
- e. Backfill material must be uniformly ridged over trench, and excess hauled away. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth, and its height shall not be in excess of needs for replacement of settlement of backfill.
- f. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets and walks shall be broomed to remove all earth and loose rock immediately following backfilling.

2. Special Requirements

- a. In case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving, or about manholes, valve and meter boxes located in such paving, the following backfill material and procedure is required.
- b. The pipe shall be bedded in 4 inches minimum depth (for pipe sizes through 16 inches) of crushed rock meeting the requirements of the Kentucky Department of Highways standard size No. 8.
- c. Similar material shall be used for haunching up to the spring line of the pipe, and it shall be worked under the haunch of the pipe to provide adequate side support. The crushed rock shall then be hand placed to a point 12 inches above the top of the pipe.
- d. After the above bedding and selected backfill have been placed, fill trench to within 6 inches of the surface with Kentucky Department of Highways No. 57 crushed stone, uniformly distributed, or other gradation acceptable to the Owner. In order to accommodate compacted temporary surfacing it may be necessary to bulkhead or otherwise confine the stone fill at the open end of the trench.

- e. Temporary surfacing of street, highway, railroad, sidewalk and driveway crossings, or within any roadway paving, or about manholes, valve and meter boxes located in such paving, shall consist of 6 inches compacted depth of crushed stone as specified under Section 02235 for temporary walkway or road surfacing, placed and compacted in the trench. Compaction shall be accomplished by methods which shall be sufficient to confine stone to the trench under normal traffic. Backfills shall be maintained easily passable to traffic at original paving level until acceptance of project or replacement of paving or sidewalks.
- f. Railroad Company and Department of Highways requirements in regard to backfilling will take precedence over the above general specifications where they are involved.

D. Cut-Ins, Tie-Ins, and Cutting and Plugging

- 1. The Owner shall not be responsible for extra costs of cut-ins, tie-ins, cutting and plugging, due to flow not being entirely cut off by the existing main valves.
- 2. A cut-in is defined as the removal of one section of existing pipeline (2 cuts of pipe) and insertion of one or more new pipeline connections therein.
- 3. A tie-in is defined as the removal of an existing plug or cap and the connecting of the new pipeline into the existing pipeline or fitting or valve at the joint opened by such removal.
- 4. A cutting and plugging is defined as the cutting and installation of a plug in an existing line.

3.3 FIELD QUALITY CONTROL

A. Testing High Density Polyethylene Gas Pipe

- 1. Prior to the beginning of construction, the Owner may require a sample joint to be performed by each jointer the Contractor plans to use on the project. The Owner may require a "bend" test on each joint performed or a visual inspection by sampling a portion of the completed joint, or both.

2. Upon completion of each line installed, an air test shall be applied. The test pressure shall be 150 percent of the maximum allowable operating pressure (MAOP) or 90 psi, whichever is greater. The test pressure shall be maintained for a period of 24 hours, with pressure recording chart, without loss of air or appreciable drop in pressure. Should a line pressure drop occur, it shall be the responsibility of the Contractor to locate and repair the leaks and retest the line. The Contractor shall provide the compressor with valves and pressure gauges for the tests as well as all operational personnel to perform the tests.
3. Only lines which have been tested as outlined above in the presence of the Owner or his authorized representative, will be approved for incorporation into the Gas system.

3.4 PURGING OF GAS LINES

A. Scope

1. These procedures cover the purging of air or natural gas from distribution facilities. They describe the manner in which the facilities are to be purged, how to determine when the purge is complete, and items to be considered prior to and during purging.
2. Purging procedures and examples are included.

B. General

1. Purging is required when:
 - a. New or existing facilities are temporarily taken out of service and the removal of natural gas is necessary.
 - b. Existing facilities are temporarily taken out of service and the removal of natural gas is necessary.
 - c. Lines are abandoned.
 - d. Service restoration due to emergency depressurization for any cause.
2. Except for simple line piping systems, a written plan for purging should be prepared prior to the work and reviewed with owner personnel involved. The following items should be discussed:
 - a. The extent of the facility to be purged and points of isolation.

- b. The purging medium to be used.
 - c. The sequence of operation and assignment of personnel.
 - d. Safe working practices (especially around plastic pipe).
 - e. Means of communication during purging.
 - f. Means of determining end of purge at vent points.
 - g. Procedure for handling emergencies, such as gas ignition.
 - h. Notification for governmental authorities (police, fire, medical).
 - i. Back-up provisions, in case of unanticipated occurrences (i.e. compressor failure, purging medium, etc.).
3. When purging, the air or gas to be removed must be removed from all sections of the piping system. Branches and services must be individually purged. The straight through section should be purged first, then each lateral.
4. Injection Rate
 - a. Injection of purging medium into a medium or pipeline should be done at high enough velocity to create a minimum lineal flow of 100 feet per minute. This flow rate will maintain a turbulent interface, thereby minimizing mixing of gases and the possibility of the gases stratifying.
 - b. When purging air from pipelines, the minimum inlet control pressure specified in Table 1 should be maintained whenever possible. This pressure will create a flow velocity which greatly exceeds the 100 feet per minute requirement, maximizes turbulence and shortens purge duration.
 - c. For purging air in other than low pressure systems, a cracked main line valve will create a minimum lineal velocity of 100 feet per minute within the pipeline.
5. It is essential that vented natural gas and air/gas mixtures be diffused into the air without hazard to Owner personnel, the general public, or property. Valved vertical vent stacks should be used to keep the natural gas out of the work area and to blow it in a safe direction. Buildings, overhead lines and other obstructions or sources of ignition should be considered when determining the location for venting the gas.
6. Considerations must be given to public relations with regard to noise and odor as well as to any applicable state and local noise and air pollution regulation. Such considerations may include the

notification of residents in close proximity to the blow down operation, reduction of line pressure, reduced rate of venting, etc.

7. Purging once started, must be continued until complete.

C. Purging Air from Facilities to Be Placed in Service

1. Purging Services

- a. Service installations may be purged by opening the riser valve after the service tee has been tapped. Care must be given to blow gas away from structures by connecting a meter bend or street ell to the riser valve and pointing the stream of gas in a safe direction. The valve should be opened slowly to the full open position; no person or object should be in the exhaust stream area. The operator shall hold the wrench and keep it in contact with the valve at all times. Care must also be taken that no source of ignition is present in the area. A sufficient amount of gas should be blown to atmosphere to insure that all air is removed from the line. Service lines should be purged immediately after the service tee has been tapped and gas is in the service line.

2. Purging of Pipelines

- a. Small diameter mains should be purged of air by injecting gas at high enough velocities to create a minimum lineal flow of 100 feet per minute within the pipeline. If this velocity cannot be met, a slug of nitrogen between the air and gas is required (see Procedure 4).

3. The following methods can be used to determine the absence of air:

- a. A portable combustible gas indicator set on percent gas scale. The reading must indicate 100 percent gas.

D. Purging Natural Gas from Existing Facilities

1. When natural gas is purged by injecting air into lines less than 10 inches in diameter, it is not necessary to separate the air and natural gas with a nitrogen slug.

2. The disposal of large volumes of natural gas into the atmosphere should be minimized as far as practical by transferring as much as possible to adjacent systems.
3. Determine the absence of natural gas with a combustible gas indicator set on 100 percent gas.
4. Working on Existing Pipelines Which Have Been Purged
 - a. When it is necessary to perform work on an existing pipeline which has been purged, precautions shall be taken to verify that a combustible mixture has not developed inside the pipeline due to leakage from a segment of pipeline remaining in service, or from the release of gas from residual liquids in the pipeline. Special care must be taken when performing cutting or welding operations on such a line. The degree of isolation should be determined by observing any pressure increases within the purged space with all vents closed and by monitoring for the presence of natural gas using the method of Section C.3.

E. Purging Procedures

1. Purging Air with Natural Gas in Newly Installed Piping
 - a. Close off lines at C and D, isolating by pinching, fitting, valve or other means.
 - b. Open vent at 1.
 - c. Open valve A. Leave valve B closed.
 - d. Close vent at 1 when 100 percent natural gas is detected.
 - e. Open vent at 2. Close when 100 percent natural gas is detected.
 - f. Open vent at 3. Close when 100 percent natural gas is detected.
 - g. Open vent at 4. Close when 100 percent natural gas is detected.
 - h. Open vent at 5. Close when 100 percent natural gas is detected.
 - i. Open isolation point C and D.
 - j. Open valve B.
 - k. Purge all service lines installed. Stub services do not have to be purged.

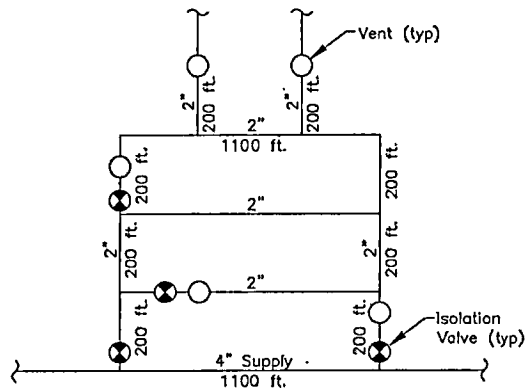


FIGURE 1

2. Purging Air from Pipelines Using Natural Gas Without a Nitrogen Slug
 - a. Determine blow-off size from table 1, using pipeline size and length of section to be purged (2-inch blow-off, 6-inch pipeline, 6000-foot section).
 - a. Determine minimum inlet control pressure from Table 1 (22.4 psig). Verify that upstream pressure is equal to or greater than the inlet control pressure. If it is not, determine if adequate pressure exists to ensure a flow of 100 feet per minute. If this velocity cannot be met, a slug of nitrogen is required between the air and gas.
 - b. Install on the section to be purged and near the upstream mainline valve, a pressure gauge which is accurate and readable within 1 psi, so that the inlet pressure can be observed. (The gauge should be connected through several feet of flexible tubing to eliminate excessive vibration.)
 - c. Open the blow off valve at the downstream end of the section to be purged. Downstream blow off valves should always be in the fully open position.
 - d. Begin purging by cracking upstream mainline valve to quickly bring the inlet pressure to the minimum inlet control pressure (12 psig) or greater. When minimum inlet control

pressure cannot be obtained, purge at the highest feasible inlet pressure.

- e. Monitor blow off gas until combustible gas indicator reads essentially 100 percent natural gas. Close mainline valve to stop injection. The use of a combustible gas indicator provides a means of analyzing the gas/air mixture throughout the purging operation. If the pressure at the gauge is maintained at the minimum inlet control pressure, the time it takes for natural gas to reach the blow off location should be approximately 2 minutes for every mile of pipeline being purged.
- f. Close blow off valve and return pipe to service.

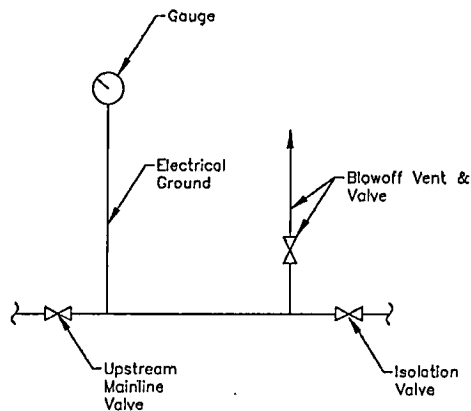


FIGURE 2

3. Purging of Natural Gas from Pipelines Using Air Without a Nitrogen Slug

- a. Determine blowdown valve size and vent pipe diameter from Table 1.
- b. Determine injection rate required for a minimum slug velocity of 100 feet per minute for a 6 inch pipe. Table 2 shows an injection rate of 20 cfm is required.
- c. Determine air injection pressure. Table 3 shows that air injection pressure of 20 cfm through a 3/4 inch I.D. hose 50 feet long is 3 psig.

- d. Install connection to inject air.
- e. Open blow off valve near downstream mainline valve.
- f. Blow down line to atmospheric pressure and leave vent open.
- g. Inject air; maintain at least 3 psig on the gauge at the inlet to the air hose.
- h. Stop injection of air when no natural gas can be detected. Refer to Section C.3 for method to determine presence of natural gas.
- i. Positive steps should be taken before working on a section of pipeline which has been purged to isolate the purge section from any source of leakage. Isolation of the section may be accomplished by insertion of blanks, approved stoppers or actual detachment. Actual detachment is preferred.

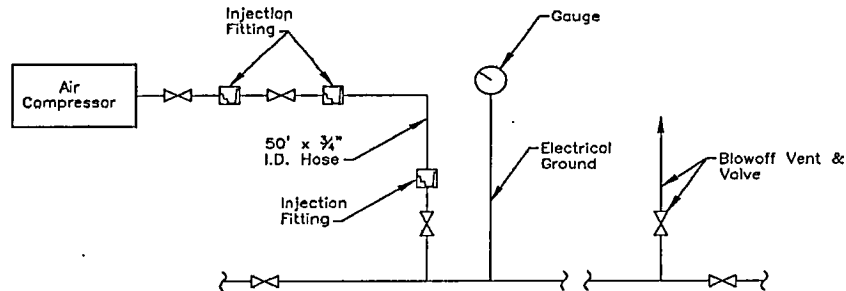


FIGURE 3

TABLE 1 - MINIMUM INLET CONTROL PRESSURE (psig)

BlowOff Valve (in.)	Line Size (in.)	Length of Pipeline (miles)													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
2	4	14	20	25	29	33	37	40	43	46	49	52	55	57	60
	6	22	25	28	30	32	35	37	39	41	43	44	46	48	50

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4	6	8	12	16	19	22	24	27	29	32	34	36	38	40	41
	8	8	11	13	16	18	20	22	24	26	28	29	31	32	34

Information from Table 8-1 "Purging Principles and Practices," AGA #XK0775

TABLE 2 - NITROGEN PURGING DATA FOR 4" TO 8"

Volume of nitrogen required for inert slug and injection rates								
Pipe Size	Pipe Connect Cu. Ft./Ft.	Slug Veloc	Inject Rate Cu. Ft./Min.	Cu. Ft. Nitrogen per length				
				500'	1000'	2000'	5000'	10000'
4"	.09	100	10	10	10	20	20	20
6"	.22	100	20	30	30	30	40	50
8"	.37	100	40	70	70	80	90	120

TABLE 3 - MEASURING INJECTION PRESS. THRU HOSES AND ORIFICES

Determination of pressure required to inject flow rates of nitrogen or air through various size hoses and orifices				
Desired Inject Rate CFM	Minimum required pressure upstream of hose or orifice, psi			
	Each ¾" I.D. 50' Hose	Each 1 - ¼" 50'	Each 2" I.D. 50' Hose	Orifices
				3/8" ½" 5/8"
10	3			
20	5			
40	11			
60	18			25

SECTION 02740

PAVEMENT REPLACEMENT

1.0 GENERAL

The Contractor shall replace all pavement cut or disturbed, with pavement similar in all respects to existing pavement in accordance with the Standard Details and at those locations approved by the Engineer. Every effort shall be made to avoid cutting the pavement. In restoring pavement, new pavement is required, except that granite paving blocks, sound brick or sound asphalt paving blocks may be reused. No permanent paving shall be placed within thirty (30) days after the backfilling has been completed. All concrete and asphalt paving materials shall be in conformance with the Standard Details shown in the plans. The pipeline trench through all paved areas (parking lots, driveways, roads, etc.) shall be fully backfilled with crushed stone.

1.1 CONCRETE PAVEMENT REPLACEMENT

This pavement replacement shall be Portland cement concrete construction in accordance with the requirements shown in the Standard Details. It shall include all pavement replacement on concrete surfaced roads, concrete driveways, concrete sidewalks and concrete parking areas, both public and private.

1.2 LIGHT DUTY BITUMINOUS PAVEMENT REPLACEMENT

This type of pavement replacement shall be bituminous concrete constructed in accordance with the details. This item shall include all light-duty bituminous concrete roadways, bituminous driveways and bituminous parking lots, both public and private.

2.0 MATERIALS

The crushed stone backfill as noted on the drawings shall be dense graded aggregate per Kentucky Department of Highways Specifications or as noted on the Drawings. The Contractor shall continuously be responsible for the maintenance of the aggregate and the surface of the trenches until the pavement replacement is completed.

Portland cement concrete for pavement replacement shall contain a minimum of 6 sacks of cement per cubic yard, the maximum free water content shall be 6 gallons per sack of cement, the slump shall be between 2 and 4 inches, and the concrete shall have minimum 28-day compression strength of at least 3,500 PSI. Cement, aggregate and water shall be described in these specifications for Class "A" concrete. A set of cylinders shall be made and tested for each 25 cubic

yards of concrete placed, or fraction thereof, to supply representative sampling and testing of the concrete, upon the direction of the Engineer. The Contractor shall produce a broomed, or burlaped uniformly smooth and nonskid surface, consistent with the existing pavement.

Bituminous materials and mixes shall be consistent with the recommended practice of the Asphalt Institute, and it shall conform to the requirements of the Kentucky Department of Highways for prime coat and Class 1 bituminous concrete. The bituminous concrete shall consist of a binder or base course and a surface course.

3.0 EXECUTION

The Contractor shall cut back the surfacing adjacent to the trench for 12 inches on both sides of the trench and shall cut down the dense graded aggregate he has placed to a depth required for either type of pavement replacement. The resulting surface shall be rolled to yield a smooth, dense surface and a uniform depth.

The concrete shall be placed in accordance with standard practice, with the welded wire mesh if required in proper position and thoroughly vibrated into place. The Contractor shall produce a surface consistent with the existing pavement. The Contractor shall apply a liquid curing component, sprayed on the surface of the concrete, and shall provide adequate protection to the pavement until it has set.

For bituminous concrete, the Contractor shall clean and broom the prepared surface, then apply the prime coat at the rate of 0.20 to 0.25 gallons per square yard, with a pressure distributor or approved pressure spray method. When the prime coat has become tacky but not dry and hard, the bituminous binder course, or base course, whichever applies, shall be placed and compacted. The Contractor shall then apply the surface course. It is recommended, but not required, that the base course remain in place for approximately one week before placing the surface course. The finished course shall be compacted and the completed surface shall match the grades and slopes of the adjacent existing surfacing and be free of offsets, depressions, raised places and all other irregular surfaces.

3.1 SEASONAL AND WEATHER LIMITATIONS FOR PAVEMENT REPLACEMENT

In the event the progress and scheduling of the work is such that the bituminous pavement replacement would occur in the winter months, during adverse cold weather and/or during such times the asphalt plants are not in operation, then the final pavement replacement shall be postponed until favorable weather occurs in the spring and the asphalt plants resume normal operations. No bituminous

concrete shall be placed when the temperature is below 40°F except by written permission of the Engineer.

Concrete pavement shall not be placed when the temperature is such that the pavement placed will freeze before it has had adequate time to set and shall be placed in conformance with the temperature conditions specified in this section of the specifications.

The Contractor shall be responsible for replacement of pavement which he has placed which has been damaged by cold weather or freezing without additional compensation.

In the meantime, the Contractor will be required to maintain the temporary surfacing until the permanent pavement is placed. Such labor, materials and equipment as is required for temporary maintenance of the streets, roadways and driveways shall be provided at the Contractor's expense, and is not a pay item. The Contractor will be required to use a cold mix asphaltic concrete as a temporary surface for trenches under heavy traffic use.

3.2 SIDEWALKS

Sidewalks which partially or fully lie over the line may be removed to accommodate installation of lines, and they shall be replaced in a neat and workmanlike manner at the expense of the Contractor.

Throughout the work of gas line installation and replacement, the Contractor shall exercise caution in providing protection to adjacent walks, pavement, curbs, gutters and related structures. Care shall be taken not to mar concrete or bituminous surfaces with equipment, and damage to such surfaces shall be properly repaired at Contractor's expense.

4.0 PAYMENT

The unit price bid per linear foot for pavement replacement, as measured along the main center line, shall constitute full compensation for the work, or be included in the lump sum as bid.

Replacement of gravel or stone roadways or drives disturbed during construction shall be performed by the Contractor and shall be deemed to be paid for under prices bid under gas lines. Also, pavement disturbed by the Contractor's equipment, but in the normal line of work, shall be repaired by the Contractor at his expense.

The one year guarantee as specified in the contract documents is also applicable to trench settlement and pavement replacement.

SECTION 02930

SODDING AND SEEDING

1.0 GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to perform sodding and seeding as shown on the Drawings and as specified herein.

B. All areas disturbed by construction operations shall receive a protective cover of vegetation. The work shall consist of preparing the area for treatment, furnishing and placing soil amendments, fertilizer, sod, seed, inoculants, mulch and plantings as specified in the designated areas.

1.2 QUALIFICATIONS

A. The work shall be done by a provider who is experienced, reputable, and qualified in the tasks required.

1.3 SUBMITTALS

A. Shop Drawings and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the Owner.

B. Where fertilizer is furnished from bulk storage, the Contractor shall furnish a supplier's certification of analysis and weight. When required by the Contract, a representative sample of the fertilizer shall be furnished the Owner for chemical analysis.

2.0 PRODUCTS

2.1 SOD

A. The sod to be used shall be Kentucky Bluegrass comparatively free from weeds or heavy root structure, cut in strips of 10 inches to 12 inches wide, 18 inches to 24 inches long, with a thickness of 1 1/2 inches to 2 inches.

2.2 SEED

A. All seed shall conform to the current rules and regulations of the state where it is being used and from the latest crop available. It shall meet or exceed the standards for purity and germination listed herein.

B. Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures will be evidence of purity and germination. No seed will be accepted with a date of test of more than 9 months prior to the date of delivery to the site.

C. The seed for use on this project shall be of the type as listed below with the listed germination and purity qualifications.

Species	% Purity	% Germination
KY 31 Tall Fescue (<u>Festuca arundinacea</u>)	98.5	80
Ryegrass (<u>Lolium multiflorum</u>)	98.0	90
Oats (<u>Avena sativa</u>)	98.0	90
Rye, grain, (<u>Secale cereale</u>)	97.0	85
Redtop (<u>Agrostis alba</u>)	90.0	80
KY Bluegrass (<u>Poa pratensis</u>)	81.0	70

2.3 FERTILIZER

A. Unless otherwise specified, the fertilizer shall be a commercial grade fertilizer or as specified herein. The fertilizer shall meet the standard for grade and quality specified by state law.

2.4 INOCULANTS

A. The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed. Two times the amount of the inoculant recommended by the manufacturer shall be used, except when seed is applied by use of hydraulic seeder, in which case 4 times the amount of inoculant recommended by the manufacturer shall be used. Seed shall be sown within 24 hours of treatment and shall not remain in the hydraulic seeder longer than 4 hours.

2.5 SOIL AMENDMENTS

A. Lime shall consist of standard ground agricultural limestone, or equal. Standard ground agricultural limestone is defined as ground limestone meeting current requirements of the State Department of Agriculture. Agricultural lime or other needed soil amendments will be uniformly applied at the rate specified herein.

2.6 ASPHALT EMULSION

A. Asphalt emulsion shall conform to the requirements of ASTM D 977-80, "Emulsified Asphalt." The emulsified asphalt may be rapid, medium, or slow cure materials.

2.7 STRAW MULCH MATERIALS

A. Straw mulch materials shall consist of wheat, oat, or rye straw, hay, grass clippings cut from any native grasses or other plants acceptable to the Owner. The mulch material shall be air dry, reasonably light in color, and shall not be musty, moldy, caked, or otherwise of low quality. The use of mulch that contains noxious weeds will not be permitted. The Contractor shall provide a method satisfactory to the OWNER for determining weight of mulch furnished.

2.8 OTHER MULCH MATERIALS

A. Mulching materials, such as wood cellulose fiber mulch, emulsion type, synthetic fiber mulch, netting, mesh, and other mulching materials that may be required for specialized locations and conditions, when specified, must be accompanied by the manufacturer's recommendations for methods of application.

3.0 EXECUTION

3.1 EXTENT

A. Sodding

1. Where sod is destroyed in areas maintained equivalent to residence yards, it shall be replaced on slightly ridged backfill on trench, and where destroyed in areas adjacent to the trench, it shall be replaced by the Contractor with fresh sod. Sodding will be required only on those Contracts where specifically shown on the Drawings or called for in the Specifications or Form of Proposal.

B. Seeding

1. Where lawns, pastures, thin grass or cover crops are destroyed by trenching, laying, backfilling, or tunneling operations, surface shall be prepared by disking, fertilizing and seeding. Seeding, fertilizing, and mulching shall be included in the price for trenching and backfilling. The timing of this operation shall be controlled by the Owner. Requirements of the Department of Highways for reseeding shall take precedence over these Specifications where they are involved.

2. When the construction project is located on privately owned property on easements acquired by the Owner and the individual landowner requires the cover grass to be the same as present at the beginning of construction, the Contractor shall supply the seed required by the landowner. Seeding and fertilizing in such instances, shall be at the rate as recommended by the seed producer with soil preparation and mulching as stated herein.
3. When the construction project encroaches within the rights-of-way of the Department of Highways, the seed mixture, application rate and method of mulching shall be as required by the Department of Highways.

3.2 SOIL PREPARATION

A. All areas to be seeded or sodded shall be thoroughly cleaned, removing all debris of whatever nature. After the area has been cleaned, the soil for seeding and sodding shall be prepared as follows:

1. Loosen the soil to a depth of not less than 4 inches.
2. Work the soil until it is in good condition, raking with hand rake to complete the soil preparation and make final finished grade.
3. Broadcast 15 pounds of 8-8-8 or better fertilizer on each 1,000 square feet of area (for sodded areas only).
4. Rake area to receive sod, to spread fertilizer and work into soil.
5. On areas to be seeded, the raking in of fertilizer may be done concurrently with raking in of seed as hereinafter specified.

3.3 SODDING

A. The timing of resodding shall be controlled by the Owner. Ground shall be prepared and fertilized as previously specified under Article 3.02 of this Specification Section. In small patches, supplying of 3 inches of topsoil and raking may be substituted for disking.

B. The strips of sod are to be laid so the joints will be broken. After the sod has been laid, it is to be watered thoroughly then rolled with a roller weighing 300 to 400 pounds, supplemented by hand tamping of sections inaccessible by roller.

C. After the sod has been put down, as described above, each piece is to have a minimum of 2 stakes to hold it in place, the stakes to be 1/2 inch square,

10 inches long, and driven into the ground with 2 inches of the stake left above the sod.

D. Sod shall be kept moist by watering for at least one month or until the Project is completed and the facilities accepted by the Owner for operation.

3.4 SEEDING

A. Temporary Cover (All Areas)

1. This item shall consist of seeding a temporary cover of grass, or grass and small grain, on areas disturbed on the construction site which will not be redisturbed within a 60 day period. The determination of the area to be temporarily seeded and the time of seeding shall be controlled by the Owner.
2. The seed mixtures to be used for temporary cover will be governed by the time of year the seeding is accomplished. The mixtures and time of seeding shall be as follows:
 - a. Time of Seeding - 2/15 to 6/1
 - (1) Rye 1-1/2 bushels and ryegrass 25 pounds per acre; or tall fescue 30 pounds and ryegrass 20 pounds per acre.
 - b. Time of Seeding - 6/2 to 8/15
 - (1) Tall fescue 30 pounds and ryegrass 20 pounds per acre; or, spring oats 2 bushels and ryegrass 30 pounds per acre.
 - c. Time of Seeding - 8/16 to 2/14
 - (1) Rye 2 bushels and ryegrass 20 pounds per acre; or, tall fescue 30 pounds and ryegrass 20 pounds per acre.
 - d. Lime will not be required for temporary seeding.
 - e. Fertilize at the rate of 400 pounds per acre of 10-10-10 fertilizer, or equivalent, broadcast uniformly on the area to be seeded.
 - f. All seed shall be broadcast evenly over the area to be seeded and cultipacked or otherwise pressed into the soil.

02930-5

Seed and fertilizer may be mixed together and applied after the seed bed has been prepared.

- g. Mulch for temporary seeding will not be required except on those areas, in the Owner's opinion, too steep to hold the seed without protective cover.

B. Seeding (Permanent Cover)

- 1. This item consists of seeding all areas disturbed during construction. All grading and/or filling of rills and gullies to a cross section acceptable to the Owner shall be included in the seed bed preparation.

- a. Pastures and Cover Crops

- (1) All areas to be seeded shall be seeded with 50 pounds of tall fescue (KY-31) per acre, subject to the provisions here-inbefore stated in this Specification group.
- (2) Prepare seed bed as specified in Article 3.02 of this Specification Section unless instructed otherwise by the Owner. Apply 2 tons of lime per acre.
- (3) No mulch will be required except when seeding is done during the period October 16 through January 31, or May 2 through July 31, tall fescue straw shall be used at the rate of 2 tons per acre.

- b. Lawns and Yards

- (1) This item consists of seeding all areas equivalent to residence lawns or yards disturbed during construction. All grading and filling shall be accomplished in a manner acceptable to the Owner prior to the placement of seed and materials. Seed shall consist of a mixture of one part Red Top and 3 parts high grade Kentucky Bluegrass seed mixed together and broadcast at the rate of 2 lbs. to each 1,000 square feet of surface, to be seeded. Apply 2 tons of lime per acre. Apply 1500 pounds of 10-20-20 fertilizer per acre. Apply mulch at the rate of 2 tons per acre. Mulch shall be applied to all lawn areas regardless of the time seeded.

3.5 MULCHING

A. Mulch materials, meeting the requirements of Part 2 of this Specification Section, shall be applied at the rate of 2 tons per acre.

B. The mulch shall be stabilized by running a "weighted" disk harrow with disks set straight, over the area on the contour, after the mulch has been applied, so as to imbed or press a part of the straw into the soil sufficiently to hold it in place. On earth embankments or areas too steep for use of mechanized equipment, the mulch shall be held in place by using small stakes and twine or other method acceptable to the Owner. The blown-on asphalt-treated straw mulch method of placing the mulch will be an acceptable placing method.

C. Mesh, netting or other special protective cover shall be at locations as shown on the Drawings and shall be installed according to the manufacturer's recommendations.

SECTION 15100

NATURAL GAS VALVES AND GAS MAIN ACCESSORIES

1.0 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install complete and ready for operation all natural gas valves, gas main accessories and all related appurtenances as shown on the Drawings and as specified herein.

B. The equipment shall include, but not be limited to, the following:

1. Polyethylene Gas Valves

1.2 RELATED WORK

A. Excavation, backfill and grading is included in Division 2.

B. Piping is included in Division 2.

1.3 DESCRIPTIONS OF SYSTEMS

A. All of the equipment and material specified herein is intended to be standard for use in natural gas systems.

B. See the Drawings for equipment sizes, quantities, connections, type, location, etc.

1.4 QUALIFICATIONS

A. All of the types of equipment and appurtenances shall be products of well established firms that are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

B. Acceptable Manufacturers

1. Polyethylene Gas Valves - Flowserve

1.3 SUBMITTALS

- A. Complete shop drawing of all equipment and appurtenances shall be submitted to the Owner for review.
- B. The Owner shall be furnished 2 certified copies of reports covering proof-of-design tests on the valves.

2.0 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. General

1. All equipment and appurtenances shall be of the size and type shown on the Drawings.
2. All equipment and appurtenances shall have the name of the maker, flow-directional arrows, and the working pressure for which they are designed cast in raised letter on some appropriate part of the body.
3. All buried valves shall open left (counter clockwise). Insofar as possible, all valves shall open counter clockwise.
4. All valves and equipment shall be provided with suitable operating devices and adapted for the operation in the position in which they are shown on the Drawings.
5. Bolts and Studs
 - a. All bolts and studs shall be in accordance with ASTM A-307 Grade B and nuts shall be in accordance with ASTM A-563. bolts, studs and nuts shall be electrogalvanized according to ASTM B-633.
 - b. All bolts, studs and nuts in contact with water, in any moist atmosphere or damp area such as occurs above water, or exposed to weather shall be stainless steel.
 - c. All bolts delivered to the job shall be free of rust and dirt and shall be stored in a manner to protect them from rust and dirt. All bolts shall be tightened to the proper torque. They shall be of the size recommended for the pipe and fittings they are to be used on and shall be in the recommended

quantity. Tightening of bolts shall be alternated, so as to not produce undue stress on the valves and fittings.

2.2 BALL VALVES

A. Polyethylene Gas Valves

1. Valve body shall be high density polyethylene with BUNA N capable of withstanding 100 psi service pressures butt or socket fused.
2. Valve shall be of the size shown on the drawings or the size of the adjacent pipe.
3. Valve shall be Poly-Gas as manufactured by Flow Serve.

3.0 EXECUTION

3.1 GENERAL

- A. All equipment and appurtenances shall be installed at the location shown on the Drawings. All necessary material, parts, operator and gaskets shall be provided.
- B. All flanged valves shall be bolted to the adjacent pipe with 304 stainless steel bolts and nuts.
- C. Buried valves shall be installed with operating stem vertical. Tips of operating nuts shall be not more than 30 inches below ground surface. Where valve operating nuts are more than 30 inches below tops of valve boxes, stem shall be provided to bring the operating nut to within 12 inches of box tops.
- D. Valve boxes shall be accurately centered over valve operating nuts and the backfill shall be mechanically tamped about them, to prevent subsequent movement. Tops of boxes shall be flush with the surface, paving, walk, or road surface and shall have the appropriate grade cover to withstand loading.
- E. All equipment and appurtenances shall be installed in strict accordance with the manufacturers recommendations/instructions.

3.2 TOOLS AND SPARE PARTS

- A. All special tools required for normal operation and maintenance shall be furnished by the valve manufacturer.

3.3 SHOP COATING

A. The exterior surface of various parts of the equipment shall be thoroughly cleaned of all scale, dirt, grease, or other foreign matter and thereafter shop coated with an approved rust-inhibitive primer of the manufacturers' recommendations and compatible with the final field coating specified in Section 02610.

3.4 FIELD COATING

A. All buried equipment shall be field coated with the same material used to field coat the adjacent piping as specified in Section 02610.

B. All exposed equipment shall be field coated with the same material used to field coat the adjacent piping as specified on the Drawings.

C. The Contractor and the equipment manufacturer shall coordinate shop and field coating to assure compatibility as specified in Section 02610.

3.5 INSPECTION AND TESTING

A. The various pipelines in which the equipment and appurtenances are to be installed are specified to be field tested. During these tests and defective equipment or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the Engineer.

B. Various regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with the specified operation capabilities any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the Engineer.

SECTION 15123

FREE BORE

1.0 GENERAL

Under this item, the CONTRACTOR shall provide all labor, tools, equipment and materials to install the free bore at selected bituminous and concrete driveways and/or county road unless otherwise directed by the ENGINEER.

2.0 MATERIALS

Not applicable.

3.0 EXECUTION

The CONTRACTOR shall provide a jacking pit and bore through the earth at the proper line and grade. The augured hole shall be as small as practical to allow the carrier pipe to pass through.

This bid item does not apply to service tubing.

4.0 PAYMENT

The unit price bid per linear foot for free boring, as measured from edge of pavement to edge of pavement, regardless of size of bore, shall constitute full compensation for the work specified.

