COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

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JAN 24 2017
PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF NATURAL ENERGY UTILITY CORPORATION FOR APPROVAL OF CONSTRUCTION OF A NATURAL GAS PIPELINE AND ISSUANCE OF A CERTIFICATE OF CONVENIENCE AND NECESSITY	)))))	CASE NO. 2017- 00049

APPLICATION FOR APPROVAL OF CONSTRUCTION

Natural Energy Utility Corporation (NEUC), by counsel, petitions for an order approving the construction of a natural gas pipeline as described below pursuant to KRS 278.020.

In support of the application, the following information is provided:

1. NEUC's office address and contact officer are:

Natural Energy Utility Corporation
%H. Jay Freeman
2560 Hoods Creek Pike
Ashland, KY 41102
606 324 3920 Ph
606 325 2991 Fax
hjfneuc@aol.com

2. NEUC is an intrastate natural gas pipeline company. It was incorporated in Kentucky on October 31, 2001. It articles of incorporation were filed in Case No. 2002-00050. It attests that it is in good standing to do business in Kentucky. It does not operate under an assumed name.

3. NEUC operates in Boyd, Greenup and Carter counties serving approximately 1058 residential customers and three industrial customers.

4. NEUC proposes to construct new facilities to serve a new industrial customer. The

customer and terms of the service are included in a confidential special contract submitted for approval on January 10, 2017. That contract is attached as exhibit 1, with a petition for confidentiality.

5. The construction is in the public interest and is required to allow NEUC to provide adequate service to this customer. The customer is new to the area and will initially employ approximately 63 to 68 full time employees. The customer requested service from NEUC and executed the attached special contract on December 17, 2016. The customer expects to begin operations on June 1, 2017 and requires gas service by that date.

Additionally, the construction of this segment of pipeline will allow NEUC to serve additional residential customers over the next few years. NEUC expects to connect approximately 30 new customers by November, 2017. 807 KAR 5:001(15)2)(a).

6. An encroachment permit from the Kentucky Transportation Cabinet has been submitted for a road bore and is the only permit needed for the project. See exhibit 2. No franchises or easements are required. Rights of way are pending for the public roads. 807 KAR 5:001(15)(2)(b).

7. A copy of the engineering report showing the full description of the proposed location, route, or routes of the new construction or extension, including description of the manner it will be constructed is attached as exhibit 3. NEUC will interconnection its existing facilities with the proposed pipeline to serve the customer. A portion of this exhibit includes the diagram and location of a road bore, which is included in the petition for confidentiality.

The pipeline materials, operating pressures and technical specifications are in included in exhibit 3. Construction will be performed by NEUC staff, augmented by

contract labor, subcontractors for road bores. NEUC staff is current on all required pipeline construction repair and maintenance certifications. NEUC staff will coordinate construction timing and schedules directly with PSC inspection division to insure all pipe is installed to PSC specifications. The facilities will be operated and maintained by NEUC's current employees. 807 KAR 5:001(15)(c).

8. Two maps and one electronic PDF copy of the project area are attached as exhibit 4 and is subject to the attached confidentiality petition. 807 KAR 5:001(15)(d).

9. The estimated cost of the total project with engineering, construction, and contingencies is stated in the special contract, exhibit 1. This project will be financed entirely by the customer pursuant to the terms of the special contract. The total project cost schedule is attached as exhibit 5. A pro forma financial statement showing that the rate for the contract service is compensable and that NEUC will recover its operating expenses is attached as exhibit 6. Both exhibits are subject to the petition for confidentiality. No debt or other obligations will be incurred by NEUC. No securities or other assumptions of debt are being issued or assumed by NEUC. Rates to other NEUC customers will not be affected. This project is self-funding and independent of any other NEUC customer rates or contracts. 807 KAR 5:001(15)(2)(e).

10. There is no natural gas utility that has facilities on or adjacent to the customer's property.

11. The proposed construction project is scheduled to begin construction in upon PSC approval. Completion is expected to take three months. Service is scheduled to begin on June 1, 2017. Because of the timing of the customer's request for service and approval of the contract, time is of the essence and NEUC requests an order by March 1, 2017 to allow construction to begin as quickly as possible to meet the customer's service date of

June 1, 2017. NEUC seeks expedited approval of the application

12. Construction descriptions and facts relied on to justify the public need are described above and in the special contract and engineering plans and specifications attached as exhibits 1 and 3. The need for the service is based on the business requirements of the customer as evidenced by the contract for service among the parties.

13. Estimated operating costs for operation and maintenance, depreciation and other expenses after construction are shown in exhibit 6.

For these reasons, NEUC requests issuance of an order granting authority to construct the facilities and for any other authorization that may be necessary.

SUBMITTED BY:

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Frankfort, KY 40601
Attorney for NEUC
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PETITION FOR CONFIDENTIALITY

Natural Energy Utility Corporation (NEUC) petitions for an order granting confidential protection of a special contract and exhibits 3, 4, 5 and 6 pursuant to 807 KAR 5:001, Section 13 and KRS 61.878. The special contract was filed on January 10, 2017 – TFS 2017-00013. The information provided in the contract is commercial information that if disclosed could cause substantial competitive harm to NEUC. This information is not publicly available. It would be difficult or impossible for someone to discover this information from other sources. If this information were available to competitors in this form, they could use it to the competitive detriment of NEUC. This information is not generally disclosed to non-management employees of NEUC and is protected internally by the Company as proprietary information. The disclosure of this proprietary information would result in significant or irreparable competitive harm to NEUC by providing its competitors with non-reciprocal competitive advantage. No public purpose is served by the disclosure of such information.

The Kentucky Open Records Act exempts from disclosure certain confidential or proprietary information. KRS 61.878(1)(c). To qualify for this exemption, and, therefore, maintain the confidentiality of the information, a party must establish that disclosure of

the information would permit an unfair commercial advantage to competitors of the party seeking confidentiality. This petition for confidentiality includes the following information in the special contract:

1. Customer name: This is a new customer that has negotiated a special contract to use natural gas at its facility, which if disclosed could result in future or existing customers seeking special rates without the same special circumstances associated with this contract.

2. Project cost and method of financing – contract and exhibits 5 and 6:

Project cost, customer's financial contribution to the financing, customer's usage, contract terms and related information gives competitors of NEUC as well as competitors of the customer information that could be used to negotiate favorable terms for themselves as well as develop marketing strategies harmful to NEUC or those specific customers. With the identity of the customer and the knowledge of the monetary and service terms, competitors would have information that would enable them to unfairly compete with NEUC.

The cost of the project, the financial terms among the customer and NEUC and the contract terms all provide detailed proprietary financial information about both NEUC and the customer and the economics of the project. These exhibits contain highly sensitive information about the NEUC's financial condition, its expectations, business operations and other closely held information. NEUC derives independent economic value from the issuance of contracts and other financing methods with advantageous terms and rates. Its profit, operating expenses and other aspects of its financial condition are contained in the pro forma and income statements. Maintaining the propriety of this information is essential to the financial integrity of its ability to successfully

compete for projects, private financing and favorable market terms. This information is highly sensitive and would provide any competitor with information that could not be obtained or derived from any other source.

Any public interest in favor of disclosure of the information is outweighed by the competitive interest in keeping the information confidential thereby enabling NEUC and the customer to successfully compete for business in Kentucky and by the need to protect confidential business plans. Disclosure of the information in question would put both NEUC and the customer at a competitive disadvantage and potentially harm each buy giving competitors detailed information concerning the planning strategies, costs, marketing incentives and other information that would allow competitors to leverage that information to their advantage.

3. Diagrams and Map – exhibits 3 and 4:

Under the Kentucky Open Records Act, KRS 61.878(1)(m), the Commission is entitled to withhold from public disclosure information disclosed to it to the extent that open disclosure would "have a reasonable likelihood of threatening the public safety by exposing a vulnerability in preventing, protecting against, mitigating, or responding to a terrorist act and limited to: . . ,

> (f) infrastructure records that expose a vulnerability referred to in this subparagraph through the disclosure of the location, configuration, or security of critical systems, including public utility critical systems. These critical systems shall include but not be limited to information technology, communications, electrical, fire suppression, ventilation, water, wastewater, sewage, and **gas system**s and;
> (g) The following records when their disclosure will expose a vulnerability referred to in this subparagraph: **detailed drawings, schematics**, **maps**, or **specifications of structural elements**, floor plans, and operating, utility, or security systems of any building or facility owned, occupied, leased, or maintained by a public agency."

Included in exhibit 3 is a diagram of the road bore and its location. Exhibit 4 is a map of the pipeline location and route. All this information is protected by the scope of confidentiality. The applicable statutes provide that "records confidentially disclosed to an agency or required by any agency to be disclosed to it, generally recognized as confidential or proprietary, which if openly disclosed would permit an unfair commercial advantage to competitors of the entity that disclosed the records" shall remain confidential unless otherwise ordered by a court of competent jurisdiction." KRS 81.878(1). The natural gas industry is very competitive. NEUC has active competitors, who could use this information to their advantage and to the direct disadvantage of NEUC. NEUC would be at a competitive threat of loss of business due to the ability of its competitors to leverage the information to their advantage. The public disclosure of the contract terms negotiated with each customer and critical monetary terms would permit an unfair advantage to those competitors. With the identity of the customer and the knowledge of the contract terms, competitors would have inside information to target these customers. For these reasons, the terms in the contracts are exempt from public disclosure pursuant to KRS 61.878(c)(1). The contract terms are also excluded from public disclosure by KRS 278.160(3).

The Supreme Court of Kentucky has held that "disclosure of [this financial information] would unfairly advantage competing operators. The most obvious disadvantage may be the ability to ascertain the economic status of the entities without the hurdles systematically associated with acquisition of such information. *Marina Management Servs. v. Cabinet for Tourism, Dep't of Parks*, 906 S.W.2d 318, 319 (Ky. 1995); see also *Hoy v. Kentucky Indus. Revitalization Auth.*, 907 S.W.2d 766, 768 (Ky. 1995) ("It does not take a degree in finance to

recognize that such information concerning the inner workings of a corporation is generally recognized as confidential or proprietary and falls within the wording of KRS 61.878(1)(c).").

NEUC requests that the information be held confidentially indefinitely. The statutes cited above do not allow for disclosure at any time. Given the competitive nature of the natural gas business and the efforts of non-regulated competitors to encroach upon traditional markets, it is imperative that regulated information remain protected and that the integrity of the information remain secure.

For these reasons, NEUC requests that the items identified in this petition be treated as confidential. Should the Commission determine that some or all the material is not to be given confidential protection, NEUC requests a hearing prior to any public release of the information to preserve its rights to notice of the grounds for the denial and to preserve its right of appeal of the decision.

Submitted by:

John N. Hughes
124 West Todd Street
Frankfort, KY 40601
502 227 7270
Fax: none
jnhughes@johnnhughespsc.com

Attorney for Natural Energy Utility Corporation

EXHIBIT 1

GAS SERVICE AGREEMENT

THIS GAS SERVICE AGREEMENT (this "Agreement") is entered into this 16th day of December, 2016, by and between Natural Energy Utility Corporation ("NEUC"), a Kentucky corporation, 2560 Hoods Creek Pike, Ashland, KY 41102, and [redacted] Incorporated ("[redacted]"), a Delaware corporation, [redacted], KY [redacted]. NEUC and [redacted] are sometimes hereinafter referred to as, individually, the "Party" and, collectively, the "Parties".

RECITALS

WHEREAS, NEUC is a natural gas utility regulated by the Kentucky Public Service Commission;

WHEREAS, [redacted] is an industrial user of natural gas located within the service territory of NEUC; and

WHEREAS, [redacted] desires to procure from NEUC, and NEUC desires to provide to [redacted], natural gas sales and service, subject to the terms and conditions of this Agreement; and

WHEREAS, upon execution of this Agreement, NEUC intends to extend its existing pipeline ("Pipeline") that will provide natural gas to the [redacted], [redacted] Kentucky, facility ("[redacted] Facility"), located at [redacted] County, Kentucky.

NOW, THEREFORE, for and in consideration of the covenants, agreements, terms, provisions and conditions hereinafter set forth and other good and valuable consideration, the receipt, sufficiency and adequacy of which the Parties hereby acknowledge, intending to be legally bound, the Parties agree as follows:

1. Gas Service. Subject to the terms and conditions of this Agreement, NEUC hereby agrees to deliver and sell, [redacted] and [redacted] agrees to receive and purchase, all of the natural gas required by [redacted] at the [redacted] Facility during the term of this Agreement. The quantities of natural gas delivered and sold by NEUC, and received and purchased by [redacted], pursuant to this Agreement shall be those quantities of natural gas delivered to NEUC by third-party suppliers ("Local Production or Interstate-Intrastate Gas").

2. Construction of Pipeline. Upon execution of this Agreement, NEUC will commence acquisition of permits and rights of way. Upon execution, NEUC shall give [redacted] notice that it is ready to construct the Pipeline from its main line to the [redacted] Facility, The notice shall include an invoice for the construction in the amount of [redacted] ($[redacted]), which shall be payable within thirty (30) days. Once NEUC receives this payment, it will commence construction of the Pipeline and complete same in a commercially reasonable and timely manner.

3. Delivery Point. The "Delivery Point" for natural gas delivered and sold by NEUC pursuant to this Agreement shall be at the outlet side of the natural gas meter owned by NEUC at the [redacted] Facility.

4. Quality. The natural gas delivered or sold by NEUC pursuant to this Agreement shall be blended production and/or Interstate-Intrastate Gas. The natural gas delivered hereunder shall be of commercial quality containing no more than one (1) grain of hydrogen sulfide nor more than ten (10) grains of total sulfur per one hundred (100) cubic feet. The natural gas so delivered shall contain an average total heating value for the time period hereof not less than nine hundred and fifty (950) British Thermal Units (BTU) per cubic foot; provided, however, that [redacted] shall not be required to accept natural gas hereunder having a heating value of less than nine hundred and fifty (950) BTUs per cubic foot.

5. Measurement. The natural gas delivered or sold by NEUC pursuant to this Agreement shall be measured by NEUC's meter located at the Delivery Point.

6. Price. For the natural gas service provided by NEUC to [redacted] pursuant to this Agreement, the following charges shall be due from [redacted] each month: (a) for [redacted] Requirements, [redacted] per MCF consumed up to [redacted] MCF's in a monthly billing period. Should [redacted] exceed [redacted] MCF's all MCF's will be charged at [redacted] ($[redacted]) for all consumed MCF's. In addition to the price specified in this Section 6, [redacted] provided by NEUC pursuant to this Agreement.

7. Billing and Payment. For the charges set forth in Section 6(a) hereof, NEUC shall bill [redacted] each month and [redacted] shall make payment to NEUC no later than 15 days after receipt of NEUC's monthly invoice. Invoices may be faxed or emailed to the billing address set forth in Section 11.10. In the event that payment of any invoiced amount is not received within 15 days of receipt of the invoice by [redacted], interest on the overdue amount shall accrue at the rate of [redacted] per month until the date payment is received by NEUC. In the event any invoice is not paid by [redacted] within thirty (30) days after receipt of the invoice by [redacted] NEUC may (reserving cumulatively all other remedies and rights under this Agreement and otherwise available at law and equity) at its sole option and discretion, and without prior notice to [redacted], terminate service and/or terminate this Agreement without any further obligation or liability to [redacted] NEUC has the option to require payment by EFT.

8. Term. This Agreement shall be effective upon the date service commences ("Effective Date"). This Agreement shall have a primary term of [redacted] ([redacted]) years after the Effective Date and shall automatically renew year to year thereafter unless either Party delivers written notice of termination to the other Party at least ninety (90) days prior to the end of the primary or any renewal term. Gas service shall commence upon completion of the Pipeline and approval by the Kentucky Public Service Commission.

9. Warranty: NEUC warrants that it has and will have throughout the term of this Agreement good and merchantable title to natural gas delivered to [redacted] by NEUC and that the same is and shall be free and clear of all taxes, liens and encumbrances. NEUC shall indemnify and save [redacted] harmless from any and all claims in respect of the title to natural as delivered and sold by NEUC pursuant to this Agreement.

10. Force Majeure. To the extent, if any, that either Party is prevented, in whole or in part, from performing any of its obligations hereunder due to reasons of Force Majeure, such obligations (other than the obligation to make monetary payments as required under this Agreement) shall be suspended during the pendency of such event of Force Majeure. For the purpose of this Agreement, "Force Majeure" shall mean an event not anticipated as of the execution of this Agreement which is not within the reasonable control of the Party claiming suspension (the "Claiming Party"), and which by the exercise of due diligence the Claiming Party is unable to overcome or to obtain, or cause to be obtained, a commercially reasonable substitute therefor, and may include, but is not restricted to acts of God; act of public enemy; war; lightning; fire; violent storm; explosion; civil disturbance; public riot; labor dispute; environmental catastrophe; inability to obtain government permits, materials or similar events or occurrences; breakages of machinery or lines of pipe; labor shortage; sabotage; and action or restraint by public or governmental authority including without limitation the Kentucky Public Service Commission; change of law; and other events, whether enumerated above or not, which wholly or partially prevent the delivery, storage or sale of natural gas.

11. Miscellaneous.

11.1. Entire Agreement. This Agreement constitutes the entire agreement among the parties with respect to the subject matter hereof and supersedes all prior agreements and understandings, both written and oral, among the parties with respect to the subject matter hereof;

11.2. Severability. In the event that any provision of this Agreement or the application thereof, becomes or is declared by a court of competent jurisdiction to be illegal, void or unenforceable, the remainder of this Agreement will continue in full force and effect and the application of such provision to other persons or circumstances will be interpreted so as to reasonably effect the intent of the parties hereto. The parties further agree to replace such void or unenforceable provision of this Agreement with a valid and enforceable provision that will achieve, to the extent possible, the economic, business and other purposes of such void or unenforceable provision of this Agreement with a valid and enforceable provision.

11.3. Other Remedies. Except as otherwise provided herein, any and all remedies herein expressly conferred upon a party will be deemed cumulative with and not exclusive of any other remedy conferred hereby, or by law or equity upon such party, and the exercise by a party of any one remedy will not preclude the exercise of any other remedy.

11.4. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the Commonwealth of Kentucky, regardless of the laws that might otherwise govern under applicable principles of conflicts of laws thereof. Each of the parties

hereto agrees that process may be served upon them in any manner authorized by the laws of the Commonwealth of Kentucky for such persons and waives and covenants not to assert or plead any objection which they might otherwise have to such jurisdiction and such process.

11.5. Rules of Construction. The parties hereto agree that they have been represented by counsel during the negotiation and execution of this Agreement and, therefore, waive the application of any law, regulation, holding or rule of construction providing that ambiguities in an agreement or other document will be construed against the party drafting such agreement or document.

11.6. Specific Performance. The parties hereto agree that irreparable damage would occur in the event that any of the provisions of this Agreement were not performed in accordance with their specific terms or were otherwise breached. It is accordingly agreed that the parties shall be entitled to an injunction or injunctions to prevent breaches of this Agreement and to enforce specifically the terms and provisions hereof in any court of the United States or any state having jurisdiction, this being in addition to any other remedy to which they are entitled at law or in equity.

11.7 Attorney's Fees. Should either party to this Agreement prevail by a final unappealable judgment in any judicial or arbitral action to enforce any right under this Agreement, the non-prevailing party shall be liable to the prevailing party for the prevailing party's reasonable attorneys' fees.

11.8 Assignment. This Agreement may be assigned by either party with the written consent of the non-assigning party, which consent will not be unreasonably withheld or delayed.

11.9 Notices. All notices and other communications hereunder shall be in writing and shall be deemed given if delivered personally or by commercial delivery service, or mailed by registered or certified mail (return receipt requested) or sent via facsimile (with acknowledgment of complete transmission) to the parties at the following address (or such other address for a party as shall be specified by like notice):

(a) If to NEUC:

Mr. Jay Freeman
Natural Energy Utility Corporation
2560 Hoods Creek Pike
Ashland, KY 41102
Telephone: 606-324-3920
Facsimile: 606-325-2991
Email: hjfneuc@aol.com

(b) If to [redacted], Incorporated:

[redacted]
[redacted], Incorporated

[redacted]
Email: [redacted]

With a copy to:

Mr. [redacted]
[redacted]
Email: [redacted]

11.10. Billing: All invoices shall be sent to the following address:

[redacted] Incorporated
[redacted]
Email: [redacted]

IN WITNESS WHEREOF, the Parties have duly executed and delivered this Agreement as of the day and year first above written.

NATURAL ENERGY UTILITY CORPORATION
2560 Hoods Creek Pike
Ashland, Kentucky 41102

By: [redacted]
Its: President

[redacted], INCORPORATED
[redacted]

By: [redacted]
Its: Vice President, Adm

EXHIBIT 2

Kentucky Transportation Cabinet
Department of Highways
Permits Branch

APPLICATION FOR ENCROACHMENT PERMIT

Permittee Information				**KYTC No.**	
Name	Natural Energy Utility Corp			**Permit Information**	
Address	2560 Hoods Creek Rd			Address	200 Harris Rd
				City	
City	Ashland			State	KY Zip 41144
State	KY	Zip	41102	County	GREENUP
Phone#	(606) 324-6995			Route No.	US 23 Mile Point 8.07
Contact	MATT OAKS			Longitude (X)	-82.792400°
Phone	(606) 324-3920	Cell	(606) 922-3288	Latitude (Y)	38.551306°
Email	MLONEUC@AOL.COM			***Information below to be filled out by KYTC***	
Contact	ANDREW KOWALEWSKI			☐ Air Right	☐ Entrance
Phone	(630) 967-0909	Cell	(847) 712-2724	☐ Utilities	☐ Other:
Email	AKOWALEWSKI@ENENGINEERING.COM				
					☐ Left ☐ Right ☐ X-ing
				Access:	☐ Full ☐ Partial ☐ by Permit

General Description of Work:

4" MDPE PIPELINE INSIDE 8" STEEL CASING INSTALLED VIA BORE ACROSS US 23 WEST OF THE INTERSECTION WITH US 67. MAIN TO BE INSTALLED AT MINIMUM DEPTH OF 42" BELOW THE DITCHLINE.

THE UNDERSIGNED PERMITTEE(s) (being duly authorized representative(s) or owner(s)) DO AGREE TO ALL TERMS AND CONDITIONS ON THE TC 99-1 (A).

Matt T Oaks G.M. 1/17/2017

Signature Date

This is not a permit unless and until the permittee(s) receives an approved TC 99-1(B) from KYTC. This application will become void if not approved by the cancellation date. The cancellation date will be one year from the date the permittee submits their application.

APPLICATION FOR ENCROACHMENT PERMIT

TERMS AND CONDITIONS

1. The permit, including this application and all related and accompanying documents and drawings making up the permit, remains in effect and is binding upon the Applicant/Permittee, its successors and assigns, as long as the encroachment(s) exists and also until the permittee is finally relieved by the Department of Highways from all its obligations.

2. Applicant shall meet all requirements of the Clean Water Act if the project will disturb one acre or more, the applicant shall obtain a KPDES KYR10 Permit from the Kentucky Division of Water. All disturbed areas shall meet the requirements of the Department of Highway's Standard Specifications, Sections 212 and 213, as amended.

3. INDEMNITY:

- **A.** PERFORMANCE BOND: The permittee shall provide to the Department a performance bond according to the Permits Manual, Section PE-203 as a guarantee of conformance with the Department's Encroachment Permit requirements.
- **B.** PAYMENT BOND: At the discretion of the department, a payment bond will be required of the permittee to ensure payment of liquidated damages assessed to the permittee.
- **C.** LIABILITY INSURANCE: Liability insurance will be required of the permittee (in an amount approved by the department) to cover all liabilities associated with the encroachment.
- **D.** It shall be the responsibility of the permittee, its successors and assigns, to maintain all indemnities in full force and effect until the permittee is authorized to release the indemnity by the Department.

4. A copy of this application and all related documents making up the approved permit will be given to the applicant and shall be made readily available for review at the work site at all times.

5. Perpetual maintenance of the encroachment is the responsibility of the permittee, its successors and assigns, with the approval of the Department as required, unless otherwise stated.

6. Permittee, its successors and assigns, shall comply with and agrees to be bound by the requirements and terms of (a) this application and all related documents making up the approved permit, (b) by the Department's Permits Manual, and (c) by the Manual on Uniform Traffic Control Devices, both manuals as revised to and in effect on the date of issuance of the permit, all of which documents are made a part thereof by this reference. Compliance by the permittee, its successors and assigns, with subsequent revisions to applicable provisions of either manual or other policy of the Department may be made a condition of allowing the encroachment to persist under the permit.

7. Permittee agrees that this and any encroachment may be ordered removed by the Department at any time, and for any reason, upon thirty days written notice to the last known address of the applicant or to the address at the location of the encroachment. The permittee agrees that the cost of removing and of restoring the associated right-of-way is the responsibility of the permittee, its successors and assigns.

8. Permittee, its successors and assigns, agree that if the Department determines that motor vehicular safety deficiencies develop as a result of the installation or use of the encroachment, the permittee, its successors and assigns, shall provide and bear the expenses to adjust, relocate, or reconstruct the facilities, and/or add signs, auxiliary lanes, or other corrective measures reasonably deemed necessary by the Department within a reasonable time after receipt of a written notice of such deficiency. The period within which such adjustments, relocations, additions, modifications, and/or other corrective measures must be completed will be specified in the notice.

9. Where traffic signals are required as a condition of granting the requested permit or are thereafter required to correct motor vehicular safety deficiencies, as determined by the Department, the costs for signal equipment and

APPLICATION FOR ENCROACHMENT PERMIT

installation(s) shall be borne by the permittee, its successors and assigns, and/or the Department in its reasonable discretion and only in accordance with the Department's current policy set forth in the Traffic Operations Manual and Permits Manual. Any modifications to the permittee's entrance necessary to accommodate signalization (including necessary easement(s) on private property) shall be the responsibility of the permittee, its successors and assigns, at no expense to the Department.

10. The requested encroachment shall not infringe on the frontage rights of an abutting owner without their written consent as hereinafter described. Each abutting owner shall express their consent, which shall be binding on their successors and assigns, by the submission of a notarized statement as follows, "I (we), _____, hereby consent to the granting of the permit requested by the applicant along Route _____, which permit does affect frontage rights along my (our) adjacent real property." By signature(s) _____, subscribed and sworn by _____, on this date _____.

11. The permit, if approved, is subject to the agreement that it shall not interfere with any similar rights or permit(s) previously granted to any other party, except as otherwise provided by law.

12. Permittee shall include documentation which describes the facilities to be constructed. Permittee, its successors and assigns, agrees as a condition of the granting of the permit to construct and maintain any and all permitted facilities or other encroachments in strict accordance with the submitted and approved permit documentation and the policies and procedures of the Department. Permittee, its successors and assigns, shall not use facilities authorized herein in any manner contrary to that prescribed by the approved permit. Only normal usage as contemplated by the parties and by this application and routine maintenance are authorized by the permit.

13. Permittee, its successors and assigns, at all times from the date permitted work is commenced until such time as all permitted facilities or other encroachments are removed from the right-of-way and the right-of-way restored, **shall defend, protect, indemnify and save harmless** the Department from any and all liability claims and demands arising out of the work, encroachment, maintenance, or other undertaking by the permittee, its successors and assigns, related or undertaken pursuant to the granted permit, due to any claimed act or omission by the permittee, its servants, agents, employees, or contractors. This provision shall not inure to the benefit of any third party nor operate to enlarge any liability of the Department beyond that existing at common law or otherwise if this right to indemnity did not exist.

14. Upon a violation of any provision of the permit, or otherwise in its reasonable discretion, the Department may require additional action by the permittee, its successors and assigns, up to and including the removal of the encroachment and restoration of the right-of-way. In the event additional actions required by the Department under the permit are not undertaken as ordered and within a reasonable time, the Department may in its discretion cause those or other additional corrective actions to be undertaken and the Department may and shall recover the reasonable costs of those corrective actions from the permittee, its successors and assigns.

15. Permittee, its successors and assigns, shall use the encroachment premises in compliance with all requirements of federal law and regulation, including those imposed pursuant to Title VI of the Civil Right Act of 1964 (42 U.S.C. § 2000d et seq.) and the related regulations of the U.S. Department of Transportation in Title 49 C.F.R. Part 21, all as amended.

16. Permittee, its successors and assigns, agree that if the Department determines it is necessary for the facilities or other encroachment authorized by the permit to be removed, relocated or reconstructed in connection with the reconstruction, relocation or improvement of a highway, the Department may revoke permission for the

APPLICATION FOR ENCROACHMENT PERMIT

encroachment to remain under the permit and may order its removal, relocation or reconstruction by the permittee, its successors and assigns, at the expense of the permittee, except where the Department is required by law to pay any or all of those costs.

17. Permittee agrees that the authorized permit is personal to the permittee and shall remain in effect until such time as (a) the permittee's rights to the adjoining real property to have benefitted from the requested encroachment have been relinquished, (b) until all permit obligations have been assumed by appropriate successors and assigns, and (c) unless and until a written release from permit obligations has been granted by the Department. The permit and its requirements shall also bind the real property to have benefitted from the requested encroachment to the extent permitted by law. The permit and the related encroachment become the responsibility of the successors and assigns of the permittee and the successors and assigns of each property owner benefitting from the encroachment, or the encroachment may not otherwise permissibly continue to be maintained on the right-of-way. (Does not apply to utility encroachments serving the general public.)

18. If work authorized by the permit is within a highway construction project in the construction phase, it shall be the responsibility of the permittee to make personal contact with the Department's Engineer on the project in order to coordinate all permitted work with the Department's prime contractor on the project.

19. This permit is not intended to, nor shall it, affect, alter or alleviate any requirement imposed upon the permittee, its successors and assigns, by any other agency.

20. Permittee, its successors and assigns, agrees to contain and maintain all dirt, mud, and other debris emanating from the encroachment away from the surrounding right-of-way and the travel way of the highway hereafter and at all times that its obligations under the permit remain in effect.

EXHIBIT 3

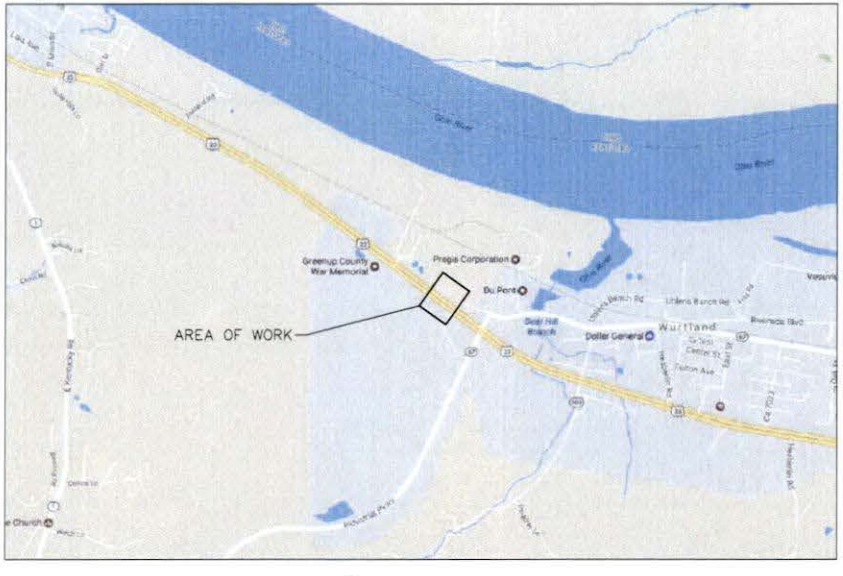
INDEX OF SHEETS

SHEET NO.	SHEET TITLE
1	TITLE SHEET
2	PLAN
3	PROFILE
4	TRAFFIC CONTROL PLANS

NATURAL ENERGY UTILITY CORPORATION
INSTALLATION
4" PLASTIC GAS MAIN

PROJECT DESCRIPTION AND SCOPE OF WORK:

INSTALL: 4" PLASTIC GAS MAIN IN 8" STEEL CASING AND (2) 4" VALVES
LOCATION: US ROUTE 23 NORTH OF US ROUTE 67



N VICINITY MAP (NOT TO SCALE)

INSTALL APPROX. 245 FT. OF 4" PL. GAS MAIN
INSTALL APPROX. 140 FT. OF 8" STEEL CASING

0 100' 200' 300' — 1"= 100'
0 10 20 30 — 1"= 10'
0 50 100' — 1"= 50'
0 50 100' — 1"= 40'
0 50 100' — 1"= 30'
0 50 100' — 1"= 20'

FULL SIZE PLANS HAVE BEEN PREPARED USING STANDARD ENGINEERING SCALES. REDUCED SIZED PLANS WILL NOT CONFORM TO STANDARD SCALES. IN MAKING MEASUREMENTS ON REDUCED PLANS, THE ABOVE SCALES MAY BE USED.

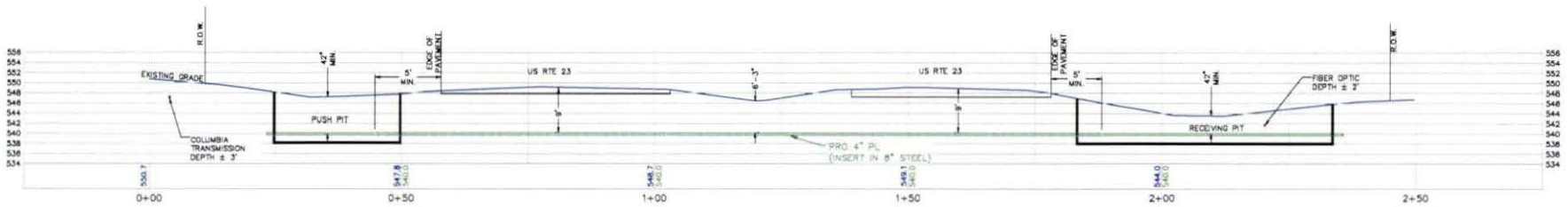
PREPARED FOR: NEUC

APPROVED FOR REVIEW

REV.	DESCRIPTION	BY	CHK'D BY	APP'D. BY	DATE

PREPARED BY: ENengineering
28100 TORCH PARKWAY, SUITE 400
WARRENVILLE, IL 60555
TEL 630-353-4000
FAX 630-353-7777
WWW.ENENGINEERING.COM

COUNTY: GREENUP	TOWNSHIP: X		1/4 SECTION: X X
TOWN: WURTLAND	TIER: X	RANGE: X	X X
DESIGN: X	DEPARTMENT: X	ENGINEER/DESIGNER: D. KOWALEWSKI	DATE: 01-18-2017
WORK ORDER NO.: X		DRAWN BY: J. PEREZ	DATE: 01-18-2017
SCALE: NONE		DRAWING FILE NO.: F7300820.00	SHEET 1 OF 4



PROFILE VIEW
(SCALE: 1"=10')

NOTES:
1. PUSH PIT AND RECEIVING PIT SHALL BE BACKFILLED AND THOROUGHLY COMPACTED.
2. ALL DITCH LINES ARE TO REMAIN OPEN AT ALL TIMES.
3. SEED AND STRAW ALL DISTURBED AREAS IMMEDIATELY AFTER COMPLETING THE WORK.

N

PREPARED FOR: NEUC

APPROVED FOR REVIEW

REV.	DESCRIPTION	BY	CHK'D BY	APP'D. BY	DATE

PREPARED BY:
ENGengineering
28100 TORCH PARKWAY, SUITE 400
WARRENVILLE, IL 60555
TEL 630-353-4000
FAX 630-353-7777
WWW.ENGENGINEERING.COM

DESIGN	TOWNSHIP	1/4 SECTION
GREENUP	X	X X
TOWN	TIER RANGE	X X
WURTLAND	X X	
DESIGN	DRAWN/DESIGNED	DATE
X X	D. KOWALEWSKI	01-18-2017
WORK ORDER NO.	DRAWN BY	DATE
X	J. PEREZ	01-18-2017
SCALE	DRAWING FILE NO.	SHEET 3 OF 4
1"=10'	F700800.00	

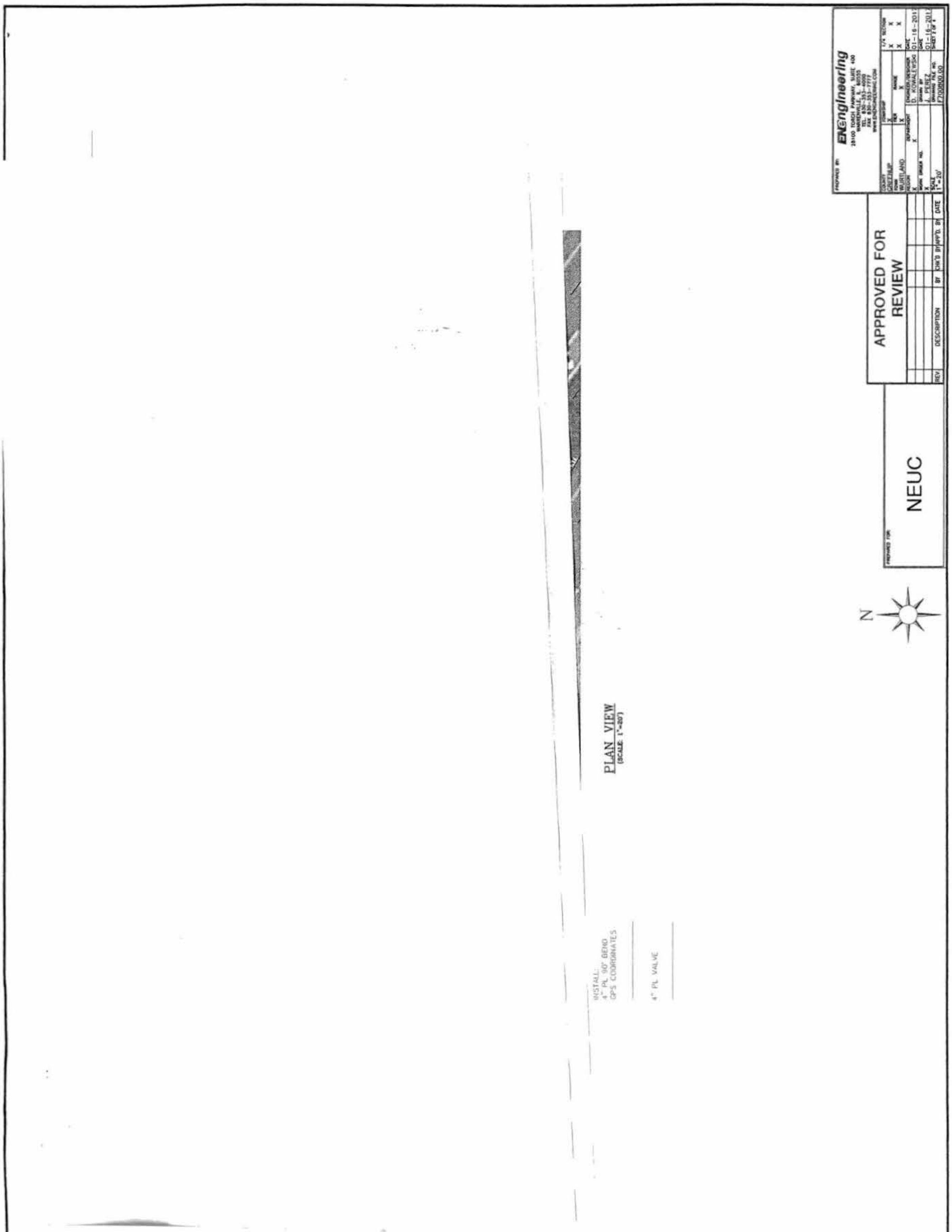


EXHIBIT 3

CONFIDENTIAL

TRAFFIC CONTROL

(SCALE: 1"=20')

TYPICAL TEMPORARY TRAFFIC CONTROL SIGNS

NOTES:
ALL SIGNS USED TO CONFORM TO THE SPECIFICATIONS WITHIN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, KS 2009" OR LATER.

NOTE:
ANY SIGNS THAT ARE TO BE IN PLACE FOR MORE THAN FOUR (4) DAYS MUST HAVE A VERTICAL CLEARANCE OF 7 FEET FROM THE TOP OF PAVEMENT TO THE BOTTOM OF THE SIGN. THESE SIGNS SHALL BE POST MOUNTED IN THE GROUND WHERE POSSIBLE.

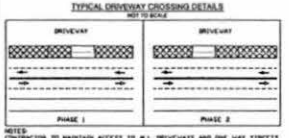
NOTE:
A 3'-6" DEFLECTION AREA IS REQUIRED FROM THE BACK SIDE OF THE TEMPORARY CONCRETE BARRIER WALL TO ANY OBSTRUCTION OR DROP OFF IN THE WORK ZONE. IF THIS 3'-6" DEFLECTION AREA CANNOT BE MAINTAINED, THE TEMPORARY CONCRETE BARRIER WALL SHALL BE ANCHORED TO THE PAVEMENT THROUGH THE THREE (3) ANCHORING HOLES ON THE TRAFFIC SIDE OF THE TEMPORARY CONCRETE BARRIER WALL.

PAVEMENT MARKING LEGEND

- (A) TEMPORARY PAVEMENT MARKING LINE 4 (SOLID, WHITE)
- (B) TEMPORARY PAVEMENT MARKING LINE 4 (SOLID, YELLOW)
- (C) TEMPORARY PAVEMENT MARKING LINE 4 (SOLID, DOUBLE WHITE)
- (D) TEMPORARY PAVEMENT MARKING LINE 4 (SOLID, DOUBLE YELLOW)
- (E) TEMPORARY PAVEMENT MARKING LINE 4 (10' DASH - 30' SHIP, WHITE)
- (F) TEMPORARY PAVEMENT MARKING LINE 4 (10' DASH - 30' SHIP, YELLOW)
- (G) TEMPORARY PAVEMENT MARKING LINE 8 (SOLID, WHITE)
- (H) TEMPORARY PAVEMENT MARKING LINE 8 (2' DASH - 6' SHIP, WHITE)
- (I) TEMPORARY PAVEMENT MARKING LINE 8 (SOLID, WHITE)
- (J) TEMPORARY PAVEMENT MARKING LINE 12 (SOLID, YELLOW)
- (K) TEMPORARY PAVEMENT MARKING LINE 12 (SOLID, WHITE)
- (L) TEMPORARY PAVEMENT MARKING LINE 24 (SOLID, WHITE)

TYPICAL DRIVEWAY CROSSING DETAILS

NOT TO SCALE



NOTES:
CONTRACTOR TO MAINTAIN ACCESS TO ALL DRIVEWAYS AND ONE WAY STREETS AT ALL TIMES. CONTRACTOR TO COORDINATE CLOSINGS WITH AFFECTED PROPERTY OWNERS AND/OR TENANTS PRIOR TO WORK NEAR DRIVEWAY ACCESSES. CONTRACTOR TO MAINTAIN ONE (1) LANE OF TRAFFIC IN ALL DIRECTIONS AT ALL TIMES.

N

LEGEND

- GAS MAIN TO BE INSTALLED AT DIFFERENT TIME
- PROP. GAS INSTALLATION
- PROP. TRAFFIC CONTROL PHASES
- PROP. TRAFFIC CONTROL PHASES
- PROP. TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- ARROW BOARD
- SIGN
- FLAGGER
- DRUM FOR 2-WAY TRAFFIC CHANNELIZATION WITH STEADY BURN BI-DIRECTIONAL LIGHTS
- TYPE II BARRICADE WITH STEADY BURN LIGHT
- TYPE III BARRICADE WITH TWO FLASHING LIGHTS

General Notes for Traffic Control

All traffic control operations within the limits of this project shall be done in accordance with the applicable sections of the following:

- Standard Specifications for Road and Bridge Construction in Macomb.
- Federal Highway Administration Manual on Uniform Traffic Control Devices for Streets and Highways.
- Greenup County's Regulations for Openings, Construction and Repair in the Public Way

1. Construction along roadways shall be coordinated with Greenup County and the Owner to insure that the convenience and safety of the general public and of property owners and tenants along the roadway shall be provided for in an adequate and satisfactory manner. At no time shall the existing roadways be closed to traffic, unless approved by the Greenup County and the Owner. During construction operations access shall be provided to private property along existing roadways. The Contractor(s) shall be responsible for the installation and maintenance of adequate signs, barricades, and warning devices to inform and protect the public.

2. This traffic plan is intended to guide the contractor in directing the existing traffic flows in a safe and efficient manner during the course of the project. The safety of the public is of paramount importance, and must never be compromised.

3. Lane Closure length for traffic control devices is defined as $L = WS^2/60$ where
   - L = Taper length in feet
   - W = Width of offset in feet
   - S = Posted speed limit in mph

   Wherever practicable, the traffic control plans under this cover utilize this formula in determining taper lengths for all lane reductions. Refer to MUTCD Table VI-2 for formula.

4. Lane Shift taper length for traffic control devices is defined as $L = WS^2/120$ where
   - L = Taper length in feet
   - W = Width of offset in feet
   - S = Posted speed limit in mph

   Wherever practicable, the traffic control plans under this cover utilize this formula in determining taper lengths for all lane reductions. Refer to MUTCD Table VI-2 for formula.

5. Prior to the beginning of work in a given work location, all traffic control devices shall be in place at that location.

6. Traffic control devices shall be in conformance with the Kentucky Transportation Cabinet (KYTC) Standard Specifications for Road and Bridge Construction, Edition of 2008.

7. Details of traffic control devices can be found in the MUTCD.

8. All dimensions given are for traffic control purposes only. Refer to Construction Drawings for project details.

9. Arrow Boards are optional on one way streets when the parking lane is not utilized as a traffic lane during morning and/or evening hours.

PREPARED FOR:

NEUC

APPROVED FOR REVIEW

REV.	DESCRIPTION	BY	CHK'D BY	APP'D. BY	DATE

PREPARED BY:
ENGineering
29100 TORCH PARKWAY, SUITE 108
WARRENVILLE, IL 60555
TEL: 630-353-4000
FAX 630-353-7777
www.ENGINEERINC.COM

COUNTY	TOWNSHIP	1/4 SECTION
GREENUP	X	X X
TOWN	TIER	RANGE	X X
WURTLAND	X	X	
REVISION	DEPARTMENT	ENGINEER/DESIGNER	DATE
X	X	D. KOWALEWSKI	01-16-2013
WORK ORDER NO.		DRAWN BY	DATE
X		J. PEREZ	01-16-2013
SCALE		DRAWING FILE NO.	SHEET # OF #
1"=20'		F700900.00	

NEUC SUPPLEMENTAL INFORMATION To ENengineering report:

NEUC Supplemental comments: The purpose of this study is to ensure adequate volume demands were met for current and future customers if the proposed customer is connected to the existing pipeline. NEUC has a pipeline tap at the EastPark Industrial Park where it receives gas from the Kinder Morgan Natural Gas Line. The ENe overall study was prepared to allow NEUC to plan for future expansion, in addition to the proposed anchor tenant, which is the subject of this application. The original study was for the entire 8 mile section of KY RT 67.

NEUC's application for pipeline construction is for 3.1 miles from KY RT 1 through Horn Hollow, onto KY RT 67 crossing US RT 23 onto the anchor tenant's property, which is included in the study.

8-Mile from Naples Inner-Connect, Capacity Study

The following study reviewed the system capacity for an 8-mile throughput pipeline with 1 anchor tenant. Additional models were run to assess the impact of additional customers, and the system's capability of supporting them and the anchor tenant at peak day loads.

Analysis Criteria

The analysis was based on the following criteria:

Required Loads:

- Anchor Tenant: 107 dth/day (year round) with a 10 psig minimum inlet pressure.
- Anticipated Additional Customer Peak Winter Load: 600 dth/day
- Anticipated Additional Customer Average Load: 200 dth/day

Energy Content:

- 1 mscf = 1.03 therms
- 1 mscf = 1.2 therms

System Specifications

Pipe – 4" PE 2406 SDR 11.5

- Outside diameter: 4.50 in
- Wall thickness: 0.391 in
- Internal diameter: 3.718 in
- Roughness: 0.00006
- Efficiency: 0.85

  Efficiency is based on the following criteria:

  1.0 – New Pipe
  0.95 – Good Condition
  0.85 – Average Pipe

  An efficiency of 0.85 was selected to ensure that the capacity would not deteriorate over time.

Model Characteristics

- Friction Factor Calculation Method: Colebrook-White Equation
- Default Flow Category: Base Volumetric

  Due to the simplicity of the model and limited information regarding the system as a whole, all loadings were entered volumetrically, with the heat content calculated prior to being entered in the spreadsheet.

Analysis 1 – Peak Anchor Tenant Load

This analysis provides an understanding of the system capacity as a whole with just the anchor tenant's load. With only this load on the system, the increased energy content allows for a larger pressure range and a higher gas surplus.

Energy Content of 1.03 therm/mscf:

- Minimum system pressure: 13.17 psig
- At 60 psig:
  - System Surplus: 624.81 mscfd
  - Anchor tenant delivery pressure: 58.88 psig
- At 50 psig:
  - System Surplus: 502.84 mscfd
  - Anchor tenant delivery pressure: 48.71 psig

Energy Content of 1.2 therm/mscf:

- Minimum system pressure: 12.46 psig
- At 60 psig:
  - System Surplus: 639.786 mscfd
  - Anchor tenant delivery pressure: 59.15 psig
- At 50 psig:
  - System Surplus: 517.86 mscfd
  - Anchor tenant delivery pressure: 49.01 psig

Analysis 2 – Peak Anchor Tenant with Peak Additional Customer Load (600 dth)

This analysis analyzes the capability of the system supporting both the Anchor Tenant and the additional customers at the anticipated peak loads. At an energy content of 1.03 therms/mscf, the system will have to run at a minimum pressure of 56.53 psig. Increasing the gas energy content will allow the system to support estimated loads at a minimum pressure of 48.54 psig.

Energy Content of 1.03 therm/mscf:

- Minimum system pressure: 56.53 psig
- Anchor tenant delivery pressure at 60 psig: 18.77 psig
- Anchor tenant delivery pressure at 50 psig: Not Feasible

Energy Content of 1.2 therm/mscf:

- Minimum system pressure: 48.54 psig
- Anchor tenant delivery pressure at 60 psig: 32.19 psig
- Anchor tenant delivery pressure at 50 psig: 13.55 psig

Analysis 3 – Anchor Tenant with Average Additional Customer Load (200 dth)

This analysis assesses the impact of a standard customer load in addition to the peak anchor tenant load.

Energy Content of 1.03 therm/mscf:

- Minimum system pressure: 25.53 psig
- Anchor tenant delivery pressure at 60 psig: 52.96 psig
- Anchor tenant delivery pressure at 50 psig: 41.71 psig

Energy Content of 1.2 therm/mscf:

- Minimum system pressure: 22.42 psig
- Anchor tenant delivery pressure at 60 psig: 54.71 psig
- Anchor tenant delivery pressure at 50 psig: 43.80 psig

Additional Comments -

EN Engineering recommends NEUC conduct additional studies to determine the following:

Regulator Sizing

En Engineering did not consider regulator sizing in this model. If the regulator is currently installed, the regulator specifications will need to be included in the models to accurately model the system capacity.

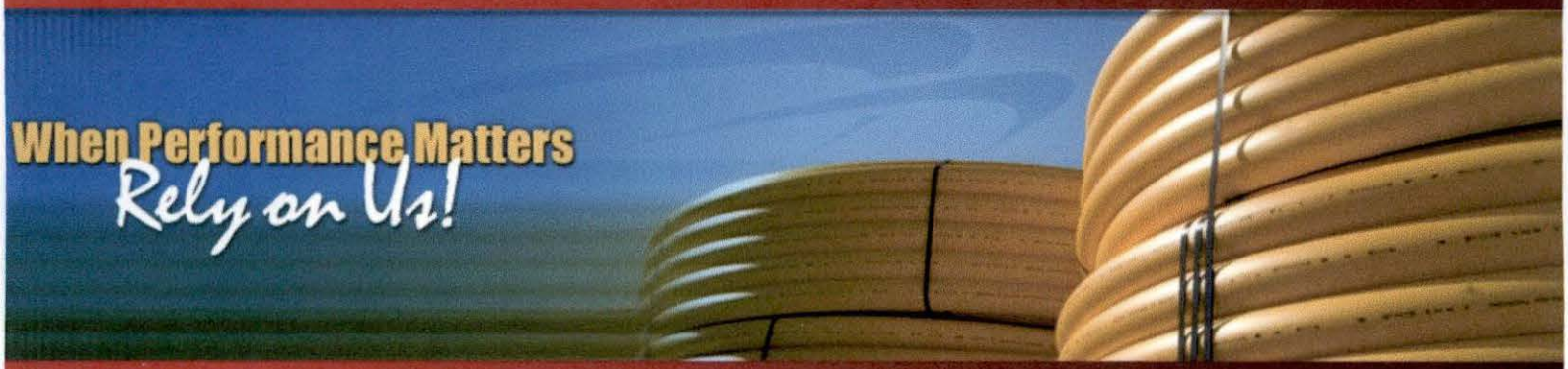
Overall System Capacity

EN Engineering did not review the impact of this expansion on NEUC's overall system. Adding large loads may impact an entire system. EN Engineering recommends assessing the impact of adding these loads to the entire system.

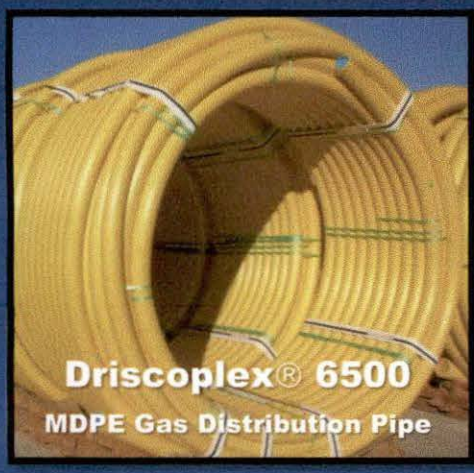
This analysis was completed with estimated loads, and approximate length. Actual conditions may vary due to external factors including, but not limited to design and construction elements. EN recommends completing additional analyses as details for the pipeline are decided.

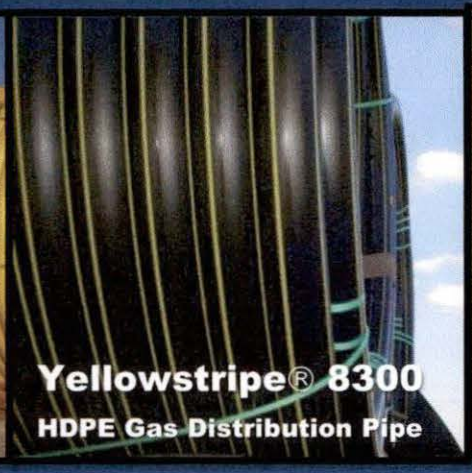
Energy Density	Model Run		Regulator		Anchor Tenant		Additional Customer	Results
Peak Anchor Tenant Load								
1.030 Therms/MSCF	Model #	Status	Pressure (psig)	Flow (mscfd)	Pressure (psig)	Flow (mscfd)	Flow (mscfd)	**Results**
	1	Feasible	**13.17**	103.88	10.00	-103.88		Min Reg Pressure = 13.17 psig
	2	Feasible	60.00	728.69	10.00	-103.88	**-624.81**	System Surplus @ 60 psig = 624.81 mscfd
	3	Feasible	60.00	103.88	**58.88**	-103.88		Anchor Tenant Pressure @ 60 psig = 58.88 psig
	4	Feasible	50.00	606.72	10.00	-103.88	**-502.84**	System Surplus @ 50 psig = 502.84 mscfd
	5	Feasible	50.00	103.88	**48.71**	-103.88		Anchor Tenant Pressure @ 50 psig = 48.71 psig
1.200 Therms/MSCF	Model #	Status	Pressure (psig)	Flow (mscfd)	Pressure (psig)	Flow (mscfd)	Flow (mscfd)	**Results**
	6	Feasible	**12.46**	89.17	10.00	-89.17		Min Reg Pressure = 12.46 psig
	7	Feasible	60.00	728.69	10.00	-89.17	**-639.79**	System Surplus @ 60 psig = 639.786 mscfd
	8	Feasible	60.00	89.17	**59.15**	-89.17		Anchor Tenant Pressure @ 60 psig = 59.15 psig
	9	Feasible	50.00	607.03	10.00	-89.17	**-517.86**	System Surplus @ 50 psig = 517.86 mscfd
	10	Feasible	50.00	89.17	**49.01**	-89.17		Anchor Tenant Pressure @ 50 psig = 49.01 psig
Peak Anchor Tenant Load with Peak Additional Customer Load								
1.030 Therms/MSCF	Model #	Status	Pressure (psig)	Flow (mscfd)	Pressure (psig)	Flow (mscfd)	Flow (mscfd)	**Results**
	11	Feasible	**56.53**	686.40	10.00	-103.88	-582.52	Min Reg Pressure = 56.53 psig
	12	Feasible	60.00	686.40	**18.77**	-103.88	-582.52	Anchor Tenant Pressure @ 60 psig = 18.77 psig
	13	Not Feasible	50.00	Not Feasible	Not Feasible	-103.88	-582.52	Reg below minimum inlet pressure
1.200 Therms/MSCF	Model #	Status	Pressure (psig)	Flow (mscfd)	Pressure (psig)	Flow (mscfd)	Flow (mscfd)	**Results**
	14	Feasible	**48.54**	589.17	10.00	-89.17	-500.00	Min Reg Pressure = 48.54 psig
	15	Feasible	60.00	589.17	**32.19**	-89.17	-500.00	Anchor Tenant Pressure @ 60 psig = 32.19 psig
	16	Feasible	50.00	589.17	**13.55**	-89.17	-500.00	Anchor Tenant Pressure @ 50 psig = 13.55 psig
Peak Anchor Tenant Load with Average Additional Customer Load								
1.030 Therms/MSCF	Model #	Status	Pressure (psig)	Flow (mscfd)	Pressure (psig)	Flow (mscfd)	Flow (mscfd)	**Results**
	17	Feasible	**25.53**	298.05	10.00	-103.88	-194.17	Min Reg Pressure = 25.53 psig
	18	Feasible	60.00	298.05	**52.96**	-103.88	-194.17	Anchor Tenant Pressure @ 60 psig = 52.96 psig
	19	Feasible	50.00	298.05	**41.71**	-103.88	-194.17	Anchor Tenant Pressure @ 50 psig = 41.71 psig
1.200 Therms/MSCF	Model #	Status	Pressure (psig)	Flow (mscfd)	Pressure (psig)	Flow (mscfd)	Flow (mscfd)	**Results**
	20	Feasible	**22.42**	255.84	10.00	-89.17	-166.67	Min Reg Pressure = 22.42 psig
	21	Feasible	60.00	255.84	**54.71**	-89.17	-166.67	Anchor Tenant Pressure @ 60 psig = 54.71 psig
	22	Feasible	50.00	255.84	**43.80**	-89.17	-166.67	Anchor Tenant Pressure @ 50 psig = 43.8 psig

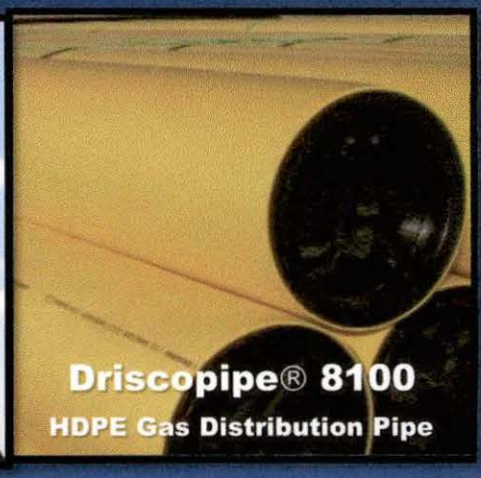
PERFORMANCE PIPE
A Division of Chevron Phillips Chemical Company LP



PERFORMANCE PIPE GAS DISTRIBUTION BROCHURE







PERFORMANCE PIPE
A Division of Chevron Phillips Chemical Company LP

Performance Pipe

Performance Pipe is a name you can trust in gas distribution piping. We specialize in natural gas distribution, liquid propane gas (LPG), propane gas distribution, and yard gas products and fittings.

With more than fifty years of polyethylene pipe manufacturing experience, Performance Pipe has nine ISO 9001 certified manufacturing facilities strategically located across the United States.

The unmatched quality and performance of Performance Pipe polyethylene piping products is further enhanced and strengthened by more than five decades of quality polyolefin plastic resin production from our parent company Chevron Phillips Chemical Company LP.

As active members of the American Gas Association, ASTM International, Gas Piping Technology Committee, Plastics Pipe Institute, American Society of Mechanical Engineers, and American Petroleum Institute, we provide technical expertise and service to these organizations on an ongoing basis.

When you select Performance Pipe gas pipe and fittings, in addition to receiving quality products, you also gain access to our team of experts for technical support and assistance. Topics range from assistance in product applications and capabilities to installation and handling to testing and operating procedures. We are here to help.
Our territory sales teams are dedicated to the gas distribution industry and to the service of Performance Pipe's gas distribution product customers.

Products

Performance Pipe's gas piping products are the material of choice for premium medium and high density natural gas distribution, LPG, propane gas and yard gas piping systems. Performance Pipe's products are produced to meet or exceed the manufacturing and material requirements of the latest edition of ASTM D2513 *Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings*, or applicable international standards. The pipes meet the requirements of ANSI/NFPA 58 *Standard for the Storage and Handling of Liquefied Petroleum Gases*.

Performance Pipe offers the following gas distribution products:

Driscoplex® 6500 MDPE Gas Distribution Pipe These medium density polyethylene (MDPE) PE2708 (PE2406) pipes and fittings are used primarily in pressure-rated gas distribution systems. The product is also suitable for LPG, propane, yard gas and most after-meter applications. The product is a solid yellow medium density pipe that meets ASTM D3350 Cell Classification of PE234373E and APWA/ULCC Color Code Standards.

Performance Pipe, a division of Chevron Phillips Chemical Company LP | 5085 W. Park Blvd | Suite 500 | Plano, TX 75093 | Phone: 800-527-0662 | Fax: 972-599-7348

Yellowstripe® 8300 HDPE Gas Distribution Pipe These high density polyethylene (HDPE) PE4710/PE100 (PE3408) pipes and fittings are used primarily in pressure rated gas distribution systems. The product is black pipe with four equidistant yellow stripes. The Yellowstripe® 8300 pipe series meets APWA/ULCC Color Code Standards and has an ASTM D3350 Cell Classification of PE445574C when using HDB or PE445576C using MRS.

Driscopipe® 8100 HDPE Gas Distribution Pipe These high density polyethylene (HDPE) PE4710/PE100 (PE3408) pipes and fittings are also primarily used in pressure rated gas distribution applications. The Driscopipe® 8100 pipe series is a black pipe with a co-extruded yellow-shell that complies with the APWA/ULCC Color Code Standards. The pipe has an ASTM D3350 Cell Classification of PE445574C when using HDB or PE445576C using MRS. The yellow shell helps reflect solar heat, enabling retention of higher strength ambient temperature properties. It also provides improved ability to detect damages and scratches.

Fittings

Performance Pipe manufactures medium density and high density molded butt, socket, and saddle fusion fittings.

Quality

Performance Pipe's polyethylene piping products for gas are unmatched in quality and performance. In addition to meeting the manufacturing and quality requirements of ASTM D2513 *Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings,*. Performance Pipe's gas products also meet our own internal quality assurance (QA) and quality control (QC) requirements. These internal QA/QC requirements meet or exceed those required by industry standards. Each product line is continuously monitored throughout the manufacturing cycle to ensure that the product adheres to all internal quality control specifications and the manufacturing standard. All nine of Performance Pipe's manufacturing facilities are certified in accordance with the latest edition of ISO 9001. Individual plant certificates of conformance to ISO 9001 are available upon request.

Sizes

Performance Pipe manufactures its Driscoplex® 6500 pipe product through 12" IPS sizes. For larger diameter gas applications (8" though 24") we recommend our high density polyethylene pipes Yellowstripe® 8300 pipe and Driscopipe® 8100 pipe. Both products are available in 1/2" through 24" (16 mm through 630 mm) outside-diameter-controlled polyethylene pipe and tubing sizes. Specific sizes of pipe and fittings available for each product can be found on Performance Pipe's website at www.PerformancePipe.com.

Performance Pipe, a division of Chevron Phillips Chemical Company LP | 5085 W. Park Blvd | Suite 500 | Plano, TX 75093 | Phone: 800-527-0662 | Fax: 972-599-7348

Available Certifications

Specific sizes of Driscoplex® 6500 (MDPE) pipe, Yellowstripe® 8300 (HDPE) pipe and Driscopipe® 8100 (HDPE) pipe and fittings are available with CSA (Canadian Gas Association) certification. Many sizes of Driscoplex® 6500 pipe are available with UPC (Uniform Plumbing Code) certification by IAPMO (International Association of Plumbing and Mechanical Officials) for yard gas piping, LPG and other after-meter applications.

Outdoor Storage

Performance Pipe polyethylene gas distribution piping products are protected from UV effects and outdoor exposure to ensure pipe performance requirements are maintained.

Yellow pipes, such as Driscopipe® 8100 HDPE gas distribution pipe and Driscoplex® 6500 MDPE gas distribution pipe, are protected against outdoor exposure through additive formulations and are defined as Code E materials in accordance with ASTM D3350. Yellowstripe® 8300 HDPE gas distribution pipe is defined as a Code C material and as such contains a minimum of 2-3 percent carbon black.

Accelerated laboratory weathering tests were conducted on the formulations that predict the yellow pipe materials are sufficiently protected to provide a service life of at least four years in outdoor exposure conditions.

Black pipe material weathering tests indicate an unlimited outdoor storage potential. The actual test data confirmed that there is no measurable change in pipe performance properties after four years of outdoor exposure for Code E materials and no measurable change for Code C materials after more than 40 years.

Based on the tests conducted, Performance Pipe provides the following specific unprotected outdoor storage recommendations for Performance Pipe's gas distribution piping products.

- Driscoplex® 6500 pipe 3 years
- Driscopipe® 8100 pipe 3 years
- Yellowstripe® 8300 pipe 10 years

Cautions

Polyethylene piping has been safely used in thousands of applications. However, there are general precautions that should be observed when using any product. In this respect, polyethylene piping is no different. Below is a list of some of the precautions that should be observed when using Performance Pipe's gas pipe and fittings.

- **Fusion**

  During the heat fusion process, equipment and products can reach temperatures in excess of 450°F (231°C). Caution should be taken to prevent burns.

  Do not bend pipes into alignment against open butt fusion machine clamps. The pipe may spring out and cause injury or damage.

  Performance Pipe polyethylene piping products cannot be joined with adhesives or solvent cement. Pipe-thread joining and joining by hot air (gas) welding or extrusion welding techniques are not recommended for pressure service.

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- **Static Electricity**

  High static electricity charges can develop on polyethylene piping products, especially during squeeze-off, when repairing a leak, purging, making a connection, etc.

  Where a flammable gas atmosphere and static electric charges may be present, observe all company (pipeline operator, utility, contractor, etc.) safety procedures for controlling and discharging static electricity and all requirements for personal protection. See website for: Performance Pipe Technical Note *Polyethylene Pipe Squeeze Off; PP 801-TN.*

- **Weight, Unloading and Handling**

  Although polyethylene pipe is not as heavy as some other piping products, significant weight may be involved. Care should be used when handling and working around polyethylene pipe. Improper handling or abuse may cause damage to piping, compromise system quality or performance, or cause personal injury. Observe the safe handling instructions provided by the delivery driver. See website for: *Pipe Loading/Unloading-Truck Driver Safety Video.*

- **Coils**

  Coiled PE pipe is restrained with strapping to contain the spring-like energy retained within the coil. Cutting or breaking strapping can result in an uncontrolled release. Take all necessary safety precautions and use appropriate equipment. Observe the safe handling instructions provided by the delivery driver.

Leak Testing

When testing is required, fuel gas distribution systems should be tested in accordance with applicable codes and regulations and distribution system operator procedures. Observe all safety measures, restrain pipe against movement in the event of catastrophic failure, and observe limitations of temperature, test pressure, test duration, and procedures for making repairs.

Protection against Shear and Bending Loads

Measures such as properly placed, compacted backfill, protective sleeves, and structural support are sometimes necessary to protect plastic pipe against shear and bending loads.

For additional installation information see ASTM D-2774, *Underground Installation of Thermoplastic Pressure Piping.*

Liquid Hydrocarbon Permeation

PE piping that has been in service conveying fuel gases that include heavier hydrocarbons can sometimes exhibit a bubbly appearance when melted for heat fusion. This bubbling is the result of the rapid expansion (by heat) and passage of heavier, adsorbed hydrocarbon gases through the heated and molten polyethylene material. Studies* have shown that propane concentrations under 0.2% is sufficient to sometimes show some bubbling, but is not high enough to effect any significant degradation in strength of the pipe or fusion joint. However, since there currently are no field tests to readily determine the amount of adsorbed hydrocarbons in PE pipe and their potential effect on the fusion joint, the heat fusion process should be abandoned and mechanical connections should be used if bubbles are encountered during a heat fusion process.

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(*)S.M. Pimputkar, J.A. Stets, and M.L. Mamoun, "Examination of Field Failures", Sixteenth International Plastics Pipe Symposium, New Orleans, Louisiana, November 1999.

Locating

Most polyethylene materials are not detectable with standard magnetic locating equipment. When installing PE piping, a method or methods for future pipeline detection should be considered. Gas utilities in the area should always be contacted before the start of any underground installation work such as excavation, trenching, directional boring, etc.

Joining

- D.O.T. Regulations require that each joint in a gas piping system must be made in accordance with written procedures that have been proved by test or experience to produce strong gastight joints (49 CFR, Part 192, §192.273(b)).
- D.O.T. Regulations require that written procedures for butt fusion, saddle fusion, and socket fusion joining of polyethylene gas piping must be qualified before use by subjecting specimen joints to required test procedures (CFR 49, Part 192, §192.283(a)).
- D.O.T. Regulations require that all persons who make joints in polyethylene gas piping must be qualified under the operator's written procedures (CFR 49, Part 192, & §192.285(a)).
- D.O.T. Regulations require that the gas system operator must ensure that all persons who make or inspect joints are qualified (CFR 49, Part 192, §192.285(d) & §192.287).

Performance Pipe recommends using Performance Pipe's Fusion Joining Procedures Bulletin *PP-750 Heat Fusion Joining Procedures and Qualification Guide* when making heat fusion joints with our gas piping products. When PP-750 is used to join Performance Pipe polyethylene gas pipe and fittings, Performance Pipe fusion joining procedures are qualified in accordance with U.S. Department of Transportation Regulations. A copy of PP-750 may be obtained from our website at: www.performancepipe.com

Other qualified procedures used for butt and saddle fusion of polyethylene gas piping products are the Plastic Pipe Institute's, PPI TR-33/2006 *Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe* and PPI TR-41 *Generic Saddle Fusion Joining Procedure for Polyethylene Gas Piping.*

Squeeze-Off

Squeeze-off is used to control flow in PE pipe by flattening the pipe between parallel bars. Squeeze-off is used for routine and emergency situations. ***Do not squeeze-off more than once at the same point on the pipe.*** For repeated flow control, throttling, or partial flow restriction, install a valve or an appropriate flow control device.

Complete flow stoppage will not occur in all cases. For larger pipes, particularly at higher pressures, some seepage is likely. If seepage is not permissible, the pipe should be vented in between two squeeze-offs.

Use squeeze-off procedures meeting ASTM F1041 and tools meeting ASTM F1563 with Performance Pipe polyethylene pipes. The combination of pipe, tool, and squeeze-off procedures should be qualified in accordance with ASTM F1734. Correct tool closure stops and closing and opening rates are key elements to squeezing-off without damaging the pipe. Tool closure stops must be correct for the pipe size and wall thickness (SDR). It is necessary to close slowly and release slowly, with slow release being more important.

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See Performance Pipe Technical Note *PP-801 Squeeze-Off* on our website at: www.performancepipe.com.

Performance Characteristics

Cell Classification

ASTM D3350 *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials* standard cell classification covers the identification of polyethylene materials for pipe and fittings according to a cell classification system. Performance Pipe's gas piping products are listed below.

Table 1: Cell Classifications

Performance Pipe Product Series	Material Designation Code		ASTM D3350 Cell Classification
	Present	Past	
Driscoplex® 6500 Pipe (MDPE)	PE2708	(PE2406)	234373E
Driscopipe® 8100 Pipe (HDPE)	PE4710-PE100	(PE3408)	445574C (445576C*)
Yellowstripe® 8300 Pipe (HDPE)	PE4710-PE100	(PE3408)	445574C (445576C*)

* When using the Minimum Required Strength (MRS) classification.

Long-Term Strength (HDB)

Performance Pipe's polyethylene piping products for gas distribution are listed with the Plastics Pipe Institute (PPI) and have PPI recommended Hydrostatic Design Basis (HDB) ratings as follows:

Table 2: Hydrostatic Design Basis

Performance Pipe Product Series	Hydrostatic Design Basis (HDB) 73°F (23°C)	Hydrostatic Design Basis (HDB) 140°F (60°C)
Driscoplex® 6500 Pipe (MDPE)	1250 psi (8.62 MPa)	1000 psi (6.89 MPa)
Driscopipe® 8100 Pipe (HDPE)	1600 psi (11.03 MPa)	1000 psi (6.89 MPa)
Yellowstripe® 8300 Pipe (HDPE)	1600 psi (11.03 MPa)	1000 psi (6.89 MPa)

HDB by Temperature Interpolation

Elevated temperature properties can be used to determine product capabilities for applications where products will be exposed to elevated temperatures. The Hydrostatic Design Stress for polyethylene is established by testing at 73°F. As with all thermoplastics, when operating temperature increases, pressure capacity decreases.

When determining HDB values, use the interpolation protocol of PPI TR-3-2006 D.2 *Policy for Determining Long-Term Strength (LTHS) By Temperature Interpolation.*
The policy states that, for thermoplastic pipe that is going to be installed at a service temperature greater than 73°F and less than that at which the next HDB has been established, the HDB at the anticipated service temperature can be determined by interpolation.

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Table 3: HDB in PSI by Temperature Interpolation

Service Temperature (°F)	73 Determined	100 interpolated	110 interpolated	120 interpolated	130 interpolated	140 Determined
Driscoplex® 6500 Pipe (MDPE)	1250	1250	1000	1000	1000	1000
Driscopipe® 8100 Pipe (HDPE)	1600	1250	1250	1000	1000	1000
Yellowstripe® 8300 Pipe (HDPE)	1600	1250	1250	1000	1000	1000

Slow Crack Growth (SCG) Resistance

Resistance to slow crack growth is a critical performance requirement because long-term stress can cause cracks to grow slowly through polyethylene pipe resin material. Polyethylene gas pipe is under long-term stress from internal pressure and earthloading. Thus gas distribution service requires materials that have superior long-term resistance to stress cracking and slow crack growth (SCG).

Resistance to slow crack growth is measured using ASTM F1473 *Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins*. Studies* have shown that a 150 hour PENT test could be compared to several centuries of leak free performance in the field.

(* PENT Quality Control Test for PE Gas Pipes and Resins: Dr. Norman Brown and X. Lu; Presented at the 12th Plastic Fuel Gas Pipe Symposium, Sept. 24-26, 1991.)

Table 4: Typical PENT Values

Performance Pipe Product Series	PENT, hours (ASTM F1473)
Driscoplex® 6500 Pipe (MDPE)	>2,000
Driscopipe® 8100 Pipe (HDPE)	>2,000
Yellowstripe® 8300 Pipe (HDPE)	>2,000

ASTM D2513 requires that all PE materials used in gas distribution service meet a minimum of at least 100 hours for two tests before failure when tested per ASTM F1473. Performance Pipe's gas products are tested to over twenty times these minimum testing requirements.

Recent research* has revealed various failure modes for pipes under long term PENT testing. Some doubt has been cast on the correlation between brittle and ductile failure in pressurized pipes and the laboratory established PENT failure times. The research lends credibility to limiting testing times of the PENT test.

(*) R.K Krishnaswamy, Asish M. Sukhadia and Mark J. Lamborn "Is PENT a True Indicator of PE Pipe Slow Crack Growth Resistance", Performance Pipe Technical Note PP-818-TN, Chevron Phillips Chemical Company, LP.

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Over 9,245 production lots of gas pipe manufactured from Performance Pipe PE2708 (PE2406) piping material have been tested against ASTM F1248, *Standard Test Method for Determination of Environmental Stress Crack Resistance (ESCR) of Polyethylene Pipe.* These production lots have amassed a performance history that cumulatively represents over 105 years of testing without failure.

Rapid Crack Propagation

When a pressurized polyethylene pipe is subjected to an instantaneous and intense impact, a pre-existing or consequently initiated crack or flaw can propagate axially at extremely high speeds. Such an impact is referred to as Rapid Crack Propagation, or RCP. It is a property inherent in fracture mechanics of many pipe materials, including polyethylene. Similarly, Rapid Crack Arrest (RCA) is a fast fracture property of the pipe material that arrests the travel of the crack after initiation or before RCP can occur.

While RCP occurrences in PE pipes are extremely rare, the consequences can be significant. Because of the catastrophic nature of a potential RCP event, pipe producers have begun to design pipes and applications such that RCP may be avoided in most circumstances. This has led to the development of several tests, of which the Full-Scale (FS) and Small-Scale Steady State (S4) tests are most relevant.

Full Scale Test (FST) ISO 13478

Polyethylene pipes that are approximately 40 times the diameter in length are pressurized at low temperatures, and failure is initiated through blunt force impact with a striker at one end to initiate a crack. The critical pressure and temperature are directly determined. There are no Full-Scale Test facilities in the United States.

Small-Scale Steady State (S4) ISO 13477 and ASTM F1589

The S4 test pipe specimens are typically a minimum of seven times the diameter in length. Specimens are conditioned at the test temperature externally, and then moved to the S4 test rig where they are sealed at both ends and pressurized with air. A sharp chisel-edged striker impacts the pipe at one end to initiate a fast-running crack. A containment cage around the specimen and a series of baffles constrain the outside diameter of the pipe. The results are correlated to the critical temperature and pressure.

Performance Pipe's gas piping products are all tested to ISO 13477 Small-Scale Steady State with exceptional RCP resistance.

ASTM Test Values

The charts below show material physical properties, ASTM test methods for the property, and nominal values for Performance Pipe materials used for gas pipe. (Note - Per ASTM D 748, the brittleness temperature is less than <-180°F (<-118°C), therefore, Performance Pipe's Yellowstripe® 8300 pipe, Driscopipe® 8100 pipe and Driscoplex® 6500 pipe series may be used at operating temperatures down to or below <- 40°F (<-40°C)). Typical physical properties for each pipe are included below.

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Yellowstripe® 8300 HDPE Gas Distribution PIpe PE4710-PE100 / (PE3408) Typical Physical Property Pipe Data Sheet			
Property	**Unit**	**Test Procedure**	**Typical Value**
Material Designation	--	**PPI TR-4**	**PE4710 PE100**
Cell Classification	--	**ASTM D3350**	**445574C 445576C**
Pipe Properties			
Density	gms / cm^3	ASTM D1505	0.961 (black)
Melt Index (MI) Condition 190/2.16	gms / 10 minutes	ASTM D1238	0.08
Melt Index (HLMI) Condition 190/21.6	gms / 10 minutes	ASTM D1238	7.5
Hydrostatic Design Basis, (73°F)	psi	ASTM D2837	1,600
Hydrostatic Design Basis, (140°F)	psi	ASTM D2837	1,000
Minimum Required Strength	Mpa (psi)	ISO 9080	>10 (>1450)
Rapid Crack Propagation Critical Pressure (Pc), 0°C (32°F)(1)	Bar (psi)	ISO 13477	>12 bar (>174)
Color; UV Stabilizer [C]	%	ASTM D3350	Min. 2% Carbon Black UV stabilized 10 years
Pipe Test Category	---	ASTM D2513	CEE
Material Properties			
Flexural Modulus @2% strain	psi	ASTM D790	>150,000
Tensile Strength at Yield	psi	ASTM D638 (Type IV)	>3,500
Elongation at Break 2 in/min., Type IV bar	%	ASTM D638	>800
Hardness	Shore D	ASTM D2240	65
PENT	hrs	ASTM F1473	>2,000
Manufactured to ASTM D2513 for pipe. Fittings comply with ASTM D2513 and ASTM D3261.			
Thermal Properties			
Vicat Softening Temperature	°F	ASTM D1525	255
Brittleness Temperature	°F	ASTM D746	-180
Thermal Expansion	in / in / °F	ASTM D696	1.0×10^{-4}

(1) Determination made using Small-Scale Steady state. Pc calculated in accordance with ISO 13477

(2) NOTICE: This data sheet provides typical physical property information for polyethylene resins used to manufacture PERFORMANCE PIPE polyethylene piping products. It is intended for comparing polyethylene piping resins. It is not a product specification, and it does not establish minimum or maximum values or manufacturing tolerances for resins or for piping products. Some of these typical physical property values were determined using compression molded plaques. Values obtained from tests of specimens taken from piping products can vary from these typical values. This data sheet may be changed from time to time without notice. Contact Performance Pipe to determine if you have the most recent edition.

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DRISCOPIPE® 8100 HDPE Gas Distribution Pipe PE4710-PE100 / (PE3408) Typical Physical Property Pipe Data Sheet			
Property	**Unit**	**Test Procedure**	**Typical Value**
Material Designation	--	**PPI TR-4**	**PE4710 PE100**
Cell Classification	--	**ASTM D3350**	**445574C 445576C**
Pipe Properties			
Density	gms / cm^3	ASTM D1505	0.961 (black)
Melt Index (MI) Condition 190/2.16	gms / 10 minutes	ASTM D1238	0.08
Melt Index (HLMI) Condition 190/21.6	gms / 10 minutes	ASTM D1238	7.5
Hydrostatic Design Basis, (73°F)	psi	ASTM D2837	1,600
Hydrostatic Design Basis, (140°F)	psi	ASTM D2837	1,000
Minimum Required Strength	Mpa (psi)	ISO 9080	>10 (>1450)
Rapid Crack Propagation Critical Pressure (Pc), 0°C (32°F)(1)	Bar (psi)	ISO 13477	>30 bar (>435)
Color; UV Stabilizer	---	ASTM D3350	Co-extruded yellow shell UV stabilized for 4 years outdoor storage
Pipe Test Category	---	ASTM D2513	CEE
Material Properties			
Flexural Modulus @2% strain	psi	ASTM D790	>140,000
Elastic Modulus @ Secant 2% strain (2in/min, Type IV bar)	Psi	ASTM D638	>200,000
Tensile Strength at Yield	psi	ASTM D638 (Type IV)	>3,700
Elongation at Break 2 in/min., Type IV bar	%	ASTM D638	>800
Hardness	Shore D	ASTM D2240	65
PENT	hrs	ASTM F1473	>2000
Pipe is manufactured to ASTM D2513. Fittings comply with ASTM D2513 and ASTM D3261.			
Thermal Properties			
Vicat Softening Temperature	°F	ASTM D1525	255
Brittleness Temperature	°F	ASTM D746	-180
Thermal Expansion	in / in / °F	ASTM D696	1.0×10^{-4}

(1) Determination made using Small-Scale Steady state. Pc calculated in accordance with ISO 13477

(2) NOTICE: This data sheet provides typical physical property information for polyethylene resins used to manufacture PERFORMANCE PIPE polyethylene piping products. It is intended for comparing polyethylene piping resins. It is not a product specification, and it does not establish minimum or maximum values or manufacturing tolerances for resins or for piping products. Some of these typical physical property values were determined using compression molded plaques. Values obtained from tests of specimens taken from piping products can vary from these typical values. This data sheet may be changed from time to time without notice. Contact Performance Pipe to determine if you have the most recent edition.

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Driscoplex® 6500 MDPE Gas Distribution Pipe PE2708/2406 Typical Physical Property Pipe Data Sheet			
Property	**Unit**	**Test Procedure**	**Typical Value**
Material Designation	--	**PPI TR-4**	**PE2708/2406**
Cell Classification	--	**ASTM D3350**	**234373E**
Pipe Properties			
Density	gms / cm^3	ASTM D1505	0.939
Melt Index (MI) Condition 190/2.16	gms / 10 minutes	ASTM D1238	0.18
Melt Index (HLMI) Condition 190/21.6	gms / 10 minutes	ASTM D1238	---
Hydrostatic Design Basis, (73°F)	psi	ASTM D2837	1,250
Hydrostatic Design Basis, (140°F)	**psi**	**ASTM D2837**	**1,000**
Minimum Required Strength	Mpa (psi)	ISO 9080	>8.0 (>1160)
Rapid Crack Propagation Critical Pressure (Pc), 0°C (32°F)(1)	Bar (psi)	ISO 13477	>8.5 bar (>123)
Color; UV Stabilizer	---	ASTM D3350	Yellow UV stabilized for 4 years outdoor storage
Pipe Test Category	---	ASTM D2513	CEE
Material Properties			
Flexural Modulus @2% strain	psi	ASTM D790	>100,000
Elastic Modulus @ Secant 2% strain (2in/min, Type IV bar)	Psi	ASTM D638	>86,000
Tensile Strength at Yield	psi	ASTM D638 (Type IV)	>2,800
Elongation at Break 2 in/min., Type IV bar	%	ASTM D638	>800
Hardness	Shore D	ASTM D2240	63
PENT	hrs	ASTM F1473	>2000
Thermal Properties			
Vicat Softening Temperature	°F	ASTM D1525	227
Brittleness Temperature	°F	ASTM D746	-180
Thermal Expansion	in / in / °F	ASTM D696	1.0×10^{-4}
Manufactured to ASTM D2513 for pipe. Fittings comply with ASTM D2513 and ASTM D3261.			

(1) Determination made using Small-Scale Steady state. Pc calculated in accordance with ISO 13477

(2) NOTICE: This data sheet provides typical physical property information for polyethylene resins used to manufacture PERFORMANCE PIPE polyethylene piping products. It is intended for comparing polyethylene piping resins. It is not a product specification, and it does not establish minimum or maximum values or manufacturing tolerances for resins or for piping products. Some of these typical physical property values were determined using compression molded plaques. Values obtained from tests of specimens taken from piping products can vary from these typical values. This data sheet may be changed from time to time without notice. Contact Performance Pipe to determine if you have the most recent edition.

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Permeability and Permeation

Plastics are permeable to gases to varying degrees. Although the constituents of natural gas can permeate through polyethylene, the volume of gas lost through permeation is generally so low as to have an insignificant effect on the handling of natural gas in a piping system. The American Gas Association (AGA) *Plastic Pipe Manual for Gas Service* lists the permeability of PE 2406 polyethylene pipe to methane, the primary constituent of natural gas, as 4.2×10^{-3}. Using the AGA factor, one mile of 2" SDR 11 PE2708/2406 pipe carrying 100% methane at 60 psi would lose less than 0.27 ft^3 per day.

Other constituents of natural gas are typically heavier than methane, thus less permeable through polyethylene. Hydrogen is the exception; however, the concentration of hydrogen in most natural gas is so low that the actual amount of hydrogen permeation would be insignificant. At low temperatures and higher pressures, heavier hydrocarbon gases such as propane or butane may condense and liquefy in the pipe. Such condensates are known to permeate polyethylene pipe. All types of hydrocarbons (aromatic, paraffinic, etc.) have a similar effect, and the relative effect on different polyethylene pipe resins is essentially the same. Liquid hydrocarbon permeation will affect joining. ***See Cautions on Liquid Hydrocarbon Permeation, page 5.***

Design Pressure

The following formula is used to compute the design pressures for polyethylene piping systems for natural gas service at operating temperatures up to but not over 140°F (60°C). For operating temperatures below 73°F (23°C), use 73°F (23°C) Design Pressures.

$$P = \frac{2S}{(SDR - 1)} \times f$$

Where:

P = Design Pressure in pounds per square inch gauge (psig);

S = Long Term Hydrostatic Strength (Hydrostatic Design Basis) psi, at pipeline operating temperature; See Table 5.

f = Design factor (specified in CFR 192.121); See Table 6.

SDR= Standard Dimension Ratio

$$SDR = \frac{\text{Pipe Nominal Outside Diameter}}{\text{Pipe Minimum Wall Thickness}}$$

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Table 5: Hydrostatic Design Basis

Hydrostatic Design Basis or Long Term Hydrostatic Strength, S				
Performance Pipe Product Series	73.4F Data	100F Interpolated	120F Interpolated	140F Data
Driscoplex® 6500 Pipe (MDPE)	1250	1250	1000	1000
Driscopipe® 8100 Pipe (HDPE)	1600	1250	1000	1000
Yellowstripe® 8300 Pipe (HDPE)	1600	1250	1000	1000

Table 6: Design Service Factor

Application	Design (service) Factor, f
Gas distribution and transmission per CFR 49 Part 192, §192.121	0.32
Gas distribution and transmission in Canada per CSA Z662-96	0.40
Gas distribution or transmission piping that is permeated by solvating chemicals such as liquid hydrocarbons or liquefied gas condensate	0.25

Operating Pressures (psig)

The following tables provide ***maximum allowable operating pressures (MAOP)*** and recommended maximum design pressure rating (PR) for PE2708 (PE2406) pipes and PE4710/PE100 (PE3408) pipes for gas distribution service at the indicated operating temperatures. PE pipes of the same DR and Material Designation Code but different outside diameters have the same Design (Working) Pressure Ratings. Pipe minimum wall thickness is determined by dividing the pipe average outside diameter (O.D.) by the DR number.

Pressure ratings are calculated in accordance with applicable federal codes. A check should be made to determine if these pressures apply under the state and/or local codes governing the specific application. Use 73°F (23°C) pressure ratings for operating temperatures below 73°F (23°C).

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Table 7: MAOP Driscoplex® 6500 MDPE Gas Distribution Pipe (PE2708)

MAOP & Maximum Design Pressure Rating (PR) for Dry Natural Gas Service --				
PE2708 (PE2406)	Drisciplex® 6500 Pipe PE2708 (PE2406) (Class 1, 2, 3, and 4 location per U.S. federal regulations CFR 192.121 – Design (Service) Factor 0.32‡)			
SDR	73°F (23°C) *(PSIG)*	100°F (38°C) *(PSIG)*	120°F (48°C) *(PSIG)*	140°F (60°C) *(PSIG)*
7.0	125†	125†	107	107
7.3	125†	125†	102	102
9.0	100	100	80	80
9.3	96	96	77	77
10.0	89	89	71	71
11.0	80	80	64	64
11.5	76	76	61	61
12.5	70	70	56	56
13.5	64	64	51	51

‡ Class 1, 2, 3, & 4 locations per U.S. federal regulations.
† 49 CFR Part 192.123(e) allows and limits design pressure to 125psig, provided the pressure is calculated in accordance with 49CFR 192.121.

Table 8: MAOP Driscopipe® 8100 Pipe & Yellowstripe® 8300 Pipe (PE4710)

MAOP & Maximum Design Pressure Rating (PR) for Dry Natural Gas Service --				
PE4710/PE100 (PE3408)	Driscopipe® 8100 pipe and Yellowstripe® Pipe PE4710-PE100 (Class 1, 2, 3, and 4 location per U.S. federal regulations CFR 192.121 – Design (Service) Factor 0.32‡)			
SDR	73°F (23°C) *(PSIG)*	100°F (38°C) *(PSIG)*	120°F (48°C) *(PSIG)*	140°F (60°C) *(PSIG)*
7.0	125†	125†	107	107
7.3	125†	125†	102	100†
9.0	125†	100	80	80
9.3	123†	96	77	77
11.0	102	80	64	64
12.5	89	70	56	56
13.5	82	64	51	51

‡ Class 1, 2, 3, & 4 locations per U.S. federal regulations.
† 49 CFR Part 192.123(e) allows and limits design pressure to 125psig, provided the pressure is calculated in accordance with 49CFR 192.121.

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Cold Bending Radius

The allowable cold bending radius for DriscoPlex® 6500 pipe 2406 is dependent upon the pipe OD, DR and the presence of fittings in the bend. See Performance Pipe's Technical Note *PP-819-TN Field Bending of DriscoPlex® PE Piping*.

Table 9: Allowable Cold Bending Radius

Pipe Dimension Ratio	Allowable Cold Bending Radius
9 or less	20 times the pipe OD
>9 to 13.5	25 times the pipe OD
13.5 or greater	27 times the pipe OD
Fitting or flange present in the bend	**100 times the pipe OD**

Special Considerations for Plowing and Planting

Plowing and planting involve cutting a narrow trench and feeding the pipe into the trench through a shoe or chute fitted just behind the trench cutting equipment. The shoe or chute feeds the pipe into the bottom of the cut. The minimum bend radius of the pipe through the shoe may be tighter than the minimum bend radius of the pipe used for a permanent long-term installation, but it must not be so tight that the pipe kinks. Table 10 presents the minimum short-term bend ratio for applications such as plowing and planting. The pipe's path through the shoe or chute should be as friction free as practicable to reduce additional outerfiber tensile stresses. Generally plowing and planting is limited to 12" and smaller pipes.

Table 10: Minimum Short-term Cold Bending Radius

Pipe Dimension Ratio	Minimum Short-Term bending Radius
9	10
>9 to 13.5	13
>13.5 to 17	17

Propane (LPG) Gas Service

The Office of Pipeline Safety Advisory Bulletin No. 73-4, dated April 1973, states, "It is the operator's responsibility to assure the integrity of the plastic pipe selected for use in the piping system, and this should be based on a favorable recommendation from the manufacturer. Therefore, the Federal minimum safety standards do permit the use of plastic in a properly engineered underground system of LPG distribution conforming to the limitations of these regulations." DriscoPlex® 6500 pipe (PE2708), Driscopipe® 8100 pipe (PE4710) and Yellowstripe® 8300 pipe (PE4710) series products meet the requirements of ANSI/NFPA 58 *Standard for the Storage and Handling of Liquefied Petroleum Gases.*

The Plastics Pipe Institute has made the following "Use Recommendation" for polyethylene piping systems for commercial propane systems:

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PPI Use Recommendation (Technical Report TR-22)

The information collected indicates that polyethylene plastic piping is satisfactory for transporting LPG and its major component, propane gas. This information also indicates that pressure design parameters based on propane gas should be adequate and reasonable. However, until more information is available, these use recommendations cover only commercial propane vapor in detail.

1. The polyethylene plastic pipe, tubing and fittings should be only those specific types designated as PE 2708 or PE 4710 and meeting the appropriate requirements of ASTM D 2513.
2. A Hydrostatic Design Basis of 1000 psi should be used in the design of polyethylene pipe systems for propane gas distribution at pipe temperatures of 73°F or lower. The long-term hydro static strength measurements should be made in accordance with ASTM D 2837.
3. Polyethylene should be used only in underground propane gas distribution systems designed to operate at internal pressures and temperatures such that condensation will not occur.

It is also recommended that operating pressures be limited to 30 psig or less.

In cases where condensation does occur in a propane system or propane enriched system and the presence of condensation is of relatively short duration, there is no indication of loss of physical integrity or observable change in polyethylene pipe. Under actual operating conditions, in a properly designed system, the pressures and temperatures are such that revaporization of any propane condensates will usually occur. Experience with propane liquids in polyethylene shows that there is no cumulative effect of intermittent, short duration exposure of propane condensate in polyethylene. For additional information, see PPI Technical Report TR-22. Exposure to liquefied propane condensates for extended periods may affect joining.

Mercaptans

Mercaptans are a group of organic compounds containing a Sulfur-Hydrogen bond that have a distinct odor in small concentrations. Natural gas is an odorless hydrocarbon. Natural gas carriers and distributors add mercaptans to natural gas to warn of leaks and to alert the presence of natural gas atmospheres. New plastic pipes have the tendency to absorb mercaptans, causing the odor to fade or become faint. The effect is not long term and after a period of time the distinctive odor of mercaptan is readily detected when released.

Mercaptan enriched natural gas has the possibility of inducing a phenomenon known as "odor fatigue." The condition can cause nasal passages to become saturated with the smell of gas over time, making it difficult to continue to detect the mercaptan odor.

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When Performance Matters Rely on Performance Pipe

CONTACT INFORMATION:

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Polyethylene Valves for Natural Gas.

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Providing valves and equipment to the world's energy markets for over 100 years.

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Polyethylene Valves

Made in the U.S.A.

Kerotest Manufacturing Corp. has over a 100 year commitment to the gas distribution industry. So Polyball will always be American made, supported and distributed. With ample inventory at all times.

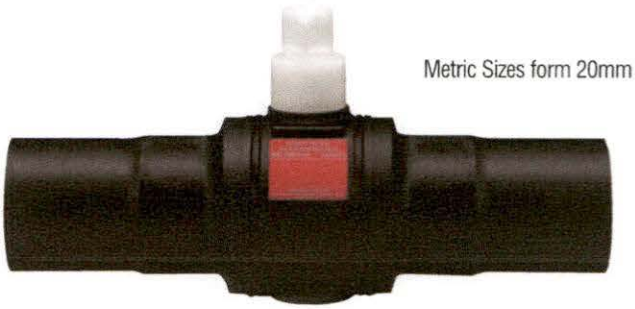
Made to perform and comply.

- 49 CFR Part 192
- ASTM D2513
- ASTM F2897
- ASME B16.40
- CSA standard B137.4 - 02
- CSA International certified (Canadian Standard Association)

Made to meet your needs in these applications:

- Natural Gas Distribution
- Natural Gas Gathering
- Landfill Gas (Methane)
- Air
- Inert Gases (Argon, Helium, Neon)

Full port and reduced port sizes from 1/2" to 12" IPS.



Metric Sizes form 20mm to 315mm.

Available with High Head Extensions in varying heights to meet specific installation requirements. These valves meet the same strict standards of all Polyball valves.

GENERAL INFORMATION

ITEM	OPERATING FEATURES
OPERATING	PE 2406/PE 2708 : 80 psig (5.5 bar), SDR 11 PE 3408/PE 4710 : 100 psig (6.9 bar), SDR 11 PE 3408/PE 4710 : 125 psig (8.6 bar), SDR 7.0, 9.0, 9.3
MATERIALS	Medium Density Polyethylene (PE 2406/PE 2708) High Density Polyethylene (PE 3408/PE 4710)
TEMPERATURE	From -20°F to 140°F (-29°C to 60°C)
PIPE CONNECTION VIA	Butt Fusion, Mechanical Fittings, Electrofusion
BORE	Full Port or Reduced Port
STEM TYPE	Standard or High Head Extended Stem, length as required
SDR	SDR'S available – 7.0, 9.0, 9.3, 11, 11.5, 12.5, 13.5, 15.5, 17, 21

KEROTEST®
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Providing valves and equipment to the world's energy markets for over 100 years.

Kerotest Manufacturing Corp.
5500 Second Avenue • Pittsburgh, PA 15207
412-521-5942 • Fax: 412-521-5990
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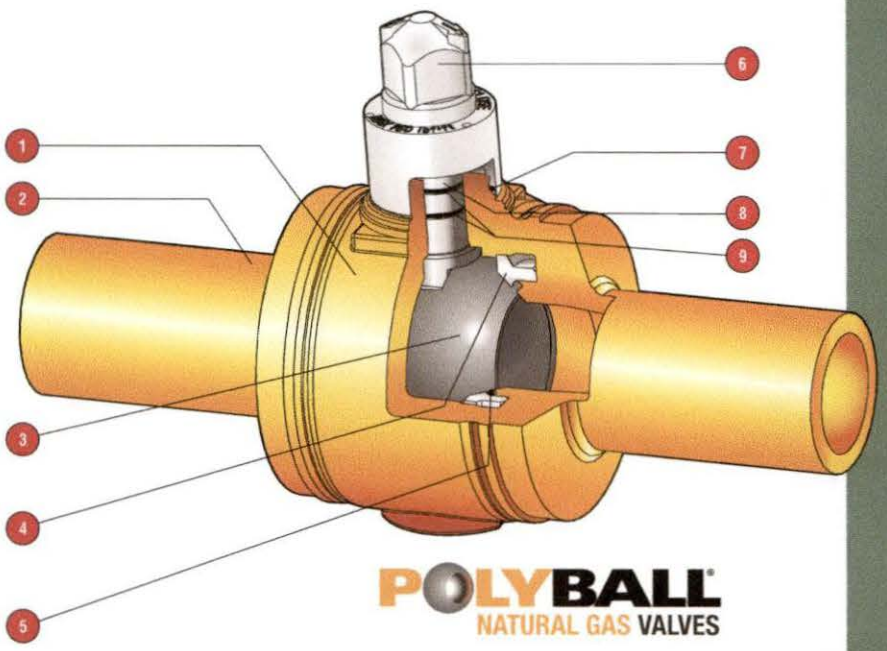
Polyethylene Valves Made in the U.S.A.

The Polyball valve is manufactured at our Mansura, Louisiana facility. Custom, dedicated tooling and equipment have been developed for every valve size to achieve and maintain quality levels during production and minimize variation in all processes.

At assembly, each valve is assigned a unique serial number that provides complete traceability for critical components. The serial number allows complete traceability from the customer's installation back to the raw material.

All POLYBALL valves now feature the new industry standard tracking and traceability code per ASTM F2897 that allows instant access to individual valve specifications. With decoding software, simply scan the barcode to see the production date, size, material and valve type, lot code and more.

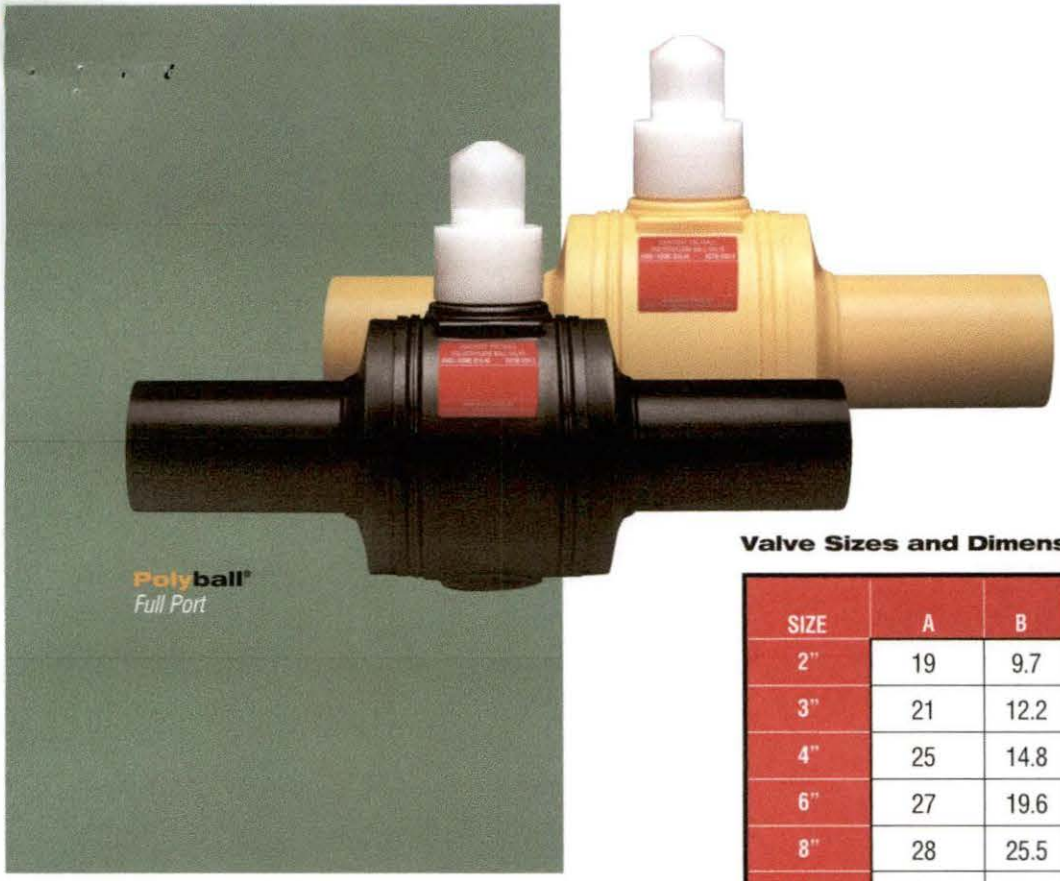


POLYBALL®
NATURAL GAS VALVES

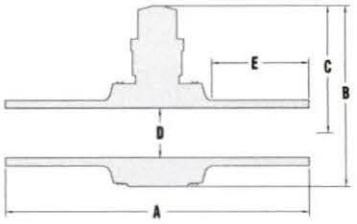
MATERIALS OF CONSTRUCTION

NO.	COMPONENT	MATERIAL	FEATURES AND BENEFITS
1	Body	POLYETHYLENE	PE 2406/PE 2708, medium density PE 3408/PE 4710, high density
2	Ends	POLYETHYLENE	PE 2406/PE 2708, various SDR's PE 3408/PE 4710, various SDR's
3	Ball	POLYPROPYLENE	High strength, long life and low operating torque
4	Retainer	POLYPROPYLENE	Positive restraint under any condition; Retains seat under high differential pressure
5	Ball Seat	BUNA-N	Reliable sealing from -20°F to 140°F
6	Actuator	POLYPROPYLENE	2" operating square, positive position indication, over-torque protection
7	Weather Seal	BUNA-N	Protects from ground water and dirt
8	Stem	ACETAL *	Excellent durability and strength, blowout proof
9	Stem Seals	BUNA-N	Redundant sealing with dual o-rings

** Stem is stainless steel on 2" RP, 1 1/2" FP, 1 1/4" FP sizes.*



Polyball®
Full Port



Valve Sizes and Dimensions (Approx. inches) **Full Port**

SIZE	A	B	C	D	E	Cv	WEIGHT (lbs)
2"	19	9.7	7.0	1.90	6.4	180	5
3"	21	12.2	8.7	2.70	6.4	400	10
4"	25	14.8	10.2	3.63	7.6	710	20
6"	27	19.6	13.2	5.25	7.0	1290	42
8"	28	25.5	17.2	6.70	5.3	2170	96
12"	93	31.3	19.4	10.10	35	5400	440

12" POLYBALL Full Port features a 10.1" port opening.

Polyball®
Full Port

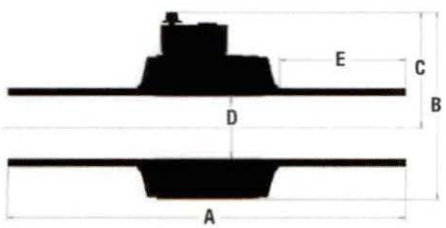
Body is high density PE 3408/ PE 4710 polyethylene.

Nipple extensions available in PE 3408/PE 4710 or PE 2406/PE 2708.

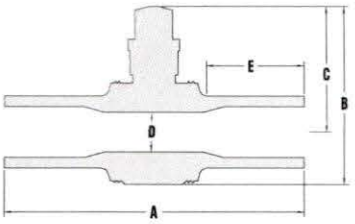
The gear box features a 6:1 ratio and is also sealed against outside contaminants making it virtually waterproof.

12" Full Port also available with bypass option.

All POLYBALL valves now feature the new industry standard tracking and traceability code per ASTM F2897 that allows instant access to individual valve specifications. With decoding software, simply scan the barcode to see the production date, size, material and valve type, lot code and more.

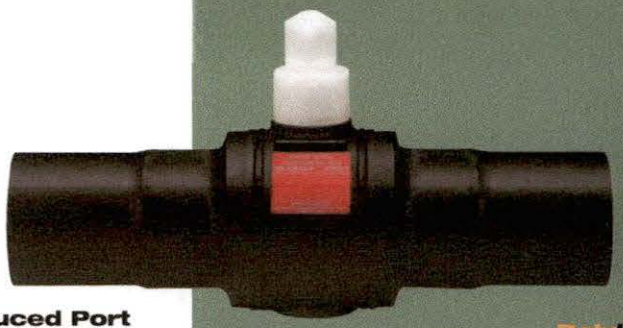


12" FULL PORT DIMENSIONS (Approx. Inches)						
A	B	C	D	E	Weight (lbs)	SDR
93	31.3	19.4	10.10	35	440	9 to 21

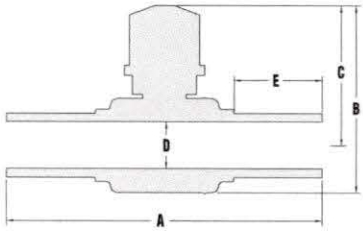


Valve Sizes and Dimensions (Approx. inches) **Reduced Port**

SIZE	A	B	C	D	E	Cv	WEIGHT (lbs)
3"	19	9.6	6.9	1.90	6.8	180	5.3
4"	21	12.2	8.7	2.70	6.5	450	11
6"	25	14.8	10.2	3.63	7.3	910	26
8"	27	19.6	13.2	5.25	7.2	2200	47
10"	28	25.5	17.2	6.70	5.5	4450	102
12"	28	25.5	17.2	6.70	5.7	4950	110



Polyball®
Reduced Port



Valve Sizes and Dimensions (Approx. inches)

	SIZE	A	B	C	D	E	Cv	WEIGHT (lbs)
F	1.25"	11.8	6.9	5.2	1.38	3.2	100	2
F	1.5"	11.8	6.9	5.2	1.38	3.2	150	2
R	2"	11.8	6.9	5.2	1.38	3.2	150	2

(**F**) Full Port (**R**) Reduced Port

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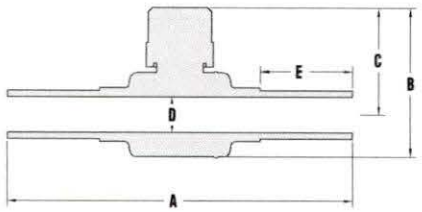


Valve Sizes and Dimensions (Approx. inches) **Service Port**

SIZE	A	B	C	D	E	Cv	WEIGHT (lbs)
1/2" CTS	11.5	5.2	3.7	1.01	3.0	7	1
1/2" IPS	11.5	5.2	3.7	1.01	3.0	21	1
3/4" CTS	11.5	5.2	3.7	1.01	3.0	22	1
3/4" IPS	11.5	5.2	3.7	1.01	3.0	30	1
1" CTS	11.5	5.2	3.7	1.01	3.0	33	1
1" IPS	12	5.2	3.7	1.01	3.2	42	2
1.25" CTS	12	5.2	3.7	1.01	3.2	45	2
1.25" IPS	12	5.2	3.7	1.01	3.2	49	2

Polyball®
Service Valve

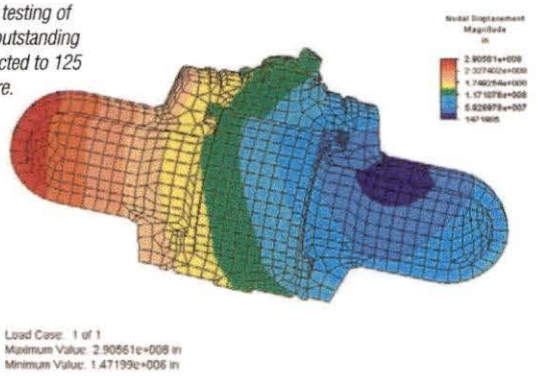
All dimensions are approximate and subject to change. Consult Factory for certified dimensions.

Pass With Flying Colors

Kerotest Polyball Polyethylene Ball Valves meet the requirements of ASME B16.40: Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems.

Independent third party evaluation. A complete report, demonstrating compliance with ASME B16.40 is available upon request. All qualification and production tests were successfully completed. Additional tests performed by Kerotest beyond the B16.40 requirements include: Burst Test, Cycle Test, Impact Test, Bend Test and Tensile Test.

Linear static stress testing of Polyball delivered outstanding results when subjected to 125 psi internal pressure.



Test conditions for ASME B16.40 and additional tests.

TEST ITEM	TEST METHOD	SDR 11 HIGH DENSITY PE 3408/4710 SDR 9 MEDIUM DENSITY PE 2406/2708	SDR 9 HIGH DENSITY PE 3408/4710
SEAT TEST	Air seat test under water, both directions	4 psi (0.3 bar) 150 psi (10.4 bar)	4 psi (0.3 bar), 190 psi (13 bar)
SHELL TEST	Air test under water	4 psi (0.3 bar) 150 psi (10.4 bar)	4 psi (0.3 bar) 190 psi (13 bar)
OPERATIONAL TESTING	Valve operated 10 times at full differential pressure	100 psi (6.9 bar)	125 psi (8.6 bar)
BEND TEST	20 pipe diameters bend radius at differential pressure operation, seat leakage checked	10 psi (0.7 bar) 100 psi (6.9 bar)	10 psi (0.7 bar) 125 psi (8.6 bar)
TORQUE TEST	Operating torque at -20°F (-29°C) and 100°F (38°C)	100 psi (6.9 bar)	125 psi (8.6 bar)
SUSTAINED PRESSURE TEST	Tested at 176°F (80°C)	134 psi (9.2 bar) 170 hours min	148 psi (10.2 bar) 170 hours min
IMPACT RESISTANCE	Valve impacted with 20 lb. weight from 3 ft. at 0°F (-18°C) and 100°F (38°C)	5 times	5 times
HIGH PRESSURE TEST	High pressure Shell Test	> 600 psi (41 bar)	> 700 psi (48 bar)

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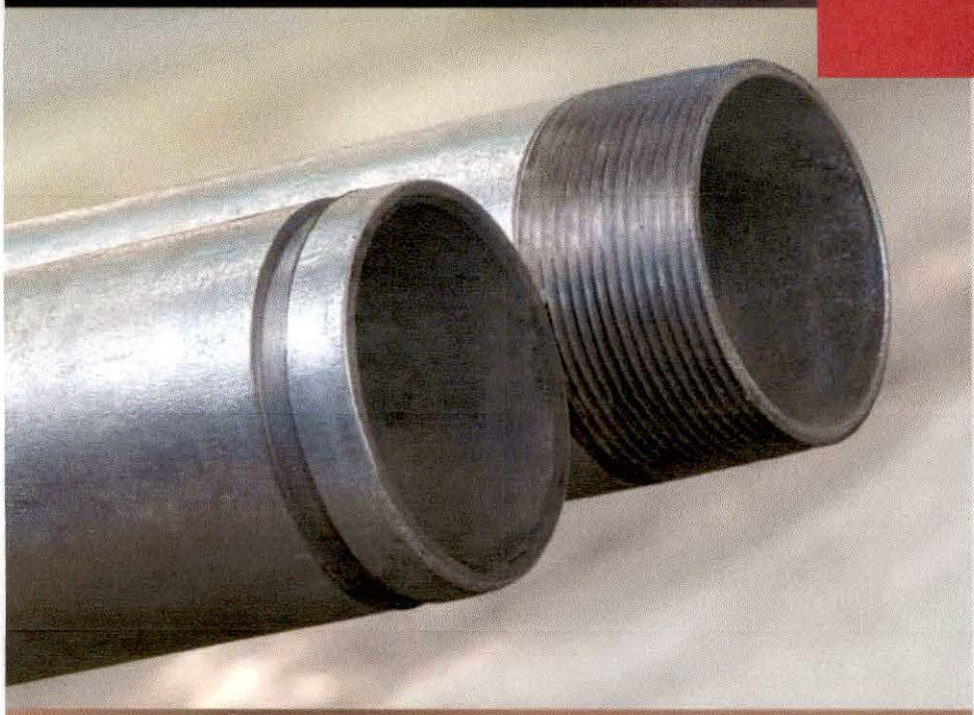

Standard Pipe

Wheatland Tube
A DIVISION OF ZEKELMAN INDUSTRIES

Standard Pipe: SureThread™ and ERW

Setting the standard in the standard pipe industry

With a tradition of service and quality that's 80-plus years strong, Wheatland Tube is the only domestic, full-line producer of continuous weld (CW) and electric resistance weld (ERW) ¼–18 NPS pipe today. Wheatland is also a worldwide leader in hot-dip galvanization technology.

¼–18 nominal sizes produced and stocked in a variety of ASTM standards

Standard hot-dip galvanization to ASTM A53 requirements

350 combinations of finish, end treatments and lengths

All Wheatland black and galvanized pipe (½–6 NPS) is approved for drinking water usage

A Full Line of Pipe Products for Any Application

Wheatland produces and stocks pipe of ¼–18 nominal sizes in a variety of ASTM standards. SureThread (ASTM A53) and ERW are used for mechanical and pressure applications, and for ordinary uses in steam, water, gas and air lines.

More than 350 different combinations of finish, end treatments and lengths are available on standard pipe. Our standard process is hot-dip galvanization to ASTM A53 requirements.

Surface finishes include black, passivate, galvanized, uncoated, pickled, pickled and oiled, bare and soluble oil. End finishes include plain end, roll groove, cut groove, threaded and coupled, and threads only (one or both ends).

Documented Quality Assurance

Wheatland facilities have quality systems in place and are registered to ISO 9001:2008 Quality Management Systems at minimum. Strategically located in the U.S., we carry a large inventory and can ship quickly to meet your tight delivery schedules.

MADE IN THE USA

For more information, call **800.257.8182** or visit **wheatland.com**

A53 Electric Resistance Weld Pipe, Type F, Grade A

The continuous weld process creates a uniform grain structure to make bending, cutting and threading easier

Ideal for applications with frequent threading, grooving and bending requirements

Finish options:
Black, passivate, bare, pickled and oiled, and hot-dip galvanized

Sizes:
¼–4 NPS

Standard and extra heavy

Produced to ASTM A53/A53M, federal specification WW-P404 and ASME B36.10M

TEST PRESSURES (GRADE A)

NOMINAL SIZE	TEST PRESSURE (psi)
¼	700
½	700
¾	700
1	700
1¼	1,200
1½	1,200
2	2,300
2½	2,500
3	2,220
3½	2,030
4	1,900

ASTM A53, TYPE F, WEIGHTS AND DIMENSIONS

TRADE SIZE	OD	SCHEDULE 40		SCHEDULE 80	
	in.	Wall (in.)	Weight (lbs./ft.)	Wall (in.)	Weight (lbs./ft.)
¼	0.54	0.088	0.43	0.119	0.54
⅜	0.675	0.091	0.57	0.126	0.74
½	0.84	0.109	0.85	0.147	1.09
¾	1.05	0.113	1.13	0.154	1.48
1	1.315	0.133	1.68	0.179	2.17
1¼	1.66	0.14	2.27	0.191	3
1½	1.900	0.145	2.72	0.2	3.63
2	2.375	0.154	3.66	0.218	5.03
2½	2.875	0.203	5.8	0.276	7.67
3	3.5	0.216	7.58	0.3	10.26
3½	4	0.226	9.12	0.318	12.52
4	4.5	0.237	10.8	0.337	15

TENSILE REQUIREMENTS

TENSILE STRENGTH, MIN.	YIELD STRENGTH, MIN.	ELONGATION IN 2
48,000 psi	30,000 psi	Refer to A53 table X 4.1, latest revisions—ASTM A53/A53M

BENDING TEST (LESS THAN NPS 2)

	DEGREE OF BEND	DIAMETER OF MANDREL
Standard	90°	12x pipe OD
Close Coiling	90°	8x pipe OD

FLATTENING TEST (NPS 2 AND GREATER)

To test the quality of the weld, we position the weld at 90° from the direction of force and flatten until the OD is ¾ of the original outside diameter. No cracks should occur along the inside or outside surface of the weld.

STANDARD PIPE SCHEDULE 40 — ASTM A53 GRADES A AND B

TRADE SIZE	DN DESIGNATOR	OD		ID		WALL THICKNESS		NOMINAL WEIGHT (MASS) PER UNIT LENGTH			
		in.	mm	in.	mm	in.	mm	Plain End (lbs./ft.)	Plain End (kg/m)	Threads & Couplings (lbs./ft.)	Threads & Couplings (kg/m)
¼	8	0.540	13.7	0.364	9.2	0.088	2.24	0.43	0.63	0.43	0.63
⅜	10	0.675	17.1	0.493	12.5	0.091	2.31	0.57	0.84	0.57	0.84
½	15	0.840	21.3	0.622	15.8	0.109	2.77	0.85	1.27	0.86	1.27
¾	20	1.050	26.7	0.824	20.9	0.113	2.87	1.13	1.69	1.14	1.69
1	25	1.315	33.4	1.049	26.6	0.133	3.38	1.68	2.50	1.69	2.50
1¼	32	1.660	42.2	1.380	35.1	0.140	3.56	2.27	3.39	2.28	3.40
1½	40	1.900	48.3	1.610	40.9	0.145	3.68	2.72	4.05	2.74	4.04
2	50	2.375	60.3	2.067	52.5	0.154	3.91	3.66	5.44	3.68	5.46
2½	65	2.875	73.0	2.469	62.7	0.203	5.16	5.80	8.63	5.85	8.67
3	80	3.500	88.9	3.068	77.9	0.216	5.49	7.58	11.29	7.68	11.35
3½	90	4.000	101.6	3.548	90.1	0.226	5.74	9.12	13.57	9.27	13.71
4	100	4.500	114.3	4.026	102.3	0.237	6.02	10.80	16.07	10.92	16.23
5	125	5.563	141.3	5.047	158.2	0.258	6.55	14.63	21.77	14.90	22.07
6	150	6.625	168.3	6.065	154.1	0.280	7.11	18.99	28.26	19.34	28.58
8	200	8.625	219.1	7.981	202.7	0.322	8.18	28.58	42.55	29.35	43.73
10	250	10.750	273.0	10.020	254.5	0.365	9.27	40.52	60.29	41.49	63.36
12	300	12.750	323.0	12.000	304.8	0.375	9.52	49.61	73.78	51.28	76.21
14	350	14.000	355.6	13.250	336.5	0.375	9.52	54.62	81.25	-	-
16	400	16.000	406.4	15.250	387.5	0.375	9.52	62.64	93.17	-	-
18	450	18.000	457.0	17.250	438.1	0.375	9.52	70.65	105.10	-	-

Black and galvanized Schedule 40 A53 ERW Grade B trade sizes ¼–8 are FM Approved.

FM APPROVED

EXTRA-HEAVY PIPE SCHEDULE 80 — ASTM A53, TYPE F, GRADE A

TRADE SIZE	DN DESIGNATOR	OD		ID		WALL THICKNESS		NOMINAL WEIGHT (MASS) PER UNIT LENGTH			
		in.	mm	in.	mm	in.	mm	Plain End (lbs./ft.)	Plain End (kg/m)	Threads & Couplings (lbs./ft.)	Threads & Couplings (kg/m)
¼	8	0.540	13.7	0.302	7.7	0.119	3.02	0.54	0.80	0.54	0.80
⅜	10	0.675	17.1	0.423	10.7	0.126	3.20	0.74	1.10	0.74	1.10
½	15	0.840	21.3	0.549	13.9	0.147	3.73	1.09	1.62	1.09	1.62
¾	20	1.050	26.7	0.742	18.8	0.154	3.91	1.48	2.20	1.48	2.21
1	25	1.315	33.4	0.957	24.3	0.179	4.55	2.17	3.24	2.19	3.25
1¼	32	1.660	42.2	1.278	32.5	0.191	4.85	3.00	4.47	3.03	4.49
1½	40	1.900	48.3	1.500	38.1	0.200	5.08	3.63	5.41	3.65	5.39
2	50	2.375	60.3	1.939	49.3	0.218	5.54	5.03	7.48	5.08	7.55
2½	65	2.875	73.0	2.323	59.0	0.276	7.01	7.67	11.41	7.75	11.52
3	80	3.500	88.9	2.900	73.7	0.300	7.62	10.26	15.27	10.35	15.39
3½	90	4.000	101.6	3.364	85.4	0.318	8.08	12.52	18.63	12.67	18.82
4	100	4.500	114.3	3.826	97.2	0.337	8.56	15.00	22.32	15.20	22.60

PERMISSIBLE VARIATIONS — ASTM A53 GRADES A AND B PIPE

	OD	OVER	UNDER
Outside Diameter	NPS ⅛ to 1½; DN 6 to 40	1/64 (0.4 mm)	1/64 (0.4 mm)
	NPS 2 and up; DN 50 and up	1%	1%
Wall Thickness at Any Point	—	—	12.5%
Weight	—	10%	10%

Mechanical Properties:
Grade A: Yield — 30,000 psi [205 MPa] minimum; Tensile — 48,000 psi [330 MPa] minimum.
Grade B: Yield — 35,000 psi [240 MPa] minimum; Tensile — 60,000 psi [415 MPa] minimum.

A53 Electric Resistance Weld Pipe, Type E, Grade B

Suitable for welding, threading and grooving

Finish options:
Black and hot-dip galvanized

Sizes:
Schedule 40, 2–18 NPS

Produced to ASTM A53/A53M, federal specification WW-P404 and ASME B36.10M

ASTM A53, TYPE E, WEIGHTS AND DIMENSIONS

TRADE SIZE	OD	NOMINAL WALL THICKNESS	WEIGHT
	in.	in.	lbs./ft.
2	2.375	0.154	3.66
2½	2.875	0.203	5.80
3	3.500	0.216	7.58
4	4.500	0.237	10.80
5	5.563	0.258	14.63
6	6.625	0.280	18.99
8	8.625	0.322	28.58
10	10.750	0.365	40.52
12	12.750	0.375	49.61
14	14.000	0.375	54.62
16	16.000	0.375	62.64
18	18.000	0.375	70.65

HYDROSTATIC AND NON-DESTRUCTIVE ELECTRIC TESTING

Hydrostatic inspection test pressures for plain-end pipe are listed in Table X 2.2 of the A53/A53M industry specification. Test pressures are maintained for a minimum of five seconds. Non-destructive electric testing of the weld seam is required on each length of ERW pipe NPS 2 and larger.

TENSILE REQUIREMENTS

TENSILE STRENGTH, MIN.	YIELD STRENGTH, MIN.
60,000 psi	35,000 psi

BENDING TEST (COLD)

DEGREE OF BEND	DIAMETER OF MANDREL
90°	12x pipe OD

Wheatland Tube
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About Wheatland Tube Standard Pipe

Wheatland produces a full line of standard pipe — SureThread™ and ERW pipe, lance pipe and seamless pressure pipe. We're the industry leader in hot-dip galvanized pipe, and we offer more than 350 different combinations of finish, end treatments and lengths on our standard pipe.

All Wheatland manufacturing locations' quality management systems are certified to ISO 9001:2008 requirements.

For more information, contact Wheatland Tube at:
800.257.8182 or **info@wheatland.com**
Or, visit our website at wheatland.com

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WST-112216

EXHIBIT 4

EXHIBIT 4

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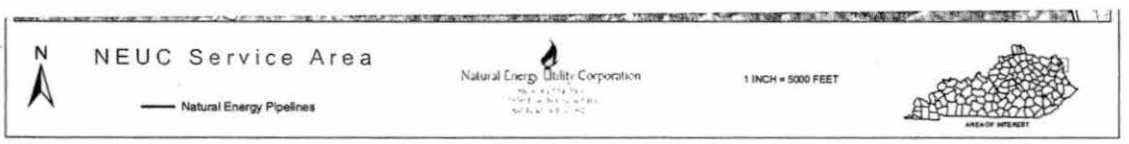

EXHIBIT 5

Vendor	Material	Units of Measure	Units	Pricing	Total
McJunkin	[redacted]				
Meter Station	Meter Station	Lot Price	[redacted]		
[redacted]	Line Construction/Bore	Per Foot	[redacted]		
EN Engineering	Line Survey	Lot Price	[redacted]		
[redacted]	Bore U.S. RT 23	Per Foot	[redacted]		
	Lines Markers	Each	[redacted]		
Legal	Permits	Lot Price	[redacted]		
					[redacted]

EXHIBIT 5

CONFIDENTIAL

EXHIBIT 6

[redacted] Income and Expense statement

Year 1	17-Jun	17-Jul	17-Aug	17-Sep	17-Oct	17-Nov	17-Dec	18-Jan	18-Feb	18-Mar	18-Apr	18-May
Income												
Volume	[redacted]											
Unit/cost	[redacted]											
Revenue	[redacted]											
Expenses												
Metering	[redacted]											
Admin												
Maint												
Gas/cost												
Total	[redacted]											
Net	[redacted]											

EXHIBIT 6

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Year 2
18-Jun
18-Jul
18-Aug
18-Sep
18-Oct
18-Nov
18-Dec
19-Jan
19-Feb
19-Mar
19-Apr
19-May
Income
Volume
Unit/cost
Revenue
Expenses
Metering
Admin
Maint
Gas/cost
Total
Net


Year 3
19-Jun
19-Jul
19-Aug
19-Sep
19-Oct
19-Nov
19-Dec
20-Jan
20-Feb
20-Mar
20-Apr
20-May
Income
Volume
Unit/cost
Revenue
Expenses
Metering
Admin
Maint
Gas/cost
Total
Net

Application

CONTAINS

LARGE OR OVERSIZED

MAP(S)

RECEIVED ON:
01/24/2017