FILED
AT 11:30 O'CLOCK A M
MAR 07 2019
ARTURO GUAJARDO, JR. COUNTY CLERK
HIDALGO COUNTY, TEXAS
BY DEPUTY

EXHIBIT "C"

STATE OF TEXAS §

COUNTY OF HIDALGO §

LPA STANDARD UTILITY AGREEMENT

DICKER RD.

LONE STAR PIPELINE ADJUSTMENT,

REMOVAL, AND/OR REPLACEMENT

This Agreement is made by and between the County Of Hidalgo, Texas hereinafter referred to as "County" and Lonestar Pipeline Company, LLC, hereinafter referred to as "Utility", acting by and through its duly authorized representative, and shall be effective on the date of approval and execution by and on behalf of the County.

WHEREAS, the County of Hidalgo has deemed it necessary to make certain highway improvements as designated by the County and approved by the Federal Highway Administration located on the highway as indicated above;

WHEREAS; the County is a county in the State of Texas;

WHEREAS, the proposed highway improvements will necessitate the adjustment, removal, and/or relocation of certain facilities of the Utility as indicated in the following statement of work: *adjustment of 8" gas line* and the proposed roadway widening being performed by the County with oversight from the Texas Department of Transportation and more specifically shown in the Utility's plans, specifications and estimated costs, which are attached hereto in Attachment "A";

WHEREAS, the County, in receipt of evidence it deems sufficient, acknowledges the Utility's interest in certain lands and/or facilities that entitle it to reimbursement for the adjustment, removal, and relocation of certain facilities located upon lands as indicated in Attachment "A";

WHEREAS, the County, in receipt of evidence it deems sufficient, acknowledges the Utility's interest in certain lands and/or facilities that entitle it to reimbursement for the adjustment, removal, and relocation of certain facilities located upon lands as indicated in Attachment "A";

NOW, THEREFORE, for and in consideration of the premises and mutual promises, covenants and agreements hereinafter set forth, and intending to be legally bound, the County and the Utility agree as follows:

EXHIBIT "C"

1. The County will pay the Utility all eligible actual costs which are incurred in the adjustment, removal, and/or relocation of the Utility's facilities.

2. The Utility agrees that all conduct under this Agreement, including but not limited to the adjustment, removal, and/or relocation of the facility, the development of reimbursement of costs, any environmental requirements, and retention of records will be in accordance with 23 CFR 645, Subparts A & B and all other applicable federal and state laws, rules and regulations. The Utility agrees to supply, upon request by the County, proof of compliance with the aforementioned laws, rules and regulations prior to commencement of construction.

3. The Utility agrees to develop relocation or adjustment costs by accumulating actual direct and related indirect costs in accordance with a work order accounting procedure prescribed by the County, or may, with the County's written approval, accumulate actual direct and related indirect costs in accordance with an established accounting procedure developed by the Utility. The bill for the work hereunder will be submitted to the County not later than ninety (90) days after completion of the work.

4. Upon execution of this Agreement by both parties hereto, the County will, by written notice, authorize the Utility to proceed with the necessary adjustment, removal, and/or relocation. The Utility agrees to proceed in a diligent manner and will take all prudent actions to avoid delay or interference with the highway construction.

5. The Utility will endeavor to perform this work at its earliest window of opportunity.

6. The County will, upon satisfactory completion of the relocation or adjustment, receipt of a proper certification by the Utility that the work has been completed in accordance with the approved plans and specifications, receipt and verification of the bill prepared in an approved form and manner, and concurrence by TxDOT, make payment to the Utility.

7. This Agreement in its entirety consists of the following:

    i. LPA Standard Utility Agreement;
    ii. Plans of Adjustment (color coded), Specifications, and Estimated Costs (Attachment "A")(2 Originals);
    iii. Accounting Method (Attachment "B")(2 Originals);
    iv. Schedule (Start & End Dates) (Attachment "C")(2 Originals);
    v. Statement Covering Contract Work – TxDOT ROW-U-48 (Attachment "D")(2 Originals);
    vi. Proof of Property Interest – TxDOT ROW-U-1A (Attachment "E")(2 Originals and 1 copy of recorded instrument);
    vii. Eligibility Ratio(Attachment "F")(2 Originals);
    viii. Cost Comparison (if Betterment) (Attachment "G")(2 Originals);
    ix. Betterment Statement (Attachment "H")(2 Originals);

EXHIBIT "C"

x. Quit Claim Deed – TxDOT ROW-N-30 (Attachment "I")(2 Originals), if applicable;
xi. Joint Use Agreement (Attachment "J")(2 Originals), if applicable.

All attachments are included herein as if fully set forth. In the event it is determined that a substantial change from the statement of work contained in this agreement is required, reimbursement therefore shall be limited to costs covered by a modification of this Agreement or a written change or extra work order approved by the County.

8. The Utility agrees to provide signed and sealed "as-built" plans to the County within sixty (60) days of the completion of the work.

9. This Agreement is subject to immediate cancellation by the County at any time up to the date that work under this Agreement has been authorized and that such cancellation will not create any liability on the part of the County.

10. The Utility by execution of this Agreement does not waive any of the rights which the Utility may have within the limits of the law.

11. It is expressly understood that the Utility conducts the adjustment, removal, and/or relocation using its own methods, and that the Utility agrees to indemnify and hold the County harmless for any and all damages and attorney's fees caused by the Utility's actions and/or conduct.

12. The Utility affirms that it has the authority to enter into this Agreement, and that it has obtained the approval, if necessary, from any bankruptcy court exercising jurisdiction over the Utility.

13. Notice: Except as maybe otherwise specifically provided in this Agreement, all notices, demands, requests or communication required or permitted hereunder shall be in writing and shall either be (i) personally delivered against a written receipt, or (ii) sent by registered or certified mail, return receipt requested, postage prepaid and addressed to the parties at the addresses set forth below, or at such other addresses as may have been theretofore specified by written notice delivered in accordance herewith:

If to Utility: Lonestar Pipeline Company, LLC (d/b/a Rio Grande Intrastate Pipeline LLC)
c/o Kindle Energy LLC
500 Alexander Park Drive, Suite 300
Princeton, NJ 08540

EXHIBIT "C"

If to County: Hidalgo County, Texas
Attention: Richard Cortez, Hidalgo County Judge
P. O. Box 758
Edinburg, Texas 78540-0758

With copy to: Eduardo "Eddie" Cantu, Commissioner, Precinct No.2
300 Hall Acres, Suite G.
Pharr, Texas 78577

14. Each notice, demand, request or communication which shall be delivered or mailed in the manner described above shall be deemed sufficiently given for all purposes at such time as it is personally delivered to the addressee, or, if mailed, at such time as it is deposited in the United States mail.

15. Additional Documents: The parties hereto covenant and agree that they will execute such other and further instruments and documents as are or may become necessary or convenient to effectuate and carry out the terms of this Agreement.

16. Texas Law to Apply. This Agreement shall be construed under and in accordance with the laws of the State of Texas, and all obligation of the parties created hereunder are performable in Hidalgo County, Texas. The parties hereby consent to personal jurisdiction in Hidalgo County, Texas

17. Successors. This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective heirs, executors, administrators, legal representatives, successors, and assigns where permitted by this Agreement.

18. Assignment: This Agreement shall not be assignable.

19. Headings. The headings and captions contained in this Agreement are solely for the convenience reference and shall not be deemed to affect the meaning or interpretation of any provision of paragraph hereof.

20. Gender and Number. All pronouns used in this Agreement shall include the other gender, whether used in the masculine, feminine or neuter gender, and singular shall include the plural whenever and as often as may be appropriate.

21. Authority to Execute. The execution and performance of this Agreement by the Utility and County have been duly authorized by all necessary laws, resolutions or corporate action, and this Agreement constitutes the valid and enforceable obligations of the Utility and County in accordance with its terms.

EXHIBIT "C"

22. Governmental Purpose. Each party hereto is entering into the Agreement for the purpose of providing for governmental services or functions and will pay for such services out of current revenues available to the paying party as herein provided.

23. Commitment or Current Revenues Only. In the event that during any term hereof; the governing body of any party does not appropriate sufficient funds to meet the obligations of such party under this Agreement, then any party may terminate this Agreement upon ninety (90) days written notice to the other party. Each of the parties hereto agrees, however, to use its best efforts to secure funds necessary for the continued performance of this Agreement. The parties intend this provision to be a continuing right to terminate this Agreement at the expiration of each budget period of each party hereto pursuant to the provisions of Tex. Loc. Govt. Code Ann. §271.903.

24. The signatories to this Agreement warrant that each has the authority to enter into this Agreement on behalf of the party represented.

WITNESS THE HANDS OF THE PARTIES effective as of the day and year of approval and execution by and on behalf of the County.

Lonestar Pipeline, LLC

By: _____

William Lee Davis

CEO

COUNTY OF HIDALGO

By: _____

Richard Cortez, County Judge

COMMISSIONERS COURT HIDALGO COUNTY, TEXAS

ATTEST: _____

County Clerk

APPROVED BY COMMISSIONERS' COURT ON: 2/26/19

APPROVED AS TO FORM:

ATLAS, HALL & RODRIGUEZ, LLP

By: _____

Stephen L. Crain

Statement of Work

Hidalgo County will widen Dicker Road from Jackson Rd. to 23rd St. The conflict with underground storm sewers necessitates the vertical adjustment of the existing 8" Lone Star pipeline in order to avoid a conflict and be in accordance with Texas Administrative Code pipeline safety standards. Reference drawing titled Dicker Road Utility and Drainage STA. 46+00 to 58+00 and 58+00 to 70+00.

The existing 8" pipeline will be removed and placed at a greater depth. Approximately 580' of existing pipeline will be removed and replaced. The replacement will be done using a HDD process to provide adequate clearance between the proposed replacement segment and all existing and proposed utilities located in the vicinity of the intersection of Dicker Road and 10th Street.

Lone Star will return during construction of the roadway to remove the abandoned segment of pipe during construction and utilize the TCP put in place by the contractor during roadway construction.

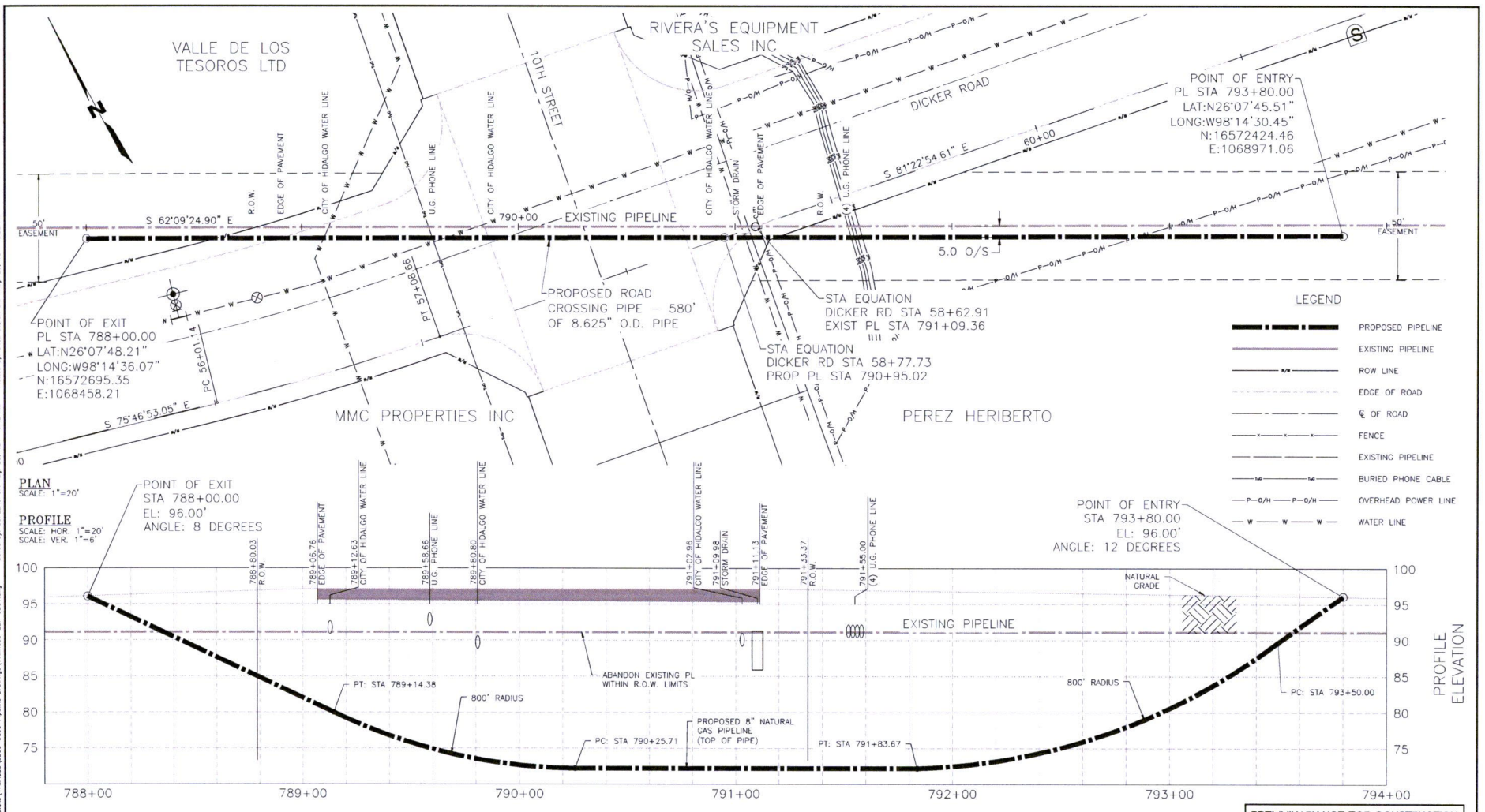
The completion of the work is expected to begin within 30 days of a signed agreement and subsequent Notice to Proceed is provided by Hidalgo County.

The drawings in this packet show a plan and profile view of the proposed boring relative to the roadway and underground storm sewer locations as part of the road improvement project.

Hidalgo County will reimburse Lone Star for 100% of the eligible costs as part of this relocation.

ATTACHMENT A

Plans, Specifications & Cost estimate



PRELIMINARY NOT FOR CONSTRUCTION

NOTES

1. REFER TO TXDOT "TEXAS MUTCD (MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES), PART 6, TEMPORARY TRAFFIC CONTROL" FOR GUIDELINES ON TRAFFIC SAFETY PLAN.

REFERENCE

NO.	DATE	DESCRIPTION	BY	CHK	APPD
B	08/29/18	ADDED ROADWAY AND PIPELINE STATIONING	JS	CC	MG
A	06/19/18	ISSUED FOR INFORMATION	CC	JS	MG

CAMS
Consolidated Asset Management Services

M&H
TEXAS REGISTERED ENGINEERING FIRM F-4000
WWW.MHES.COM

SCALE: AS SHOWN | PROJ. NO. 17MH033

CONSOLIDATED ASSET MANAGEMENT SERVICES

PROPOSED PIPELINE CROSSING
DICKER ROAD
HIDALGO COUNTY, TEXAS

PIPELINE
ROAD CROSSING

DRAWING NO. EL7-9201 | REVISION NO. B

17MH033-EL7-9201

File Path: Q:\CAMS\Dicker Rd\PIPELINE\20 Details\17MH033\9200-9899 Pipeline Drawings\17MH033-EL7-9201.dwg Saved by: COPLENC on: Aug. 28, 18 - 9:42 AM Plotted by: chad copien on: Aug. 29, 18 - 9:28 AM

Lonestar Pipeline Company

Construction Specifications
for
Land Pipeline Construction

CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Table of Contents			
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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: General Conditions			
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1. INTRODUCTION

This document contains Company's Construction Specification, hereinafter referred to as "Specification", to be utilized during the fabrication and/or installation of pipelines and/or facilities for COMPANY. The Specification describes requirements for the fabrication, testing, painting, coating, handling, transportation and installation of pipelines and related facilities. The directions, provisions and requirements of this Specification pertain to the Scope of Work. However, this Specification is general in nature and is intended to cover many of Company's similar construction projects.

Local, State and Federal regulations, ordinances, statutes or codes shall govern where compliance is mandatory. Requirements, however, of this Specification shall apply when they are more exacting or do not conflict with such regulations, ordinances, statutes or codes.

2. INTENT OF SPECIFICATIONS

Adherence to the Specification is not intended to relieve Contractor of the responsibility to perform the Scope of Work as an independent contractor in accordance with all applicable governmental and regulatory requirements.

All references to codes, standards or other specifications shall be construed to be the most current issue in effect at the time the Contract is executed, and shall be considered as being a part of this Specification.

3. SAFETY

The Contractor shall take all reasonable precautions to ensure that labor employed by it and its subcontractors on the rights-of-way or premises of the Company comply with the Company's Safety and Health Handbook and the Contractors' Safety Program. The Company shall furnish the Contractor copies of the Safety and Health Handbook before the Contractor commences its field Work.

4. CONTROL OF THE WORK

4.1. Authority of the Company Representative

4.1.1. The Company Representative shall have the right to inspect all Work to the end that the results contracted for will be attained, but they shall not have the right to direct or supervise the details of said Work. The Contractor, being an "Independent Contractor", shall have full power and authority to

select the means, methods, and manner of performing the Work. The Work shall be done to the satisfaction of the Company Representative and in accordance with the Contract, Drawings and Specifications.

4.1.2. The Company Representative will decide all questions which may arise as to the quality or acceptability of materials furnished and the Work performed, the manner or performance and the rate of progress of the Work and the interpretations of the Drawings and Specifications.

5. INSPECTION

No work shall be done nor material used without approval by the Company's Representative. The Contractor shall furnish the Company's Representative with every reasonable facility for ascertaining whether or not the Work performed is in accordance with the requirements and the intent of the Specifications and Contract including QA & QC equipment. If the Company Representative so requests, the Contractor shall, at Contractor expense, at any time before acceptance of the Work, remove or uncover such portions of the finished Work as may be directed. After examination, the Contractor shall restore said portion of the Work to the standard required by the Specifications.

6. CONTROL OF MATERIALS

6.1. Quality of Materials

6.1.1. Material not furnished by the Company shall be new and approved by the Company's Representative. If the sources of supply do not furnish a uniform product or if the product proves unacceptable at any time, the Contractor shall furnish approved material from other sources.

6.1.2. No materials shall be used in the Work which have in any way become unfit for use after acceptance.

6.1.3. When one material is specified by name and "or equal to" is written thereafter, the material mentioned by name is the material desired. If the Contractor desires to use another material in lieu thereof, approval of the Company Representative shall be obtained before making the substitution.

6.1.4. Whenever the words "approved by" or "satisfactory to" or similar phrases are used in this Specification, they shall be understood to mean that the item

or material referred to shall be approved by and be satisfactory to the Company Representative.

6.2. Handling Material

6.2.1. All pipe, valves, fittings and accessories shall be loaded and unloaded by lifting with slings, hoists or other means to avoid shock or damage.

6.2.2. Equipment which comes in contact with pipe surfaces, especially thin film coated pipe, shall be padded with rubber, Teflon, neoprene or equal, to eliminate any pipe contact with metal or other hard surfaces. Sling hooks used to unload or move pipe shall be lined with neoprene or material similar to the pipe being moved to avoid damage to beveled ends. Padding and hooks are to be approved by the Company Representative.

6.2.3. The Contractor shall dispose of banding material and dunnage from rail cars or other carriers in a manner acceptable to the Company, and shall clean-up unloading areas to the Company's satisfaction.

6.3. Storing Material

6.3.1. Materials shall be stored to preserve their quality and fitness for the Work.

6.3.2. The interior of all pipe fittings and other accessories shall be kept free from dirt and foreign matter at all times. Valves and accessories shall be drained and stored in a manner which will protect them from damage from freezing.

6.4. Defective Material

All materials not conforming to the requirements of this Specification shall be rejected and shall be removed immediately from the site of the Work unless permitted to remain by the Company Representative. Rejected materials, the defects of which have been subsequently corrected, shall have the status of new material once approved by the Company Representative.

6.5. Issuing Material to Contractor

Company-furnished material for the project will be issued by the Company to the Contractor's authorized representative who shall acknowledge, in writing, the receipt of the material and shall be responsible for all such material thereafter.

7. MANUFACTURER'S DIRECTIONS

All manufactured articles, material, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturer, unless herein specified to the contrary.

8. RESPONSIBILITY REGARDING EXISTING UTILITIES OR STRUCTURES

When Company performs preconstruction survey Company will make every effort to locate all structures (aboveground or underground) during survey and the locations of such structures identified by Company will be shown on the construction drawings. It is the responsibility of the Contractor to make regional "ONE CALL" notification and to investigate and verify the existence and location of all structures whether or not they have been identified by Company. Excavation in the vicinity of existing structures shall be carefully done by hand, by hydro vacuum, or as required by owner/operator of existing structure. The Contractor shall be responsible for protection of and for all damages to existing utilities, pipelines, and structures. Whether Work is preformed on time and material basis or lump sum contract, Contractor is responsible for all cost to repair damages to any structure.

9. TOOLS AND EQUIPMENT

If, at any time during the progress of the Work, tools or equipment appear to the Company's Representative to be insufficient, or inappropriate to secure the quality of work required or at the proper rate of progress, the Company's Representative may request that the Contractor improve the character, augment the number, or substitute new tools or equipment to the satisfaction of the Company.

10. MEASUREMENT OF QUANTITIES

The quantities of Work performed will be computed by the Contractor on the basis of measurements taken by the Company Representative or their assistants.

11. COORDINATION OF SPECIFICATIONS AND DRAWINGS

This Specification, the Drawings, Special Provisions and all supplemental documents are essential parts of the Contract, and a requirement appearing in one is as binding as though appearing in all. In case of discrepancy, figured or field verified dimensions shall govern over scaled dimensions, Drawings shall govern over Specifications, Special Provisions shall govern over both Specifications and Drawings.

12. DRAWING MATERIAL LISTS

The material lists on Drawings are not intended to be binding for the quantities of materials to be furnished and installed by the Contractor. The material lists are not necessarily complete and are intended to be used as a guide and a method of clarifying details on the drawings by means of item numbers. Contractor shall check all quantities by making its own material take-offs; and should bear in mind that it is to perform and complete all Work represented on the Drawings, and supplemented by material lists and Specifications, in accordance with accepted practices of the construction industry.

13. RULES AND PERMITS

Permits and licenses of a temporary nature necessary for the prosecution of the Work shall be secured by the Contractor. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and specified. Where the Specifications or the Drawings conflict with local conditions, or city, county, or state ordinances, the Contractor shall notify the Company Representative in writing, who shall then notify the Contractor in writing of the approved changes to resolve the issue.

14. INSTALLATION OF TEST LEADS

The Contractor shall install test leads, in accordance with the Drawings, to the pipeline by the Cadweld Thermite Process in locations shown on the Drawings and at such other locations as may be specified by the Company.

14.1. Each test lead wire must be connected to the pipeline so as to remain mechanically secure and electrically conductive after backfilling is completed.

14.2. Large diameter test leads will be attached using the "crows foot" or three-point attachment. Other test leads may be attached using a single weld.

14.3. Test leads shall be attached using a 15-gram thermit weld charge.

14.4. Each test lead wire must be attached to the pipeline so as to minimize stress concentration on the pipe.

14.5. Only one thermit charge will be placed in the welding mold for any single weld.

14.6. When more than one test lead is to be attached, they shall be installed a minimum of 6 in. apart.

14.7. All bared test lead and bared metallic area at the point of connection to the pipeline must be coated with an electrical insulating material compatible with the pipe coating and the insulation on the wire. Any additional stripped copper wire shall be taped with electrical vulcanizing tape and vinyl electrical tape.

CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Survey			
Specification No. LP-02	Issue Date: May 25th 2018	Revision Date:	Page 1 of 2

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1. SURVEY 2

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Specification Title: Survey			
Specification No. LP-02	Issue Date: May 25th 2018	Revision Date:	Page 2 of 2

1. SURVEY

1.1. The Company will stake the location of the centerline of the proposed pipeline with stakes at approximately 200-foot intervals or other intervals as required by the specific project. Each stake will be marked with a station number and/or survey information for progress reporting and installation purposes. Contractor will reimburse Company for the cost of replacing any stakes disturbed by the Contractor's construction operations.

1.2. Where the pipeline is to be installed parallel to an existing pipeline or pipelines, Contractor shall stake the centerline of the closest existing pipeline at intervals not in excess of 100 ft or as required by paralleling pipeline company or ROW conditions.

1.3. At the Company's discretion, the Contractor shall not place spoil over existing lines until warning tape is in place at natural grade.

1.4. The Company will stake, as necessary, the limits of the construction right-of-way limits, any temporary extra work spaces, staging areas, corners of sites for valve settings, meter stations, compressor/pump stations, scraper traps, other above ground piping and environmental concerns. These stakes shall not be removed until the commencement of respective "Clean up and Restoration" activities. Contractor will reimburse Company for the cost of replacing any stakes disturbed by the Contractor's construction operations.

1.5. Company staked property corners will establish dimensional control points for Contractor's installation of fabricated assemblies. Contractor shall perform all other field survey work necessary for the installation of valve settings, meter stations, compressor/pump stations, scraper traps and associated piping. The Contractor shall verify all grades, lines, levels and dimensions as shown on the drawings, and shall report any errors or inconsistencies to the Company.

1.6. The Company requires that all construction as-built surveys be conducted after the pipe is lowered into the ditch. To assist in this as-built, Contractor shall remove centerline stakes directly ahead of the trenching operation and relocate them to the outside edge of the construction right-of-way for future reference. These stakes shall not be disturbed until the contractor's cleanup operation removes them. Contractor shall allow adequate time for as-built survey prior to backfilling.

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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Fencing			
Specification No. LP-03	Issue Date: May 25th 2018	Revision Date:	Page 1 of 8

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CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Fencing			
Specification No. LP-03	Issue Date: May 25th 2018	Revision Date:	Page 2 of 8

1. GENERAL

The Contractor shall, before proceeding with the cutting of fences, installation of gates or gaps, clearing or any other right-of-way work, ascertain the staked location of the line from the Company.

1.1. Construction

The Contractor, having first ascertained from the Company that permission has been secured from the property owner, shall install gate or gap in every fence at the point of intersection of the proposed pipeline, for access to land crossed by the pipeline, and for passage of construction equipment. Before cutting the fences to make these gates or gaps, the Contractor shall install an H brace in accordance with Drawing No. STD-EC7-8801, or other brace as described in the line list, in order to prevent damages to fences. Gates shall be constructed so that they can be securely closed. Where necessary during construction, the Contractor shall furnish a watchman to maintain these gates to prevent livestock from entering or leaving the property and shall furnish watchmen in any other instance where required by the Company. Contractor will provide chains and locks for each gate located on a public access road or between different landowners, if required by Company. These gates will be locked each night at the close of the workday.

1.2. Property Owner Notices

The Contractor shall not remove or take down fences or open gates or construct gates or gaps without first notifying the respective property owner, tenant or occupiers. The Contractor shall use only roads that are designated and approved by the Company. Upon completion of the work, Contractor shall returned all roads used to their original or better condition. All fences shall be replaced by the Contractor in accordance with Drawing No. STD-EC7-8801 with workmanship which equals or exceeds existing fence.

1.3. Untreated Posts

The Contractor shall not use untreated fence posts, or posts of lesser size and quality than that of the existing fence being permanently replaced.

1.4. Marker Posts

The Contractor shall replace any existing marker post located in original fences on existing or adjacent right-of-way which are damaged or removed due to the Work.

1.5. Hedges

Gaps in hedges shall be permanently closed to the satisfaction of the Company and or Landowner.

2. CHAIN LINK FENCING

2.1. Scope

This Part governs all chain link fencing to be installed where indicated on the Drawings.

2.2. Materials

2.2.1. Posts, post tops, rails, gates, frames, braces, barb arms, and all accessories shall conform to ASTM A-120, ASTM A-123, or ASTM A-702. Barbed wire shall conform to ASTM A-121 and chain link fabric to ASTM A-392. All shall be hot-dip galvanized and shall withstand 12 one-minute immersions when tested in accordance with ASTM A-239.

2.2.2. Fabric shall be minimum No. 9 ASW gage steel wire, woven in a 2-in. pattern. The top of the fabric shall be knuckled and the bottom barbed and shall conform to ASTM A-392.

2.2.3. Barbed wire shall be 2-strand, 4-point barbed wire. Main strands shall not be smaller than No. 12½-gage steel wire and barbs not less than No. 14-gage steel wire. The barbs shall be round and not over 5 in. apart. The wire shall be hot-dip galvanized and shall conform to ASTM A-121.

2.2.4. Posts

2.2.4.1. Line posts shall be pipe not less than 2⅜ in. O.D., 3.65 lbs./ft.

2.2.4.2. Terminal, end, corner, pull and brace posts shall be pipe not less than 3½ in. O.D., 7.58 lbs./ft.

2.2.4.3. Gate posts (single) less than 13 ft. shall be pipe not less than 4½ in. O.D., 10.79 lbs./ft.

2.2.5. Top rails shall be pipe not less than 1⅝ in. O.D., 2.27 lbs./ft.

2.2.6. Braces shall be pipe not less than 1⅝ in O.D., 2.27 lbs./ft.

Gates shall have frames of not less than 2 in. welded pipe weighing not less than 2.72 lbs./ft., and frames shall have ⅜ in. round cross bracing.

2.2.7. Hinges shall be ball and socket type; one hinge shall be strong enough to carry the vertical load. Fabric shall be the same as specifies above.

2.2.8. All posts shall be fitted with heavy malleable iron or pressed steel tops. Bases of the post tops shall have flanges around the outside of the posts. Post tops for 6-ft. fences shall be barb arms with a minimum of three strands of barbed wire.

2.2.9. The top rail shall pass through the base of the line post tops and form a continuous brace from end to end of each run of fence. Couplings shall be outside sleeved type and at least 7-in. long: one coupling in every five shall contain a heavy spring to take up expansion and contraction of the top rail.

2.2.10. Bottom tension wire shall be a minimum of No. 7 gage spring coil wire.

2.3. Construction

2.3.1. The fence line shall be cleared 2 ft. on each side of the center line so that the fence can conform the ground contour. The fence shall be erected to the height shown on the Drawings so that the finished fence is plumb, taut, true to line and grade, and complete in all details. The bottom of the fence shall be placed 1 inch above the ground line, posts shall be spaced not over 10 ft. on centers and set in a concrete footing 9 in. in diameter and 36 in. deep.

2.3.2. The fence shall be staked down where required.

2.3.3. Barbed wire shall be installed at the top of fences. Barb arms shall be installed to extend to the outside of the fence.

2.3.4. All fences shall be erected with standard chainlink stretching equipment.

2.3.5. After the fence is erected, all holes from stumps, old posts and rocks shall be filled and properly tamped. New fences shall be connected to existing fences as shown on Drawings.

CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

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3. PERMANENT BARBED WIRE FENCING

3.1. Scope

This Part governs all barbed-wire fencing to be installed where indicated on the Drawings.

3.2. Materials

3.2.1. Posts – Specifications

3.2.1.1. Metal posts shall be steel, in "Tee", Channel, "U" or "Y" shapes, with anchor plates conforming to ASTM A-702, painted or galvanized, and complete with 5 wire fasteners (suitable for attaching wire to the posts) with each post.

3.2.1.2. Wood posts shall be pressure tested with either No. 1 creosote, minimum 8 lbs./ft.^{3} or C.C.A. minimum 0.60 lb./ft.^{3}

3.2.2. Posts – General

3.2.2.1. Line posts may be either steel or treated wood as specified above, or a combination of the same, as follows:

- Steel "U", "Y" or "T" shape 7 ft. long, 1.43 lb./ft. (9.98 lbs. each).
- Treated wood, minimum 4 inch diameter by 7 ft. long.

3.2.2.2. Terminal posts, end, corner, pull and gate posts shall be treated wood, minimum 6-in. diameter by 8 ft. long.

3.2.2.3. Braces shall be treated wood, minimum 4-in. diameter.

3.2.3. Staples shall be galvanized from No. 9 wire, 1½ in. long.

3.2.4. Barbed wire shall be 2-strand, 4-point barbed wire. Main strands shall not be smaller than No. 12½ gage steel wire and barbs of not less than No. 14 A.S.H. gage steel wire. The barbs shall be round and not over 5 in. apart. The wire shall be hot-dip galvanized and shall conform to ASTM A-121.

3.2.5. Wire fasteners shall be from zinc-coated wire, minimum 0.120 in., in accordance with ASTM A-702 and ASTM A-641.

3.3. Construction

3.3.1. The fence line shall be cleared 2 ft. each side of the center line so that the fence can conform to the ground contour. The fence shall be erected as shown on the Drawings so that the finished fence is plumb, taut, true to line and grade and complete in every detail. The fence shall be 48 in. high with five lines of wire spaced approximately 10 in. apart.

3.3.2. Posts shall be set firmly so that an erect position will be maintained. A small amount of soil shall be backfilled at a time and well tamped before more backfill is added. Line posts shall extend 34 in. into the ground.

3.3.3. End posts and cornerposts shall be braced as shown on the Drawings. Corner and brace posts shall extend 40 in. into the ground. Struts and ties shall be securely fastened to the posts at the ground line and from 6 to 12 in. below the top of the posts. Struts shall be not less than 4 in. in diameter: ties shall be three double strands of wire not smaller than No. 12 gage.

3.3.4. Staples shall be driven diagonally to the grain to avoid splitting the wood. They shall be set to hold the wire securely but shall not be buried in the post. The fence shall be fastened to the post in a manner with will allow for contraction and expansion.

3.3.5. Line posts shall be spaced a maximum of 10 ft. apart and set so that the appearance of the fence will not be marred by posts at different heights and spacing.

3.3.6. Splices should be made at the brace or pull posts.

3.3.7. The fence shall be stretched to produce enough tension to cause wire to feel springy to the touch. Overstretching shall not be permitted. Wire shall not be stretched around a corner, which changes the direction of the fence line more than 45°; instead, the fence shall be cut and wired to the post.

4. HOG AND BARBED WIRE FENCING

4.1. Scope of Work

This Part governs all hog wire and barbed wire fencing to be installed where indicated on the Drawings.

4.2. Materials

4.2.1. Barbed wire shall be 2-strand, 4-point barbed wire. Main strands shall not be smaller than No. 12½ gage steel wire and barbs of not less than No. 14 A.S.H. gage steel wire. The barbs shall be round and not over 5 in. apart. The wire shall be hot-dip galvanized and shall conform to ASTM A-121.

4.2.2. Hog wire shall be galvanized woven wire with minimum No. 9 gage top and bottom wires and minimum No. 11 gage intermediate line and stay wires complete with tension curves and shall conform to ASTM A-116.

4.2.3. Posts – Specifications

4.2.3.1. Metal posts shall be steel in "Tee", channel or "U" and "Y" shapes conforming to ASTM A-702 painted or galvanized, and complete with 5 wire fasteners per post.

4.2.3.2. Wood posts shall be pressure treated with either No. 1 creosote, minimum 8 lbs./ft.^{3} or C.C.A. minimum 0.60 lb./ft.^{3}

4.2.4. Posts – General

4.2.4.1. Line posts may be either steel or treated wood or a combination of same as follows: Steel "U", "Y" or "T" shape 8 ft. long - 1.43 lbs./ft. (11.44 lbs. each) complete with 5 wire fasteners (suitable for attaching wire to the posts) with each post. Treated wood, minimum 4-in. diameter by 8 ft. long.

4.2.4.2. Terminal posts, end, corner, pull and gate posts shall be treated wood minimum 6-in. diameter by 8 ft. long.

4.2.4.3. Braces shall be treated wood minimum 4-in. diameter.

4.2.5. Staples shall be galvanized, from No. 9 wire, 1½ in. long.

4.2.6. Wire fasteners shall be from zinc-coated wire, minimum 0.120 in., in accordance with ASTM A-702 and ASTM A-641.

4.3. Construction

4.3.1. The fence line shall be cleared 2 ft. on each side of the center line so that the fence can conform to the ground contour. The fence shall be erected as shown on the Drawings so that the finished fence is plumb, taut, true to line and grade and complete in all details. The fence shall be 5 ft. 0 in. high with spacing or wire as shown on the Drawings.

4.3.2. Posts shall be set firmly so that an erect position will be maintained. A small amount of soil shall be backfilled at a time and well tamped before more is added. Line posts shall extend 34 in. into the ground.

4.3.3. End posts and corner posts shall be braced as shown on the drawings. Corner and brace posts shall extend 40 in. into the ground. Struts and ties shall be securely fastened to the posts at the ground line and from 6 to 12 in. below the top of the posts. Struts shall be not less than 4 in. in diameter: ties shall be 3 double strands of wire not smaller than No. 12 gage.

4.3.4. Staples shall be driven diagonally to the grain to avoid splitting the wood. They shall be set to hold the wire securely but shall not be buried in the posts. The fence shall be fastened to the post in a manner which will allow for contraction and expansion.

4.3.5. Line posts shall be spaced a maximum of 10 ft. apart and set so that the appearance of the fence will not be marred by posts of different heights and spacing.

4.3.6. Splices should be made at the brace or pull posts.

4.3.7. The fence shall be stretched to produce enough tension to cause wire to feel springy to the touch. Hog wire shall be stretched until the tension curves are about half straightened out. Overstretching shall not be permitted. Wire shall not be stretched around a corner that changes the direction of the fence line more than 45°; instead, the fence it shall be cut and wired to the post.

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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

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Specification Title: Clearing & Grading			
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1. DEFINITIONS

For the purposes hereof, the right-of-way shall be a strip of land, width as detailed on the Drawings and the Right-of-Way Line List. All of the Contractor's operations shall be confined within such applicable widths on each respective tract as designated under the "Remarks and Special Provisions" column of the Line List and shall be controlling and binding upon the Contractor.

2. ONE CALL NOTIFICATION

It shall be the Contractor's responsibility to use the local area's ONE CALL system prior to commencing construction in accordance with the regional requirements. Contractor shall keep a log of date, time, contact person name, and description of conversations of all phone conversations and meetings.

3. CLEARING RIGHT-OF-WAY

3.1. Limitations

Before clearing operations are started, the Contractor shall be familiar and comply with all special provisions included in the Company provided Right-of-Way Line List and environmental construction requirements.

3.2. Brush and Timber

Brush and timber encountered on the right-of-way shall be cleared to a width not exceeding the construction right-of-way width. Large trees shall not be damaged or destroyed unless they are directly on the ditch line or they are near enough to be a menace to operation and maintenance of the pipeline. Restrictions in right-of-way agreements prohibiting the cutting or damaging of certain trees shall be made known to Contractor and Contractor shall conduct its work in such a manner as to avoid damaging these trees. Contractor will mark these trees in a manner that his own personnel will know to avoid removal or damage to the trees. Trees that will be ultimately left remaining on the right of way shall be cut or trimmed utilizing the proper tree trimming saws. Excavating equipment shall not be utilized to break off limbs and branches, therefore causing excessive damage to trees. Costs incurred by Company by the damage or removal of any trees will be reimbursed by Contractor including any punitive damages which may be assessed as a result of the unauthorized damage or removal of the tree.

All brush, timber, stumps, overhanging limbs and slash shall be disposed of by the Contractor in accordance with all applicable permits, state and local regulations, and right-of–way Special Provisions. The Contractor shall cut merchantable timber into lengths as directed by the Company and shall neatly stack it along the right-of-way for disposition by the landowner. The Contractor shall have the right to use unmerchantable timber cut from the right-of-way as necessary to perform the Work, unless otherwise noted in the Line List Instructions or other permits.

3.3. Utility Poles and Related Facilities

Where telephone or utility company power poles interfere with the safe ingress and egress of vehicles and equipment during construction, the Contractor shall take appropriate action with the facility owner/operator's approval.

The Contractor shall make all necessary arrangements for the relocation and preservation of such facilities during construction, if required and with the written authorization of the utility company.

4. GRADING

The Contractor shall grade as necessary to mitigate the necessity of abrupt over-bends or sag-bends. Contractor shall minimize the grading where practical to prevent unnecessary disturbance and minimize work required to return the right-of-way to its original elevations, slopes, and profile as closely as practical, but consistent with minimizing abrupt over-bends and sag-bends. Graded subsoil materials shall be stockpiled so it can be returned to its original depth and location as opposed to spread along the right-of-way. The Contractor shall grub, or otherwise remove and dispose of, all stumps, roots and debris found to be in the way of construction within permanent right-of-way limits.

The requirements of Company's Storm Water Pollution Prevention Plan (SWPPP) will apply to all erosion control operations. Water breakers will be installed on the right of way during grading operations that will minimize erosion of the right of way. Temporary interceptor dikes will be installed immediately following initial grading on all slopes greater then 5% and adjacent to intermediate streams

When the Contractor is cutting grade along or across existing pipelines, spoil or mats shall be placed over the existing lines per the requirements of the Operating Company of the foreign pipeline.

For areas excavated by the grading operation, Contractor shall remove separately the topsoil to its actual depth and shall replace the topsoil over the backfilled area upon completion.

5. DAMAGES

Contractor shall repair immediately any damage to bridges, public roads, private roads, fences, buildings or other property. Contractor is responsible for all costs and for all damages regardless of whether the work is performed in accordance with hourly rate and/or lump sum rates.

6. DUST CONTROL

During dry weather, when directed by the Company Representative, Contractor shall sufficiently water the right-of-way to minimize dust as necessary for air quality, welding quality, and coating application purposes.

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LONESTAR PIPELINE COMPANY

CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Ditching			
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1. GENERAL

The Contractor shall employ OSHA approved equipment and methods required to keep the ditch in compliance with the line established by the Company regardless of the type of soil or rock encountered and regardless of the depth of excavation necessary. Contractor shall have a trained and certified "Competent Person" at each site that excavation activities are in progress. Daily excavation inspection reports will be prepared and maintained on site by Contractor's "Competent Person".

2. FOREIGN LINE AND UTILITY CROSSINGS

When Company performs preconstruction survey Company will make every effort to locate all structures (aboveground or underground) during survey and the locations of such structures identified by Company will be shown on the construction drawings. It is the responsibility of the Contractor to make regional "ONE CALL" notification and to investigate and verify the existence and location of all structures whether or not they have been identified by Company. Excavation in the vicinity of existing structures shall be carefully done by hand, by hydro vacuum, or as required by owner/operator of existing structure. The Contractor shall be responsible for the protection of and for all damage to existing utilities, pipelines, and structures. Whether Work is preformed on time and material basis or lump sum contract, Contractor is responsible for all cost to repair damages to any structure.

A minimum clearance of 12 in., or as required by the owner/operator, shall be maintained from the foreign underground structure crossing.

3. DITCH SPECIFICATIONS

3.1. Ditch Width and Depth

3.1.1. Unless otherwise stated on the drawings or right-of-way line list, the ditch shall be a minimum of 12 in. wider than the pipe being installed for pipe diameters less than 12 in. and a minimum of 18 in. wider for pipe diameters 12 in. and greater. Pipe shall be installed at a depth as listed on Company supplied drawings and depth shall be measured from the top of the pipe to the average level of the original or restored ground on the two sides of the ditch whichever is lower.

3.1.2. Contractor may, under certain Special Right of Way conditions, be required to remove separately and conserve the topsoil (Double Ditch). Topsoil shall be removed to the depth specified in the scope of work. Topsoil stripping

will include the ditchline and backfill area. After the trench has been backfilled, Contractor shall replace the topsoil to the satisfaction of the Company Representative.

3.2. Consolidated Rock

Consolidated rock is defined as rock layers where the uppermost surface exists at a higher elevation than the elevation of the top of the pipe. This condition provides protection against damage from external forces and justifies cover.

3.3. Ditch Grading

The bottom of the ditch shall be cut to a uniform grade so that the full width of the ditch shall be available for providing slack in the line when installed.

3.4. Bend Excavations

At over-bends and side-bends, the Contractor shall excavate the ditch to allow proper clearance between the inside bend of the pipe and the bottom or side of the ditch to maintain the minimum cover.

3.5. Rock

In all cases where rock, or any boulder larger than two inches. in diameter is encountered in the bottom of the ditch, the ditch shall be evenly padded with soil, sand or other padding material approved by the Company in order to prevent the rock or boulders from coming into contact with the pipe coating.

3.6. Drainage Tile

3.6.1. Drain lines across the working side shall be cleaned out to ensure the tile has not been crushed or damaged by construction equipment. The Contractor shall construct the pipeline at such depth at the point of under crossing all drain tiles that no interference shall occur between the repaired section of tile and the pipeline. If drainage tile is damaged during the trenching operations, the locations shall be immediately flagged for repair. The flags shall not be removed until permanent repairs have been inspected and accepted by both the Company Representative and the landowner. Unless otherwise authorized in the line lists or by the Company Representative, temporary repairs shall be made and temporary supports installed to maintain serviceability of the drain tiles until the permanent repairs can be made and the tiles properly supported by compacted backfill.

Repairs shall be made by cutting tiles back into undamaged sections and replacing damaged sections with tile of equal size and quality, using care to maintain previous gradient.

4. DIKES, LEVEES, FIREWALLS

Unless approved by the Company Representative, all dikes, levees, and firewall crossed by pipeline ditch construction shall be bored. If open cutting is approved, the Contractor shall install, maintain and reconstruct any temporary facilities necessary when cutting through existing dikes, levees, fire walls or other control devices crossed by pipeline ditch construction.

5. SPOIL BANK

5.1. General

The spoil bank from the ditching operations shall not be placed on any loose debris or foreign matter which might become mixed during padding and backfilling operations.

5.2. Drainage

The Contractor shall provide and maintain gaps or openings in the spoil bank across cultivated fields, so that excessive rains do not cause water to back up and flood cultivated sections. Extreme care shall be exercised to keep all drain ditches and water courses open and useful.

6. TEMPORARY BRIDGES

When the ditch is excavated through lands where livestock/wildlife is confined or through agricultural fields where the Company determines it is desirable for the landowner or tenant to have a passageway across the ditch, the Contractor shall plug the ditch or provide safe, temporary bridges for crossing the ditch and leave an opening in the spoil bank.

7. EXCAVATING NEAR IN-SERVICE PIPELINES

When ditching parallel to an existing pipeline, care should be taken to leave sufficient distance and support to ensure said line does not slough off into new excavation. If parallel line is a coupled pipeline, Contractor shall obtain a safe excavation procedure from the owner/operator of the coupled pipeline. In all instances, the work should be planned such that the excavation is open a minimum amount of time.

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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Blasting			
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CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Blasting			
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1. GENERAL

1.1. Blasting for grade or ditch excavation shall be used only with the Company's written permission and after all other reasonable means of excavation have been used and are unsuccessful in achieving the required results.

1.2. All blasting shall be done with the Company's Representative present and with their approval on each blast.

1.3. Blasters shall be required to be licensed in accordance with all local, state, and federal agencies. Copies of all current licenses will be provided to the Company for review and approval prior to commencing any blasting activities.

1.4. Blasters shall also furnish previous work history as evidence of competency in handling explosives and performing the blasting in a safe manner.

2. PERMITS AND SAFETY REGULATIONS

The Contractor shall acquire and comply with all permits required for use of explosives and shall enforce all safety rules in their use. Such permits shall include transportation and storage of explosives.

3. BLASTING PLAN AND OPERATIONS

3.1. The Contractor shall furnish a detailed Blasting Plan to the Company and shall obtain the Company's approval in writing prior to loading any explosive charges. The Blasting Plan shall include the following information:

3.1.1. Explosive type

3.1.2. Delay types and intervals

3.1.3. Initiating methods

3.1.4. Delay pattern

3.1.5. Maximum shot hole depth and diameter

3.1.6. Maximum charge per hole

3.1.7. Maximum charge per delay

3.1.8. Distance to nearest aboveground structure

3.1.9. Distance to nearest below ground structure including buried pipelines

3.2. Any proposed blast shall be monitored to ensure that the peak particle velocity shall not exceed the specified maximum velocities. Maximum velocities are 4 in./second measured adjacent to an underground pipeline or any aboveground structure.

3.3. The frequency caused by the detonation of explosive charge shall not drop below 25 hertz without the review and approval of a blasting plan.

3.4. The minimum time delay between the detonation of charges shall be 8 milliseconds.

3.5. All blasting activity occurring within 300 ft. of a high pressure lines will require seismological surveillance (peak particle velocity and frequency) for every blast unless otherwise agreed upon following the review of the blasting plan.

3.6. Approval of the Blasting Plan by the Company is for safety purposes only. The Contractor shall be responsible for the accuracy or adequacy of the plan for obtaining adequate rock breakage.

3.7. Control shall be exercised by the Contractor to prevent damage to underground structures, such as cables, conduits and pipelines, or to springs, water wells and other water courses.

3.8. Blasting mats shall be used on all shots to prevent the scattering of loose rock onto adjacent property and to prevent damage to nearby structures and telephone, telegraph, or power lines. Dirt cover over the blast area may be used in lieu of mats if approved by Company's Representative.

3.9. Blasting shall not be done until occupants of nearby buildings, stores, residences, places of business, places of public gathering and farmers have been notified by the Contractor sufficiently in advance to protect personnel, property, and livestock.

3.10. All blasting operations shall be conducted during daylight hours.

3.11. All blasting activity occurring within 100ft. of Company facilities shall require review and approval of the blasting plan by the Company's Pipeline Services Department.

4. DISPOSAL

The Contractor shall be responsible for the disposal of all rock excavated in the blasting operation.

5. SAFETY

5.1. Smoking, firearms, matches, open-flame lamps and other fires, flame or heat-producing devices, and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported, or used.

5.2. All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine unavailable to unauthorized personnel. An inventory and use record of all explosives shall be maintained. All the above shall be done by the qualified person responsible for handling blasting operations.

5.3. The Contractor shall use every reasonable precaution including, but not limited to, visual and audible warning signals, flags, or barricades to ensure personnel safety.

5.4. Warning signs, indicating a blast area, shall be maintained at all approaches to the blast area. The warning sign lettering shall not be less than 4 in. high on a contrasting background.

5.5. No loaded holes shall be left unattended or unprotected. All explosives or blasting agents shall be verified as discharged prior to excavation.

5.6. Flagmen shall be safely stationed on all roadways which pass through the danger zone so as to stop traffic during blasting operations.

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4. DISPOSAL

The Contractor shall be responsible for the disposal of all rock excavated in the blasting operation.

5. SAFETY

5.1. Smoking, firearms, matches, open-flame lamps and other fires, flame or heat-producing devices, and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported, or used.

5.2. All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine unavailable to unauthorized personnel. An inventory and use record of all explosives shall be maintained. All the above shall be done by the qualified person responsible for handling blasting operations.

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5.5. No loaded holes shall be left unattended or unprotected. All explosives or blasting agents shall be verified as discharged prior to excavation.

5.6. Flagmen shall be safely stationed on all roadways which pass through the danger zone so as to stop traffic during blasting operations.

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Specification Title: Pipe Stringing & Material Handling			
Specification No. LP-07	Issue Date: May 25th 2018	Revision Date:	Page 2 of 4

1. UNLOADING AND RACKING (PIPE AND CASING)

1.1. General

Unless otherwise stated in the Scope of Work, the Contractor shall unload and rack pipe and casing. The Contractor shall furnish any and all permits for unloading and hauling.

1.2. Pipe yards

The Company, at its discretion, will provide storage yards. If necessary, the Contractor shall haul pipe to yards, which are not adjacent to unloading areas in accordance with this Section. The Contractor shall comply with all agreements or special provisions made by the Company with the yard owner. A Company Representative shall be present during tally. The Contractor shall cooperate and assist in obtaining a complete and accurate tally of pipe. The Company shall keep the Contractor informed about movement of pipe, and the Contractor shall unload all pipe promptly.

1.3. Handling or Unloading

The Contractor shall handle all pipe with brass, aluminum or neoprene lined hooks to avoid damage to beveled ends and shall handle all thin film coated pipe with padded hooks, slings, forks, etc. Padding may be rubber, teflon, neoprene or equal to eliminate any pipe contact with truck bolsters or other hard surfaces. All hooks, padding, slings, tie-down lines, etc. shall meet with approval of the Company. Vehicles hauling coated pipe (excluding concrete coated) shall have fenders or other protection to prevent mud and rocks from being thrown upon the pipe, damaging the coating.

1.4. Racking

Pipe shall be racked on padded (rubber tires, celotex board or equal) timber skids or earth berms to keep joint ends clear of the ground and out of water. Earth berms shall be covered with 10 mil polyethylene. Pipe shall not be racked more than six joints or a maximum of ten ft. in height. Bare pipe racked for longer than six months duration shall not be nested but shall have divider strips and 2 x 6 hardwood between tiers. Coated pipe shall be shipped from the mill with a minimum of three full encirclement padding strips (rubber tires, paper board or equal). These strips shall be left in place on the rack and during hauling or be replaced by the Contractor. Large diameter weight coated pipe shall not be stacked.

1.5. Clean-up

The Contractor shall dispose of all banding material and dunnage from rail cars or other carriers in a manner acceptable to the Company and clean-up the unloading area.

2. HAULING AND STRINGING

2.1. General

The Contractor shall haul and string pipe, casing and other materials to the right-of-way or work area. The Contractor shall provide all necessary trucks and equipment for the hauling and unloading of all materials

2.2. Stringing

The Contractor shall place pipe on skids on the right-of-way in a manner which keeps both ends free of dirt and debris. Thin film coated pipe shall require a padding strip to keep coated pipe from coming in contact with skids. The Contractor shall furnish skids. The Contractor shall furnish padding material (rubber tires, celotex board, sand filled sacks or equal). Earth berms in place of skids shall meet with approval of the Company. Gaps shall be left between adjacent lengths of pipe at suitable intervals and at well-defined trails to permit the free passage of livestock or vehicles during the time interval between stringing and other construction activities

2.3. Line Pipe Pups

Contractor shall utilize pipe pups a minimum of 5 diameters for 24 in. OD pipe and greater and a minimum of 10 ft. for pipe less than 24 in. OD.

2.4. Surplus pipe

The Contractor shall tally and haul all surplus pipe and casing to a Company designated yard and rack it as directed by the Company Representative.

2.5. Unloading and Storage of Materials, Excluding Pipe, Furnished by the Company

Principal materials that are furnished by the Company will be delivered to the Contractor F.O.B. delivery points or storage lots and warehouses along the route as may be determined by the Company and shown on a "Schedule of Material Deliveries" to be furnished by the Company to the Contractor.

The Contractor shall keep the Company informed of the locations of its unloading gangs so that the Company may place Company Representative at points where the Contractor is unloading materials furnished by the Company. Upon arrival at delivery points, material shall be checked for quantity and condition by representatives of both the Contractor and the Company. The representatives making such check shall make written record of the quantity and condition of the material, and, upon completion, the record shall be signed by both parties. If material is received in a damaged condition, an inspection must be made by an agent of the carrier before unloading or removal of material and a report of the inspection prepared and forwarded to the Company. The Contractor shall unload all materials furnished by the Company promptly upon the arrival of materials at the several stations along the route of said pipeline.

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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

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BENDING

1.1. Field Bending

1.1.1. General

The intent of this Specification is to require that field bends shall be made in a manner that shall minimize the distortion of the pipe and shall in no way impair its strength. Where it is necessary to bend pipe, only cold bends shall be employed. The bends shall be free from buckling, flattening, cracks or other evidence of mechanical damage. Particular care shall be taken so that egging of the pipe through the area of bend is such that the difference between the maximum and minimum diameters does not exceed 2.5 % of the nominal diameter. All bends shall meet the criteria set forth in DOT Part 192 or 195, which ever is applicable.

1.1.2. Slack and Longitudinal Welds

All over-bends, sags and side-bends shall be made to provide an adequate amount of slack in the pipeline.

On pipe containing a longitudinal weld, the longitudinal seam must be as near as practical to neutral axis of the bend unless the bend is made with an internal bending mandrel or the pipe is 12 in. or less in outside diameter or has a diameter–to–wall thickness ratio less than 70.

1.1.3. Bending Machine

Each bend shall be made using a Company approved bending machine having a full circle bending shoe with a neoprene or urethane lining to produce a smooth, symmetrical bend, unless specified otherwise by the Company.

If the pipe is internally coated, the bearing surfaces of the mandrel shall be constructed to avoid permanently marking or damaging the internal coating. No appreciable stretching or thinning of the pipe wall thickness shall be permitted.

1.1.4. Bending Limitation

Deflection shall be limited to a maximum of one and one-half degrees per pipe diameter measured longitudinally along the pipe. A Company accepted method of measurement shall be used by the Contractor when marking the pipe in preparation for making field bends.

1.1.5. Tangents

Bending shall not be allowed in a circumferential weld and not closer than 6 ft. to an open end.

2. SWABBING AND CLOSING OPEN ENDS

2.1.1. Swabbing

Each pipe joint shall be swabbed as necessary to remove all dirt and foreign matter from the inside of the pipe before the joints are aligned and welded. The swabbing operation shall not be carried on more than four joints ahead of the firing line welders or aligning and welding operations.

2.1.2. Closing of Pipe Ends

Where the line is welded in long sections by the firing line method, the ends of the long sections shall be closed and kept closed in a manner approved by the Company until the long sections are finally joined. During the laying operations, close attention shall be given to open ends to ensure a completely open and clean line free of any obstructions. All reasonable precautions shall be taken to prevent water from entering the line.

2.1.3. Prevention of Foreign Matter in the Pipeline

The open end of the line shall be securely closed at the end of each day's work to prevent entrance of small animals or the introduction of foreign matter of any nature and shall not be reopened until work is resumed. Any obstructions remaining in the line after the completion thereof shall be removed.

3. POSITION OF LONGITUDINAL SEAM

In instances where pipe other than seamless is furnished by the Company, the longitudinal seams of such pipe shall be staggered by not more than 45°. Longitudinal weld seams shall have a minimum four-inch circumferential offset between abutting joints. Unless otherwise specified, the longitudinal seams on adjacent pipe shall be staggered, placing one approximately in the 10 o'clock position and the other approximately in them 2 o'clock position

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LONESTAR PIPELINE COMPANY

CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Welding Procedures Manual			
Specification No. LP-09	Issue Date: May 25th 2018	Revision Date:	

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CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

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1. GENERAL

1.1. The Welding Manual is a consensus document established by the Engineering and Construction departments.

1.2. The Welding Manual will be maintained and issued by the Engineering department.

1.3. The latest version of the Welding Manual is available online on the Engineering web site.

1.4. Welding Manual procedures may initially be used when first published and are mandatory one month after the procedure date.

1.5. While every effort has been made to directly incorporate specific Environmental Health and Safety concern into Welding Manual procedures, the Welding Manual is not a substitute for a thorough working knowledge of the procedures of the Environmental Health and Safety Department.

2. REVIEW

2.1. The Welding Manual is to be reviewed annually by Engineering and Construction.

3. CHANGES

3.1. Requests for changes to the manual are to be sent to Engineering.

3.2. Depending on the nature of the change request, it will either be processed individually or retained and processed with changes during the annual review.

3.3. Change requests will be circulated to construction and engineering to obtain consensus on the change request prior to implementation.

3.4. Welding manual changes will be revised to included approved changes.

4. WAIVERS

4.1. Waiver requests are to be submitted in writing or by email to the Vice President of Engineering.

4.2. Waiver requests must:

4.2.1. Reference the paragraph in the Welding Manual that the waiver applies to.

4.2.2. Explain why the requirements of the Welding Manual cannot be complied with.

4.2.3. Propose a solution including discussion of code compliance.

4.3. In consultation with the Engineering Group the Vice President of Engineering will respond to the waiver request in writing or by email.

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1. SCOPE

1.1. This Manual prescribes minimum requirements for welding steel materials in pipelines, compressor stations, meter stations, pump stations, processing plants, and fabricated assemblies. This also includes air, oil, and water lines in the compressor stations and pump stations.

WARNING: Welding on oxygen lines is not allowed.

1.2. This standard does not apply to welding that occurs during the manufacture of steel pipe or steel pipeline components.

1.3. When codes, standards and specifications are referenced by this Manual, the latest editions shall be used unless a specific edition or section is required by the Manual, or, for DOT work, required by the DOT, in which case that required edition shall be used.

1.4. The welding may be done by shielded metal-arc welding, submerged-arc welding, gas tungsten-arc welding, gas metal-arc welding, flux cored arc welding, or oxyacetylene welding process using a manual, semiautomatic or automatic welding technique, or combination of these techniques. The flux cored arc welding process is limited to non-pressure containing welds unless approved Engineering. The welds may be produced by position welding or roll welding or by a combination of position welding and roll welding.

2. GENERAL

2.1. All welding, including temporary welds, utility piping welds, and structural welds shall be performed using qualified welding procedures.

2.2. All welding, including temporary welds, shall be performed by welders who are qualified for the welding procedure to be used.

2.3. A qualified welding inspector shall witness all welding of all process, gas transmission, hazardous liquid, or other types of pressurized piping including temporary welds.

2.4. The welding inspector shall check the certification records for each welder working on Company projects to assure that proper and current qualification data is on file for the pipe diameters and wall thickness being welded.

2.5. If the company does not have qualification data on file, the welding inspector is responsible for qualifying the welders prior to any production welding.

2.6. The welding inspector is responsible for ensuring that no welder shall weld gas piping unless, within the preceding 6 calendar months, the welder has made a weld in accordance

with either API 1104 or ASME BPV and had it tested either destructively or non-destructively in accordance with API 1104.

2.6.1. Subsequent proficiency welds shall be made on at least 4" nominal diameter pipe.

2.6.2. The proficiency weld may be either a production weld or a test weld.

2.6.3. For shielded metal arc welding, welders shall use low hydrogen electrodes if qualified to do so.

2.6.4. Proficiency welds made using low hydrogen electrodes will also extend the welder's qualifications for cellulosic electrodes, if any.

2.6.5. The proficiency weld shall be a butt weld unless the welder is only qualified to make fillet welds.

2.7. If a welder does not make proficiency weld within a six month to 1 year period, the welder shall not weld until he either:

2.7.1. Qualifies or

2.7.2. Makes a test weld as specified by the welding inspector and have it tested either destructively or non-destructively in accordance with API 1104.

2.8. If a welder does not make proficiency weld within a 1 year period, the welder loses his qualifications and shall not weld until he qualifies again.

3. QUALIFICATION OF WELDERS

3.1. Qualification of pipeline welders shall be done to either API 1104 or ASME Section IX, latest approved edition.

3.2. Welder qualification under API 1104 shall use nick breaks instead of tensile tests unless agreed upon by the project engineer in consultation with Engineering.

3.3. Welders must be qualified by destructive testing to weld on gas piping for compressor stations. This applies to both field and shop welding and for both API 1104 qualification and ASME qualification. It does not apply to ASME code stamped items.

3.4. Welders working on non-gas piping must have reasonable welding skills and shall be qualified as described below. If the project involves welding on both gas piping and non-gas piping, it is strongly recommended that all welders be qualified as gas piping welders rather than have some welders qualified solely for non-gas piping.

3.4.1. Qualified, within the last six months, in accordance API 1104 or ASME Section IX. The essential variables of these codes shall not apply. Qualifications for another company are acceptable for welding non-gas piping.

3.4.2. Welders making structural welds shall be qualified within the last six months in accordance with API 1104, ASME Section IX, or to AWS D1.1 for welding miscellaneous non-load bearing structures and supports. The location supervision shall be responsible for determining which welds are non-load bearing welds for the purpose of this procedure. Qualifications for another company are acceptable for structural welding.

3.4.3. 3.4.3 Welders making structural welds on load bearing structures and supports shall be qualified within the last six months in accordance with AWS D1.1 for welding on, but not limited to, bridges, platforms, cranes, etc. Qualifications for another company are acceptable for structural welding.

3.5. A list of qualified welders and the procedures in which they are qualified shall be maintained.

3.6. A welder may be required to re-qualify if there is a question about his competence.

4. BENDS AND ELBOWS

4.1. Factory-made, wrought-steel welding elbows or transverse segments cut from elbows may be used for changes in direction provided that the arc length measured along the crotch is at least 1 inch (25.4 mm) on pipe sizes 2 inches (50.8 mm) or larger.

4.2. Cutting of welding elbows to make smaller angle elbows is permitted.

5. BRANCH CONNECTIONS AND REINFORCEMENT

5.1. Saddles shall not be tack-welded to the riser while the branch weld is being made. Wire or soft plugs shall be used for this purpose.

5.2. Weep hole plugs in saddles shall be removed and discarded before welding the saddle. The weep hole shall be sealed with a non-pressure containing water tight sealant such as silicone.

5.3. If saddles have to be heated for shaping aprons to conform to the run diameter, they shall be allowed to cool to an atmospheric temperature before welding operations commence. When it is necessary to split saddles to apply them, the cut surface shall be beveled to an angle of 37-1/2 degrees, plus or minus 5 degrees.

5.4. The hole cut for a branch connection shall not be made in a girth weld. For new construction the hole shall not be cut in a longitudinal weld.

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6. FIELD CUTTING

6.1. Field cutting may be done with a mechanically guided, oxygen cutting torch or other methods approved by the welding inspector.

7. MINIMUM DISTANCE

7.1. Pipelines should have a minimum distance of two pipe diameters between girth welds.

7.2. All fabricated assemblies and plant piping may have distances less than two pipe diameters between girth welds, however a minimum distance of one and one half pipe diameters is recommended. All distances less than one and one half pipe diameters shall be approved by the welding inspector in consultation with Engineering.

8. SEA L WELDS

8.1. Seal welding of threaded joints shall not be allowed unless approved by the welding inspector in consultation with Engineering. All seal welding shall be accomplished by a qualified welder.

9. RESTRICTIONS

9.1. Welding on pressurized pipelines, or any existing line in which conditions exist that could promote accelerated weld cooling (liquids, gas flow, etc.) shall only be done using low hydrogen welding.

9.2. Welding on pressurized pipelines, or any existing line in which conditions exist that could promote accelerated weld cooling (liquids, gas flow, etc.) shall be done by welders with experience in in-service welding .

9.3. Except for in-service welding, lines which contained combustible material, including compressed air lines from a lubricated compressor, shall be isolated and purged as necessary prior to welding.

9.4. Chill or backup rings shall not be used.

9.5. Socket weld fittings may be used on piping less than 2 3/8". Larger sizes may be used on piping operating at a stress level less than 20% SMYS when authorized by Engineering. There shall be at least a 1/16" gap between the end of the pipe and the bottom of the socket.

9.6. Miter joints shall not be used. Deflections 3 degrees or less will not be considered a miter joint.

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10. EQUIPMENT

10.1. Welding equipment, both gas and arc, shall be of a size and type suitable for the work, and shall be maintained in such condition as to insure acceptable welds, continuity of operation, and safety of personnel. Arc welding equipment shall be operated within the amperage and voltage ranges given in the qualified welding procedure. Gas welding equipment shall be operated with the flame characteristics and tip sizes given in the qualified welding procedure. Any equipment which does not meet the requirements shall be repaired or replaced.

10.2. For shielded metal arc welding, the electrode holder shall be of the fully insulated type. On cross country pipelines, un-insulated electrode holders may be used when allowed by the welding inspector.

11. MATERIALS

11.1. Filler metals and fluxes shall be stored and handled as to avoid damage to them and to the containers in which they are shipped. Those in opened containers shall be protected from deterioration, and filler metals which are coated shall be protected from excessive moisture changes. Filler metals and fluxes which show signs of damage or deterioration shall not be used.

11.2. All low hydrogen type covered electrodes shall be stored in hermetically sealed moisture proof containers. After opening, low hydrogen electrodes shall be stored in appropriate holding ovens at a temperature of 350° F ± 50°. No other type of electrodes are to be stored in the holding ovens with the low hydrogen electrodes.

11.3. Unused low hydrogen electrodes that have been exposed for more than 30 minutes are to be discarded or reconditioned in accordance with the manufacturer's recommendations. Unused low hydrogen electrodes can be returned, after no more than 30 minute exposure, to a separate re-drying oven maintained at 350° F ± 50°. Electrodes should not be reconditioned more than once.

11.4. Ambient moisture conditions may require the storage of cellulosic electrodes in warming cabinets.

11.5. Atmospheres for shielding an arc are of several types and may consist of inert gases, active gases, or mixtures of inert and active gases. The purity and dryness of these atmospheres has great influence on the welding and should be of values suitable for the process and base metals. The shielding atmosphere to be used shall be qualified for the material and the welding process.

11.6. Shielding gases shall be kept in the containers in which they are supplied and these shall be stored away from the extremes of temperature. Gases shall not be field intermixed in their

containers. Gases which are of questionable purity and those in containers which show signs of damage shall not be used.

12. DESIGN AND PREPARATION OF A JOINT FOR PRODUCTION WELDING

12.1. The surfaces to be welded shall be smooth, uniform, free of laminations, tears, scale, slag, grease, paint, and other material which might adversely affect the welding. The joint design and spacing between abutting ends shall be in accordance with the welding procedure to be used.

12.2. Unless otherwise specified, for buried pipelines, the longitudinal seams on adjacent pipe shall be staggered, placing one approximately in the 10 o'clock position and the other approximately in the 2 o'clock position.

12.3. Each piece of pipe or subassembly shall be free of debris and foreign material before being welded into the pipeline.

12.4. The alignment of the abutting ends shall be such as to minimize the offset between surfaces. For pipe of the same nominal wall thickness, the offset at the root should not exceed 1/8 inch (3.18 mm). Any greater offset, provided it is caused by dimensional variations, shall be equally distributed around the circumference of the pipe. Hammering of the pipe to obtain proper line-up is not allowed. When welding material with different wall thicknesses, see ETWM-080 Special Details.

12.5. Line-up clamps shall be used in accordance with the requirements of the procedure specification. When it is permissible to remove the line-up clamp before completion of the root bead, the completed part of this bead shall be in approximately equal segments and these shall be approximately equally spaced around the circumference of the joint. However, when an internal line-up clamp is used and conditions make it difficult to prevent movement of the pipe, or if the weld will be unduly stressed, the root bead shall be completed before releasing clamp tension. Root bead segments used in connection with external clamps shall be uniformly spaced around the circumference of the pipe and shall have an accumulative length of no less than 50 percent of the pipe circumference before the clamp may be removed.

12.6. Internal line-up clamps shall be used wherever practical. External line-up clamps must be used where internal line-up clamps are impractical. A Company welding inspector will approve the method prior to use.

12.7. Pipe ends should be field beveled by machine tool or machine oxygen cutting. Manual oxygen cutting may also be used if so authorized by the welding inspector. The beveled ends shall be reasonably smooth and uniform, and dimensions shall be in accordance with the qualified welding procedure.

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13. WELDING

13.1. When selecting a welding procedure to weld material with different yield strengths, the procedure for the higher yield strength material is to be selected.

13.2. Welding shall not be done when the quality of the completed weld would be impaired by the prevailing weather conditions, including but not limited to airborne moisture, blowing sands, or high winds. Windshields may be used when practical. A Company welding inspector shall decide if weather conditions are suitable for welding.

13.3. Hot welds shall be protected from sudden cooling or water quenching to the satisfaction of the Company welding inspector. Every effort is to be made to allow the weld to cool slowly. Quenching in any manner is prohibited.

13.4. Warming or drying the pipe in the absence of any specific requirement is permitted.

13.5. No welding is to be done on pressure piping while the pipe is filled with water (such as that used for hydrostatic testing).

13.6. The electrical ground connection shall be securely fastened, but not welded, to the work and shall fit in a manner to prevent arc burns. This contact shall be large enough to prevent local overheating or arcing. Magnetic ground clamps are prohibited. Other grounding connections may be used when approved by the welding inspector.

13.7. Arc strikes or dragging of electrodes on the surface of the work shall not be permitted. Striking of arcs shall be confined within the welding groove.

13.8. Back welding of valve, flange and fitting welds is allowed. It is preferred that the back welding be done after the hot pass is completed. If not, a preheat of 200° F (93° C) is required.

13.9. Back welding of pipe welds may be allowed by the welding inspector. A preheat of 200° F (93° C) is required.

13.10. Scale and slag shall be removed from each bead and groove. Cleaning may be done with either hand or power tools.

13.11. The number of beads shall be such that the completed weld shall have a substantially uniform cross section around the entire circumference of the pipe. At no point shall the crown surface be below the outside surface of the pipe, nor should it be raised above the parent metal by more than 1/16-inch (1.59 mm).

13.12. After the root bead has been completed, the second bead must be started before the maximum time allowed by the welding procedure.

13.13. Two beads shall not be started at the same location. The face of the completed weld should be approximately 1/8-inch (3.18 mm) greater than the width of the original groove. The completed weld shall be thoroughly brushed and cleaned.

13.14. Girth welds shall have an odd number of passes showing on the cap so that the edges of the passes will not overlap the root pass on a radiograph. When welding on pipe having a thickness greater than 0.500 inch (12.7 mm) three or five beads shall be showing on the finish pass unless the welding inspector specifies a one pass "pipeline" cap. Welds on material greater than 0.750 inch (19 mm) thick may use more than five beads on the finish pass.

13.15. When required by the welding inspector, welds on material over 0.500" thick shall be wrapped with insulating blankets immediately after welding in order to control the cooling rate.

13.16. Each welder shall identify his work.

13.16.1. Die stamping shall not be used.

13.16.2. No oil base markers shall be used for identifying field welds.

14. AUTOMATIC OR SEMIAUTOMATIC WELDING

14.1. When automatic or semiautomatic welding is used, clusters of surface porosity, bead starts, high points, and heavy glass deposits shall be removed by grinding prior to depositing weld material over them.

15. POSITION WELDING

15.1. When the pipe is welded above ground, the working clearance around the pipe at the weld should not be less than 16 inches (406 mm). When the pipe is welded in the trench, the bell hole shall be of sufficient size to provide the welder or welders ready access to the joint.

15.2. All position welds shall be made with the parts to be joined secured against movement and with adequate clearance around the joint to allow the welder or welders space to work.

16. ROLL WELDING

16.1. Roll welding shall be performed using qualified welding procedures.

16.2. Roll welding will be permitted, provided alignment is maintained by use of skids or structural framework, having an adequate number of roller dollies to prevent sag in the supported lengths of pipe.

16.3. The pipe shall be rolled to maintain welding at or near the top of the pipe.

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1. SCOPE

1.1. This specification establishes the visual inspection requirements for pipeline welding and welded systems.

2. CODES AND STANDARDS

In addition to complying with the requirements of this specification, the following regulations, codes, standards and specifications, latest approved edition, shall apply as applicable:

- Department of Transportation Regulations Code of Federal Regulations, Title 49, Part 192, "Transportation of Natural and Other Gas by Pipelines".
- Department of Transportation Regulations Code of Federal Regulations, Title 49, Part 195, "Transportation of Hazardous Liquids by Pipelines".
- American Petroleum Institute (API), Standard 1104, "Standard for Welding Pipelines and Related Facilities"
- ASME Boiler &Pressure Vessel Code, Section IX, "Welding and Brazing Qualifications"
- ASME B31.8, "Gas Transmission and Distribution Piping Systems"
- ASME B31.4, "Pipeline Transportation Systems for Liquid Hydrocarbons"
- ASME B31.3, "Chemical Plant and Petroleum Refinery Piping"

3. INSPECTION REQUIREMENTS

3.1. General

3.1.1. The welding inspector shall have the applicable codes and Company specifications in his possession for immediate reference on the job site. In addition, the welding inspector shall have the appropriate inspection equipment on hand for determining compliance to the welding procedures and construction specifications.

3.1.2. When the welding inspector is familiar with the applicable construction specifications and is properly equipped, the following paragraphs represent primary areas which shall be inspected and documented in accordance with Company standard construction practices.

3.2. Welding Procedures

3.2.1. The welding inspector shall insure that the appropriate welding procedure specification is utilized for the specific application. He shall verify that the welding procedure is correct for the specific material type, grade, diameter, thickness, etc. The welding inspector shall document each welding procedure utilized during the construction, alteration, or repair project.

3.3. Pipe/Component Surface Condition

3.3.1. The welding inspector shall examine the surface of all pipe and components for defects that could affect their serviceability. Any gouge, dent or other defect which exceeds the allowable depth in accordance with the applicable material standard shall be either removed by grinding or the entire section replaced as a cylinder.

3.3.2. Grinding to eliminate gouges or grooves shall be followed by wall thickness measurements to assure adequate wall thickness of the pipe or component remains.

3.3.3. The end bevels shall be inspected for manufacturing defects such as dent, gouges, laminations, improper bevel angle, and improperly machined root face.

3.4. Alignment and Fit-Up

3.4.1. The welding inspector should periodically assure that the alignment and root space are in accordance with the welding procedure.

3.4.2. The welding inspector shall assure the weld joint is clean and free of all foreign material such as dirt, oil, coating material, etc. that could adversely affect the welding.

3.4.3. The welding inspector shall assure the use of line up clamps are in accordance with the welding procedure.

3.4.4. The process and method of aligning the pipe and components shall be done in a manner, which does not result in abnormal residual stress on the completed weld.

3.4.5. For fillet welds, the welding inspector should consider the probable weld shrinkage, which may occur, and require that the components being joined are properly spaced prior to welding.

3.5. Pipe Groove Welds

3.5.1. Cracks, other than a shallow crater crack or star crack not exceeding 5/32" in length, found anytime during welding shall be unacceptable and the weld rejected.

3.5.2. Root Pass

3.5.2.1. When preheating is required by the welding procedure, the preheat temperatures should be measured periodically by "tempil-stiks" or by a pyrometer. Preheating temperatures shall be maintained during the completion of the root pass.

3.5.2.2. The welding inspector shall check the general condition of the root pass electrodes and determine that the proper electrode type and diameter are being used.

3.5.2.3. The welding inspector should examine the welding cable connections at the machine to determine that the correct polarity is being used.

3.5.2.4. The welding inspector should recognize that root pass travel speed and amperage are closely related. Finding an excessive root pass travel speed usually indicates excessive amperage is being used and vice-versa. If either of these parameters are outside the limits of the welding procedure, it increases the potential for a thinner than desired root bead, possibly leading to root bead cracking.

3.5.3. Hot Pass

3.5.3.1. The welding inspector should review the condition of the hot pass electrodes and determine that the proper electrode type and diameter are being used.

3.5.3.2. The welding inspector shall ensure that the time period between the root pass and the hot pass (specified in the welding procedure) is not exceeded.

3.5.3.3. The welding inspector should require that the completed hot pass is cleaned of all slag by power brushing.

3.5.4. Fill Passes

3.5.4.1. The welding inspector should review the condition of the fill pass electrodes and determine that the proper electrode type and diameter are being used.

3.5.4.2. During fill pass welding, the welding inspector should periodically ensure that inter-pass cleaning is sufficient to eliminate slag entrapment between passes.

3.5.5. Cap Pass

3.5.5.1. The welding inspector should review the condition of the cap pass electrodes and determine that the proper electrode type and diameter are being used.

3.5.5.2. The welding inspector should ensure that the cap pass is properly cleaned including the edges of the cap pass so that a complete and thorough visual inspection can be performed.

3.5.5.3. The visual acceptance criteria for the finished weld shall be as follows:

a) Cap pass shall not be below the outside surface of the pipe nor should it be raised above the pipe surface by more than 1/16 of one inch.

b) Cap passes which are raised above the parent metal by more than 1/16 of an inch and which, in the opinion of the welding inspector, may be suspect in terms of the reasons for the excessive re-enforcement may be ground down to 1/16 of an inch above the pipe surface.

c) Undercut which has a depth greater than 1/64 of an inch regardless of length, shall be rejected.

d) Final cap pass width should not be over 1/8 of an inch wider than the width of the original groove.

e) Visible pinholes or porosity are not allowed and shall rejected. Steel punches or peening are not acceptable repair methods.

f) Cracks of any length are not allowed and shall be rejected.

g) Arc burns on the weld or on the pipe are not allowed and shall be rejected.

3.5.5.4. See "Defects" section of this Manual for repair requirements.

3.6. Pipe Fillet Welds

3.6.1. Cracks, other than a shallow crater crack or star crack not exceeding 5/32" in length, found anytime during welding shall be unacceptable and the weld rejected.

3.6.2. The welding inspector shall inspect all fillet welds to ensure compliance with the Company approved welding procedure.

3.6.3. All fillet welds, other than seal welds, shall have a minimum of two weld passes. The purpose of this requirement is to eliminate any potential leak path.

3.6.4. The welding inspector shall inspect fillet welds using the following acceptance criteria:

3.6.4.1. The fillet weld leg size shall be in conformance with the approved procedure.

3.6.4.2. Pinholes or porosity are not allowed.

3.6.4.3. Undercut greater than 1/64 of an inch in depth is not allowed regardless of length.

3.6.4.4. Cracks of any length are not allowed.

3.7. Amperage and Voltage Inspections

3.7.1. If the welding inspector has concerns with the amperage and voltage of a welder's machine, he should make periodic amperage and voltage measurements during the welding process, to ensure compliance with the welding procedure. When checking voltage at the terminals of the welding machine, the inspector should allow for a 2 to 3 volt drop at the arc depending on the length of the cables.

4. INSPECTION EQUIPMENT

4.1. Visual inspection of pipe welding involves the use of certain instruments and inspection tools for the measurement of welding parameters and material defects.

4.2. A list of recommended equipment for the welding inspector is presented below:

4.2.1. Amperage meter (0-300 amps)

4.2.2. Voltmeter

4.2.3. 6" vernier calipers for accurate measurement of root face, pipe wall thickness at the ends, nick break specimens, etc.

4.2.4. Pit measurement gage or dial indicator depth gage.

4.2.5. Tempil-Stiks (150, 200, 250, 300, 350, 400, 450 degrees F.)

4.2.6. 6 ft tape measure

4.2.7. Stop wa

4.2.8. Ultrasonic thickness gage should be available for measuring remaining wall thicknesses after a gouge or arc burn is removed.

4.3. The above recommended equipment list provides the inspector with the equipment necessary to ensure all welding activity is in compliance with the Company specifications and procedures.

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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Welding Procedures Manual			
Specification No. LP-09	Issue Date: May 25th 2018	Revision Date:	

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1. PREHEATING

1.1. When steel materials with different preheat temperatures are being preheated for welding, the higher temperature must be used.

2. CONDITIONS UNDER WHICH PREHEATING IS REQUIRED

2.1. Preheating is required when:

2.1.1. Specified in the welding procedure

2.1.2. Welding valves, flanges and fittings 20" OD and larger

2.1.3. Welding wall thicknesses greater than 0.750"

2.1.4. Welding materials of grades X65/Y65 or higher

2.1.7. Repair welding

2.1.5. Welding carbon steel, if preheating will alleviate existing conditions that would limit the welding technique or tend to adversely affect the quality of the weld.

2.1.6. Required by the welding inspector

2.1.7. Vessel preheating requirements are shown on the welding procedures, and are given in the ASME Boiler and Pressure Vessel Code, Section VIII.

2.2. There may be other conditions which will require preheating and these will be specified in the welding procedure specification sheet.

2.3. The Company recommends that X60 and higher grade pipe be preheated whenever it is being welded.

2.4. The welding procedures specify a minimum pipe temperature. This is typically 40° F. If the ambient temperature is less than the minimum pipe temperature, the pipe must be heated prior to welding.

2.5. When the pipe is moist due to weather conditions such as rain, snow, or dew, the pipe shall be heated to dry the pipe.

2.6. Preheating to dry the pipe is required when welding on in-service pipelines.

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3. PREHEATING TEMPERATURES

3.1. When preheating is required by Section 2, preheating temperatures shall be a minimum of 200° F (93° C).

3.2. When the pipe is to be warmed or dried, try to heat the pipe above 70° F

3.3. Preheating temperatures shall be checked by the use of temperature-indicating crayons, pellets, thermocouples, pyrometers, or other methods acceptable to the welding inspector. Using the warm-to-the-hand method is not acceptable.

4. PREHEATING METHODS

4.1. A band extending a minimum of 3 inches on each side of the groove shall be heated to the preheat temperature.

4.2. Preheat temperature shall be measured at the start of welding to ensure it is not less than the required preheat temperature.

4.3. Heating shall be by any suitable means, providing the heating is uniform. Butane or acetylene flame may be used on pipelines. Oil burners may not be used.

4.4. Localized overheating must be prevented.

4.5. Deposits of soot from acetylene torches or other heating devices shall be cleared away from the welding area before welding.

5. STRESS RELIEVING, GENERAL

5.1. Stress relieving is a means for relieving internal stresses, improving weldment microstructure, and restoring properties affected by welding. This is accomplished by uniform heating and cooling to a sufficient temperature below the critical range.

5.2. In general, welds on carbon steel with a wall thickness of more than 1-1/2 inches [3/4 inches for B31.3 piping] must be stress relieved. There may be other areas where engineering judgment must be used to determine stress relief requirements. The project engineer is responsible for designating which other welds require stress relief.

5.3. Stress relieving drawings shall be provided by the project engineer for all compressor and pump stations projects.

5.4. The welding inspector, in consultation with Engineering, may require stress relief of butt welds made under conditions of high restraint.

5.5. When a weld connects pipe or components that are of different thicknesses, the wall thickness to be used in determining whether stress relieving is required under this section is as follows:

5.5.1. In the case of pipe connections, the thicker of the two pipes joined, as measured at the weld joint; or

5.5.2. In the case of branch connections and slip-on flanges, the thickness of the pipe run or header.

5.6. Preheating or peening may be substituted for the stress relieving requirement prescribed herein, only when approved by Engineering.

5.6. Vessels shall be stress relieved as required in Section VIII of the ASME Boiler and Pressure Vessel Code and as specified in the welding procedure. Weld repairs or alterations to previously stress relieved vessels shall be stress relieved in accordance with API 510 or NBIC codes.

6. STRESS RELIEVING TEMPERATURES - TYPICAL

6.1. The following are typical ASME stress relieving requirements for carbon steel. The project engineer is responsible for specific stress relief requirements.

6.2. Stress relieving must be performed at a temperature of at least 1,100° F (593° C) for carbon steels. When stress relieving a weld between steel materials with different stress relieving temperatures, the higher temperature must be used.

6.3. When heating, temperatures shall be brought up first to 600° F (315° C). From 600° F (315° C) to the required temperature, the rise shall be made slowly at a maximum rate of 500° F (260° C) per hour. The holding time shall be 1 hour per inch of thickness, but not less than 30 minutes.

6.4. When cooling, the temperature shall be brought down slowly from the holding temperature at a maximum rate of 500° F to 600° F (260° C to 315° C) per hour. From 600° F (315° C) down, the cooling may be done in air as long as it is uniform.

6.5. The following precautions must be taken:

6.5.1. Heating and cooling rates must be adjusted for wall thicknesses above 1 inch. The rates shall be 500° F (260° C) per hour divided by the maximum wall thickness.

6.5.2. The heating and cooling rates are extremely critical. A high rate of heating or cooling may increase residual stresses.

6.5.3. Water cooling shall not be performed under any circumstance.

6.6. When stress relieving, the temperature must be monitored to ensure that a uniform temperature is maintained and that the proper stress relieving cycle is accomplished. Temperatures shall be checked by the use of the thermocouple pyrometers or other suitable equipment. On pipe, one thermocouple is to be placed on the bottom and one on top when doing local stress relieving. For furnace stress relieving, several thermocouples shall be placed on the item.

6.7. A chart showing temperature readings from a pyrometer shall be required from each heat so as to document that the item was properly stress relieved. The documentation shall include the type of pipe material. Contractors shall provide stress relieving records and temperature charts to the Company.

7. STRESS RELIEVING METHODS

7.1. Stress relieving may be accomplished by the following methods:

7.1.1. Heating the complete structure as a unit;

7.1.2. Heating a complete section containing the weld or welds to be stress relieved before attachment to other sections of work;

7.1.3. Heating a part of the work by heating a circumferential band containing the weld at the center. The width of the band which is heated to the required temperature shall be at least 2 inches greater than the width of the weld reinforcement. Care should be used to obtain a uniform temperature around the entire circumference of the pipe. The temperature shall diminish gradually outward from the ends of this band;

7.1.4. Heating a circumferential band around the header pipe with the branch or welded attachment at the middle of the band. The width of the band shall be at least 2 inches greater than the diameter of the weld that joins the branch or attachment to the header. The entire band shall be brought up to the required temperature and held for the time specified.

8. STRESS RELIEVING EQUIPMENT

8.1. Stress relieving may be accomplished by any of the following means, provided a uniform temperature is maintained during the stress relieving:

8.1.1. Electric induction,

8.1.2. Electric resistance,

8.1.3. Fuel fired ring burners,

8.1.4. Fuel fired torch, and

8.1.5. Furnace heating.

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1. VISUAL EXAMINATION OF WELDS

1.1. Visual inspection of welding must be conducted to insure that the following is met:

(a) The welding is performed in accordance with a Company approved welding procedure; and

(b) The weld is acceptable to the standards of this Section and the Company's construction specifications.

2. NONDESTRUCTIVE EXAMINATION FREQUENCY

2.1 General

2.1.1 This procedure applies to both permanent welds and temporary welds. It does not apply to structural welds.

2.1.2 Each circumferential weld of steel pipe which is located where the stress during bending causes a permanent deformation in the pipe shall be nondestructively examined after the bending process. NOTE: This applies to all pipe sizes and stress levels.

2.1.3 All welds made as part of a hot tap or installation of a repair sleeve shall be nondestructively examined. NOTE: This applies to all pipe sizes and stress levels.

2.1.4 The Company's goal is to have nondestructive examination performed on 100% of the welds. When reduced inspection is used, AND WHEN nondestructive examination is required under certain regulations and/or codes, the following minimum percentages of each day's field butt welds, selected at random by the company, must be nondestructively examined over their entire circumference.

2.2 Pipelines Constructed In Accordance With DOT Part 192 or ASME B31.8

2.2.1 The welds on a pipeline to be operated at a pressure that produces a hoop stress of 20 percent or more of SMYS shall be nondestructively examined, except that welds that are visually examined and approved by a qualified welding inspector need not be nondestructively examined if the following is met:

2.2.1.1 The pipe has a nominal diameter of less than 6 inches (168 mm); or

2.2.1.2 The pipeline is to be operated at a pressure that produces a hoop stress of less than 40 percent of SMYS and the welds are so limited in number that nondestructive examination is impractical.

2.2.1.3 Except for a welder whose work is isolated from the principal welding activity, a sample of each welder's work for each day shall be nondestructively examined when nondestructive examination is required under Paragraph 2.2.1.

(a) At least 10 percent in Class 1 locations, except offshore.

(b) At least 15 percent in Class 2 locations.

(c) 100 percent, if practicable, but not less than 90 percent (nondestructive examination must be impracticable for each girth weld not tested) for:

- In Class 3 and 4 locations
- Crossings of major or navigable rivers
- Offshore
- Tunnels, bridges, and overhead road crossings
- Major power line crossings
- Meter and regulator assemblies
- Fabricated assemblies
- Valve settings
- Piping within compressor and plant yards
- Major gas and fuel gas piping modifications to existing facilities
- Pig launchers and traps
- Double-jointed yard pipe

(d) 100 percent for:

- Pre-tested pipe placed in the line

- Tie-in welds
- Welds at river crossing to a point beyond the high water level
- Welds at highway and railroad crossings to a point 100 feet (30.5 m) on each side of the right-of-way
- Girth welds in bends
- Welds associated with hot taps and repair sleeves.

2.2.1.4 Station drain, water, oil, air, and other utility lines and vent piping of all sizes are to be nondestructively examined at a frequency determined by the welding inspector.

2.3 Pipelines Constructed In Accordance With DOT Part 195 or ASME B31.4

2.3.1 A minimum of 10% of the girth welds made by each welder during each welding day shall be nondestructively tested over the entire circumference of the weld.

2.3.2 All girth welds installed each day in the following location shall be 100% nondestructively tested, except that when nondestructive testing is impracticable for a girth weld, it need not be tested if the number of girth welds for which testing is impracticable does not exceed 10% of the girth welds install that day.

2.3.2.1 At any onshore location where loss of hazardous liquid could reasonably be expected to pollute any of the following locations:

(a) a stream

(b) a river

(c) a lake

(d) a reservoir

(e) other bodies of water

(f) any offshore area

2.3.2.2 Within railroad or public road rights-of ways.

2.3.2.4 At overhead crossings and within tunnels.

2.3.2.5 Within the limits of any incorporated subdivision of a State government.

2.3.2.6 Within populated areas, including, but not limited to any of the following locations.

(a) residential subdivisions

(b) shopping centers

(c) schools

(d) designated commercial areas

(e) industrial facilities

(f) public institutions

(g) places of public assembly

2.3.3 A 100% of all old girth welds shall be nondestructively tested when installing used pipe.

2.3.4 A100% of all tie-ins, including tie-ins of replacement sections, shall be nondestructively tested.

2.4 Piping Constructed In Accordance With ASME B31.3.

2.4.1 Piping in Normal Fluid Service shall be nondestructively tested to the extent specified as follows:

2.4.1.1 Not less than 5% of all girth welds shall be selected at random. The welds to be examined shall be selected to ensure that the work product of each welder is represented.

2.4.1.2 When required random nondestructive testing reveals a defective weld the following shall be performed:

(a) Two additional welds of the same welder(s) shall be nondestructively tested. If these two welds are found to be acceptable no further sampling will be required.

(b) If any of the welds examined in (a) above reveals a defect, then two additions welds for each defective weld shall performed by the welder(s) shall be nondestructively tested. If welds are found to be acceptable no further sampling will be required.

(c) If any of the welds examined in (b) above reveals a defect, then all welds performed by the welder(s) shall be nondestructively tested.

2.4.1 Piping under severe cyclic conditions shall be nondestructively tested to the extent specified as follows:

2.4.1.1 A 100% of all girth and branch connection welds shall be nondestructively tested.

3. NONDESTRUCTIVE EXAMINATION (NDE) METHODS

3.1. This section specifies the type of inspection methods that shall be used for certain types and sizes of welds. This section does not specify which welds are to be inspected. Inspection frequency is specified in Section 2.

3.2. Fillet welds, branch connections and welds of such configuration that cannot be radiographed, shall be examined using the magnetic particle method. If the use of the magnetic particle method is not applicable (i.e. stainless steels and non-ferromagnetic materials, etc.) the liquid penetrant method may be used.

3.3. Girth welds in pipe 3 inches (76 mm) or larger in diameter shall be examined by the radiographic or ultrasonic methods.

3.4. Girth welds in pipe less than 3 inches (76 mm) in diameter shall be examined by:

(a) the magnetic particle method, or

(b) if the use of the magnetic particle method is not applicable, the liquid penetrant method may be used, or

(c) if required by the weld inspector, the radiographic method.

4. INSPECTION AND EXAMINATION OF PRODUCTION WELDS

4.1. For pipelines and facilities constructed in accordance with DOT Part 192, Part 195, ASME B31.8, or ASME B31.4 all inspection and examination of production welds shall be in accordance with API Standard 1104.

4.2. ASME B31.3 contains the minimum requirements for inspection and examination for welds made under that Code.

5. ACCEPTANCE STANDARDS FOR NONDESTRUCTIVE EXAMINATION

5.1. Pipelines Constructed In Accordance With DOT Part 192, Part 195, ASME B31.8, or ASME B31.4.

5.1.1 The acceptability of a weld that is nondestructively or visually examined is determined according to API Standard 1104 Section 9. However, if a girth weld is unacceptable under that standard for a reason other than a crack, and if the Appendix to API Standard 1104 applies to the weld, the acceptability of the weld may be further determined under that Appendix.

5.2 Piping Constructed In Accordance With ASME B31.3.

5.2.1 The acceptability of a weld that is nondestructively or visually examined shall be determined in accordance with Table 341.3.2 of the ASME B31.3 Code.

6. NDE PROCEDURE

6.1. Nondestructive examination of welds must be performed by any process, other than trepanning, that will clearly indicate defects that may affect the integrity of the weld.

6.2. Nondestructive examination of welds must be performed as follows:

(a) In accordance with written and qualified procedures submitted to the Company for acceptance; and

(b) By persons who have been trained and qualified in the established procedures and with the equipment employed in the examination.

6.3. NDE personnel shall be certified as Level II or III in the applicable inspection method in accordance with American Society for Nondestructive Testing, Recommended Practice SNT-TC-1A.

6.4 Radiographic Examinations:

6.4.1 The radiographer shall produce a radiograph that is free from blemishes or film defects that might mask the image of an actual defect. The images of the penetrameter outline, identifying number, and essential hole or essential wire shall all appear clearly on the radiograph.

6.4.2 The radiographer shall be equipped with either a properly calibrated densitometer or certified comparative density strip to verify the density of the film in the area of interest. The H&D density through the area of interest shall not be less than 1.8 for transparent-based film or .5 for opaque-based film. The maximum H&D density

through the area of interest shall not exceed 4.0 for transparent-based film and 1.5 for opaque-based film.

6.4.3 The radiographer shall make at least one acceptable test radiograph, in accordance with the appropriate radiographic procedure. This test radiograph may be the first production radiograph and shall be of a weld designated by the Company's inspector. The radiographer shall then complete his portion of the Radiographic Procedure Qualification Report (Section ETWM-190) and submit it to the Company Inspector. The Company inspector shall complete his portion of the report to qualify the Radiographer for production work. This report shall be maintained in the project file.

6.4.4 Any change in a qualified radiographic procedure qualification shall require completion of a new procedure qualification in accordance with paragraph 6.4.3 above. Listed below, but not limited to, are typical changes requiring re-qualification of a procedure.

(1) Gamma ray source to X -ray source or vice versa.

(2) External exposure to internal exposure or vice versa.

(3) Pipe Diameter and/or wall thickness.

6.4.5 All film images shall be clearly identified by the use of lead numbers or letters, markers or other identification methods so that the proper weld and any defect in it can be quickly and accurately located. Whenever more than one image is used to examine a weld, identification marker shall appear on each image, and adjacent images shall overlap. The marker on each end of the image shall appear on the appropriate adjacent images in a way that establishes that no part of the weld has been omitted.

6.4.6 Film viewing equipment shall be of a variable high intensity type and shall be capable of viewing film densities within the ranges specified in the above paragraph. To prevent interference with interpretations, it shall be equipped to prevent light from coming around the outer edge or through low-density portions of the radiograph.

6.4.7 Interpretation of the radiographic film shall be in accordance with the appropriate construction code. Only Level II or III personnel shall interpret radiographic examination results.

6.4.8 Radiographic film shall be retained and kept readily available for the Company's Inspector until the project is completed and ready to be placed into service. The film shall then be forwarded to the appropriate location for proper disposal.

6.5 Magnetic Particle Examination:

6.5.1 A hand held magnetic yoke shall be utilized for field weld examinations.

6.5.2 The magnetic particles shall be of the dry powder type for all examination surfaces in excess of 100 °F. The color of the powder shall be selected for maximum contrast to the examination surface.

6.6 Liquid Penetrant Examinations:

6.6.1 Liquid penetrant examinations shall be utilized on non-ferromagnetic materials only, such as SA-316 or SA-304 stainless steels.

6.6.2 The liquid penetrant examination shall only be performed after the weld has been completed and cooled to ambient temperature.

7. RECORDS

7.1. When nondestructive examination is required under this procedure, the Company will retain, for the life of the pipeline, or facility, a record showing by milepost, engineering station, or geographic feature, the number of girth welds made, the number nondestructively examined, the number rejected, and the disposition of the rejects.

7.2. The NDE records shall be furnished to the Company's Inspector daily providing the minimum information:

(a) The type of examination.

(b) The number of welds nondestructively examined and accepted.

(c) The number of welds rejected.

(d) The examination acceptance standard.

7.3. Upon project completion, if not sooner, the film and related inspection reports shall be sent to an appropriate location for storage until such time the film can be properly disposed of.

7.4. Drawings which are marked with radiographic information when applicable for compressor stations, fabrications, or other facilities will be filed with the radiograph report and be handled the same as the report.

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1. REPAIR OF WELDS

1.1. Each weld that is unacceptable must be removed or repaired. The Company's welding inspector shall decide whether to repair or remove the defective weld.

1.2. Cracked welds shall be removed from the line.

1.3. If repairs are made, the welding inspector specifies the method of repair.

1.4. "Spot" repairs are not allowed. The minimum length of a repair weld is 3" (77 mm).

1.5. A minimum preheat of 200° F (93° C) shall be used for repair welding.

1.6. First repair of defects

1.6.1. Each weld that is repaired must have the defect removed down to sound metal.

1.6.2. Defects may be removed using oxygen fuel gas gouging, chipping, grinding, or filing. Carbon arc gouging is prohibited for field use. It may be used during shop fabrication provided that an additional 1/8" of metal is removed by grinding after carbon arc gouging.

1.6.3. The repair is to be made using the original welding procedure except the segment to be repaired must be preheated if conditions exist which would adversely affect the quality of the weld repair.

1.6.4. After repair, the segment of the weld that was repaired must be re-inspected to ensure acceptability using the original inspection method.

1.7. Repair of a previously repaired area

1.7.1. A defect in a previously repaired area shall be removed from the line unless the welding inspector authorizes a re-repair.

WARNING: A repair in a previously repaired area requires use of a repair welding procedure **specifically qualified** for such use. Engineering shall be responsible for qualifying or approving repair procedures.

1.7.2. Repair procedures must provide that the minimum mechanical properties specified for the welding procedure used to make the original weld are met upon completion of the final weld repair.

1.7.3. The repair shall be made under the supervision of a welding inspector experienced in repair welding techniques.

1.7.4. After repair, the segment of the weld that was repaired must be re-inspected to ensure acceptability using the original inspection method. .

2. ARC BURNS

2.1. Each arc burn, or arc strikes outside the weld bevel area, on steel pipe to be operated at a pressure that produces a hoop stress of 40 percent or more of SMYS must be cut out and replaced as a cylinder unless repair by grinding is authorized, on a case by case basis, by a Company representative in consultation with Engineering. Arc burns on valves, flanges and fittings may be repaired by grinding when authorized, on a case by case basis, by a Company representative in consultation with Engineering.

2.2. Arc burns on a steel pipe to be operated at a pressure that produces a hoop stress below 40 percent of SMYS shall be repaired or removed as determined by the welding inspector.

2.3. Removal of each arc burn from a length of pipe must be accomplished by cutting out the damaged portion as a cylinder.

2.4. If a repair is to be made by grinding, the arc burn must be completely removed and the remaining wall thickness must be at least equal to either:

2.4.1. The minimum wall thickness required by the tolerances in the specification to which the pipe was manufactured; or

2.4.2. The nominal wall thickness required for the design pressure of the pipeline.

2.5. Repair of an arc burn can be accomplished by hand-filing to the contour of the pipe. Smooth the surface with emery paper and etch with a 20 percent solution of ammonium persulphate a minimum of three minutes. A blackened area indicates that heat-affected metal is still present and additional filing is necessary. Wash the surface with water after etching.

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1. WELDING UNEQUAL WALL THICKNESSES AND/OR STRENGTHS

1.1. The transition between ends of unequal thickness may be accomplished by taper and welding, as illustrated in Figure 1, or by means of a prefabricated ring.

1.2. If a transition ring is used, the design pressure of the facility must be set to incorporate the smaller wall thickness, the lower design factor (F), and the higher SMYS of the two pipes being joined.

1.3. The sketches in Figure 1 illustrate acceptable preparations for joining pipe ends by butt welding for materials having unequal wall thicknesses and/or with unequal specified minimum yield strengths. The thickness of the thin wall material is labeled "**t**." The maximum thickness of the thicker material which may be used for design purposes is $\mathbf{t_d}$. $\mathbf{t_d}$ may not be greater than 1.5**t**.

1.4. The thickness of the sections to be joined, beyond the joint design area, shall comply with the design requirements of this Section.

1.5. When the minimum specified yield strengths of the sections to be joined are unequal, the deposited weld metal shall have mechanical properties at least equal to those of the section having the higher strength.

1.6. Sharp notches or grooves at the edge of the weld where it joins a slanted surface shall be avoided.

1.7. For joining unequal thicknesses of equal specified yield strengths, the rules given herein apply, except there is no minimum angle limit to the taper.

1.8. For unequal internal diameters, piping which will operate at hoop stresses of less than 20 percent of specified minimum yield strength, if the nominal wall thicknesses of the adjoining ends do not vary more than 1/8-inch (3.18 mm), needs no special treatment provided adequate penetration and bond is accomplished in welding.

1.9. For unequal internal diameters and the stress levels are above 20 percent of the minimum specified yield strength, the following paragraphs will apply:

1.9.1. If the nominal wall thicknesses of the adjoining ends do not vary more than 3/32-inch (2.38 mm), no special treatment is necessary provided full penetration and bond is accomplished in welding. See Figure 1(A).

1.9.2. Where the nominal internal offset is more than 3/32-inch (2.38 mm) and there is no access to the inside of the pipe for welding, the transition must be made by a taper cut on the inside end of the thicker section. See Figure 1(B). The taper angle shall not be steeper than 30 degrees nor less than 14 degrees.

1.9.3. Where the nominal internal offset is more than 3/32-inch (2.38 mm), but does not exceed one-half the thinner section, and there is access to the inside of the pipe for welding, the transition may be made with a tapered weld as shown in Figure 1(C). The land on the thicker section must be equal to the offset plus the land on abutting section.

1.9.4. Where the nominal internal offset is more than one-half the thinner section, and there is access to the inside of the pipe for welding, the transition may be made with a taper cut on the inside end of the thicker section as shown in Figure 1(B), or by a combination taper weld to one-half the thinner section and a taper cut from that point as shown in Figure 1(D).

1.10. For unequal external diameters, where the external offset does not exceed one-half the thinner section, the transition may be made by welding as shown in Figure 1(E), provided the angle of rise of the weld surface does not exceed 30 degrees and both bevel edges are properly fused.

1.11. Where there is an external offset exceeding one-half the thinner section, that portion of the offset over 0.5**t** shall be tapered as shown in Figure 1(F).

1.12. For unequal internal and external diameters, as shown in Figure 1, where there is both an internal and an external offset, the joint design shall be a combination of items (A) to (F); that is, item (G). Particular attention must be paid to proper alignment under these conditions.

2. FLANGES

Attachment details for flanges are shown in Figure 2.

3. OPENINGS

Reinforced and un-reinforced openings are detailed in Figures 3, 4, and 5.

4. ELBOWS FOR FIELD CUTTING

4.1. Elbows for field cutting shall state on the bill of materials "size fittings for field cutting" to insure true roundness or circularity.

4.2. The method of cutting elbows is shown in Figure 6.

FIGURE 1

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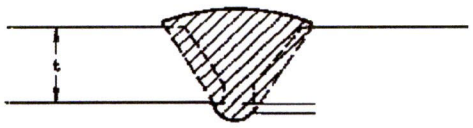
Specification Title: Welding Procedures Manual			
Specification No. LP-09	Issue Date: May 25th 2018	Revision Date:	

ACCEPTABLE DESIGN FOR UNEQUAL WALL THICKNESS



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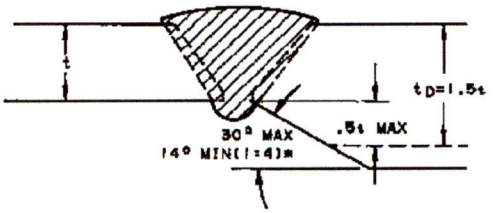

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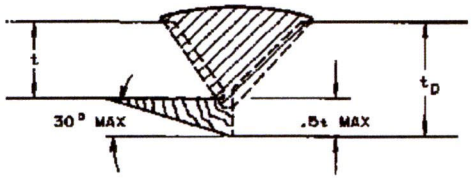

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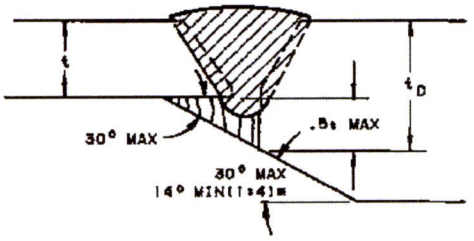

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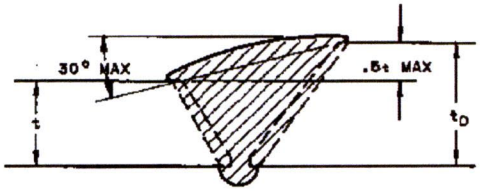
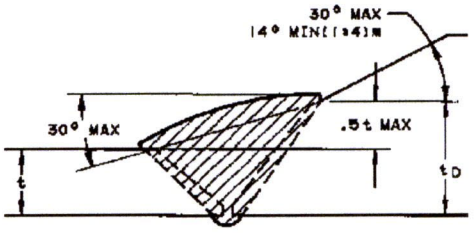
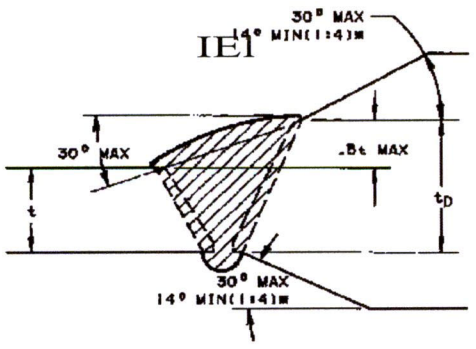




IF 1

IE1



IG J

*NO IN. WHEN ATERJALS JOINED HAVE EQUAL YIELD STRENGTH.

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FIGURE 2

ATTACHMENT DETAILS OF FLANGES

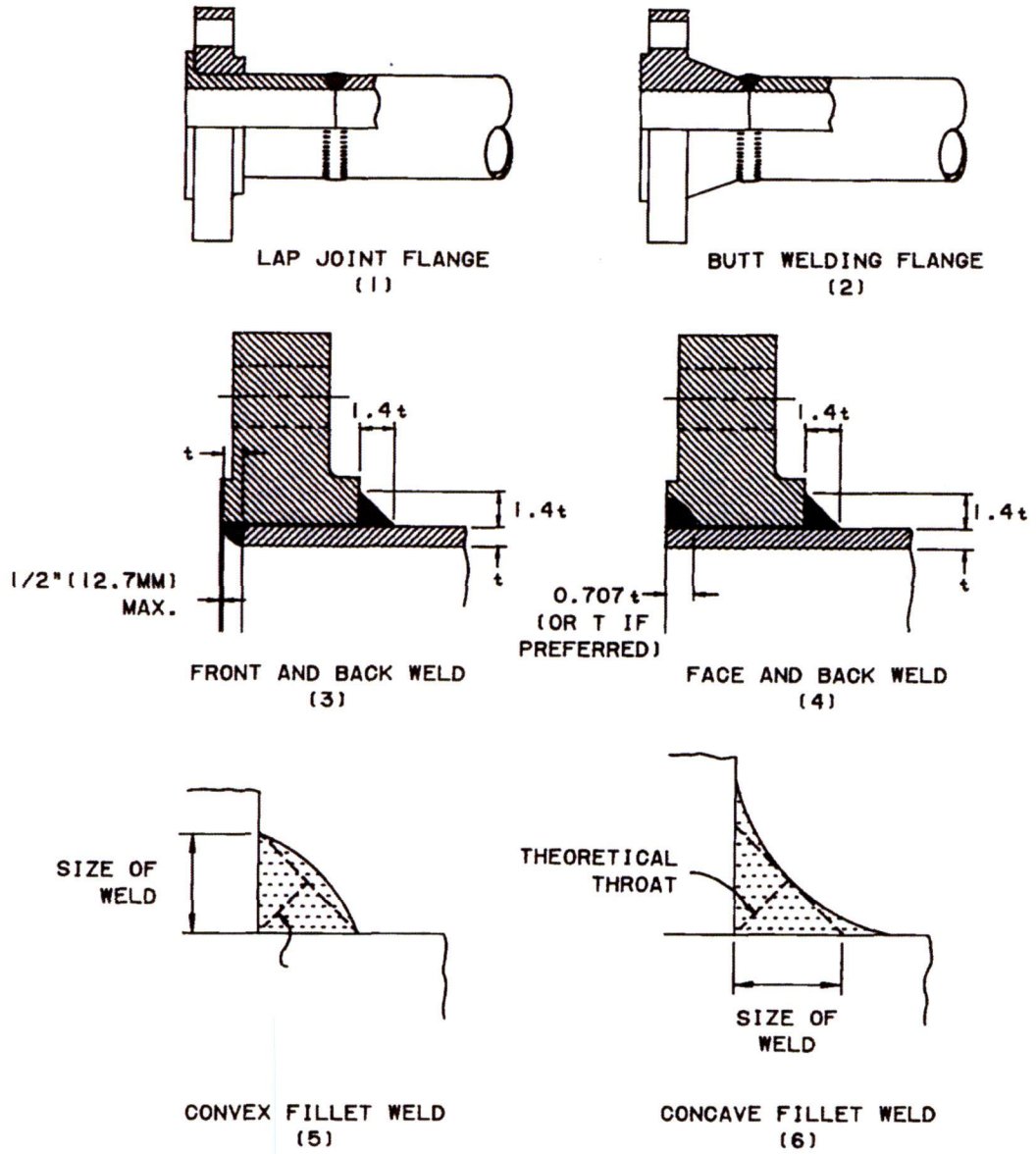

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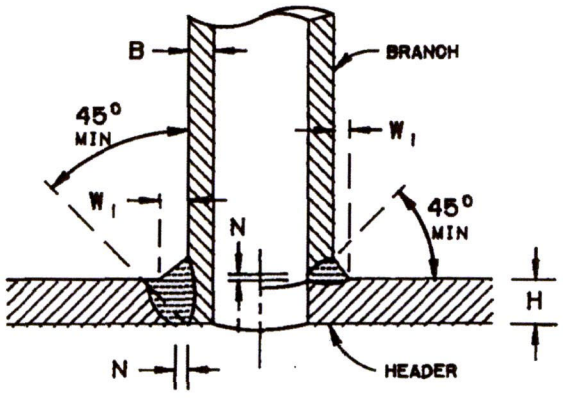
FIGURE 3

WELDING DETAILS FOR OPENINGS WITHOUT REINFORCEMENT OTHER THAN THAT IN HEADER AND BRANCH WALLS



WHEN A WELDING SADDLE IS USED IT SHALL BE INSERTED OVER THIS TYPE OF CONNECTION

W_1 = 3/8B BUT NOT LESS THAN 1/4"(6.35MM)
N = 1/16"(1.59MM) MINIMUM, 1/8"(3.18MM) MAXIMUM, (UNLESS BACK WELDED OR BACKING STRIP IS USED)

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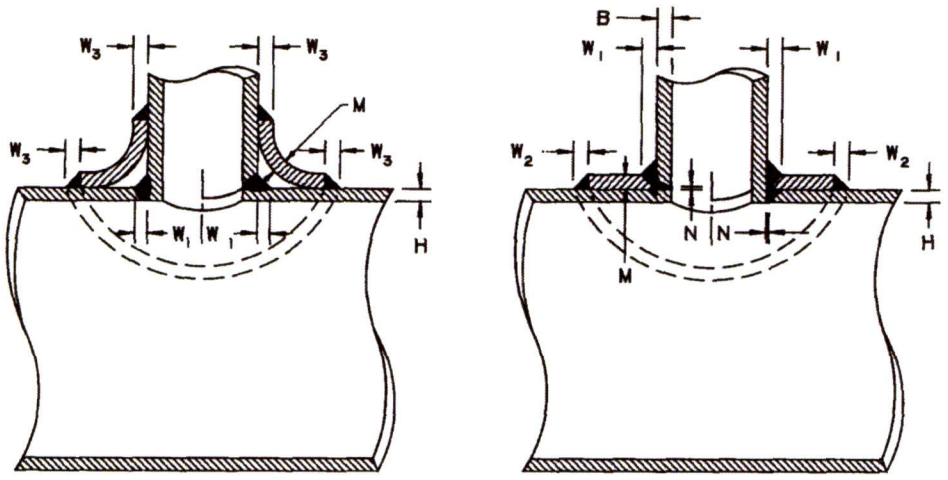
FIGURE 4

WELDING DETAILS FOR OPENINGS WITH LOCALIZED-TYPE REINFORCEMENT



SADDLE PAD

W_1 (MIN.) = 3/8B BUT NOT LESS THAN 1/4" (6.4MM)
W_2 (MIN.) = 1/2M BUT NOT LESS THAN 1/4" (6.4MM)
W_3 (MIN.) = M BUT NOT GREATER THAN H

N (MIN.) = 1/16" (1.59MM) (UNLESS BACK WELDED OR BACKING STRIP IS USED)
N (MAX.) = 1/8" (3.18MM) (UNLESS BACK WELDED OR BACKING STRIP IS USED)

ALL WELDS TO HAVE EQUAL LEG DIMENSIONS AND A MINIMUM THROAT = .707 X LEG DIMENSION.

NOTE: IF M IS THICKER THAN H THE REINFORCING MEMBER SHALL BE TAPERED DOWN TO THE HEADER WALL THICKNESS.

NOTE: PROVIDE HOLE IN REINFORCEMENT TO REVEAL LEAKAGE IN BURIED WELDS AND TO PROVIDE VENTING DURING WELDING AND HEAT TREATMENT.

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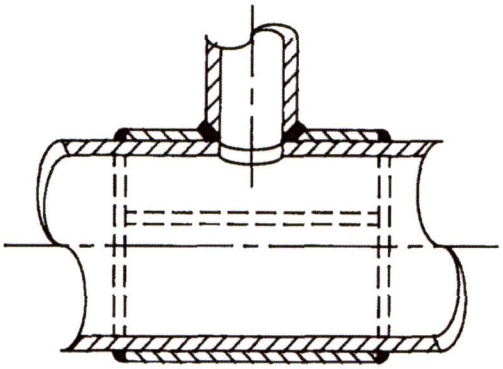
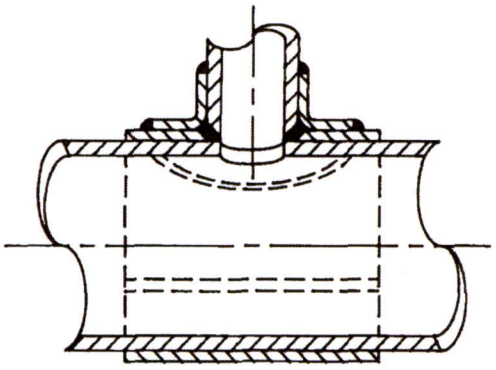
FIGURE 5

WELDING DETAILS FOR OPENINGS WITH COMPLETE ENCIRCLEMENT-TYPE REINFORCEMENT

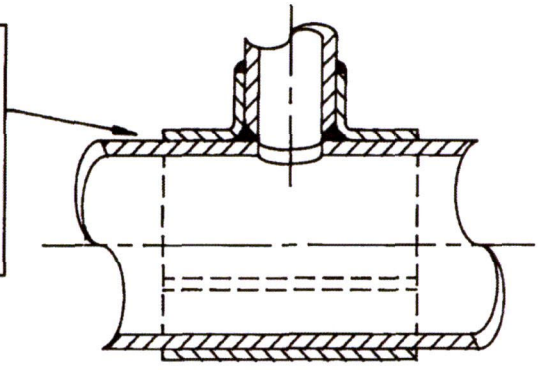


FULL ENCIRCLEMENT PAD (SLEEVE) TYPE



SADDLE AND FULL ENCIRCLEMENT PAD (SLEEVE) TYPE

Fillet weld shall be applied only if full encirclement saddle is designed to be pressure containing or if it contains a weep hole which will prevent the buildup of pressure.



FULL ENCIRCLEMENT SADDLE TYPE

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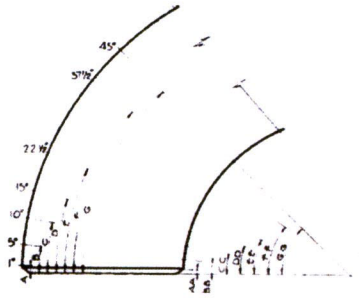
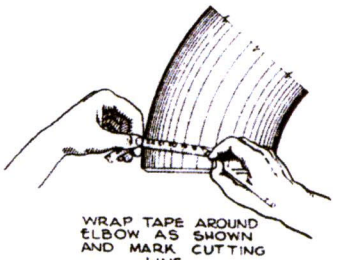
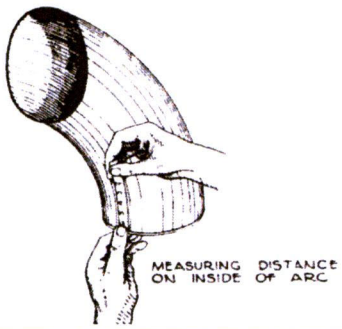
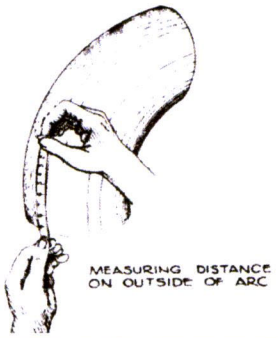
FIGURE 6

METHOD OF CUTTING ELBOWS AT ODD DEGREES









ODD DEGREE LONG RADIUS ELBOWS														
NOM	OUTSIDE ARC							INSIDE ARC						
SIZE	A	B	C	D	E	F	G	AA	BB	CC	DD	EE	FF	GG
2	1/16"	3/8"	23/32"	1-3/32"	1-21/32"	2-3/4"	3-9/32"	1/32"	5/32"	5/16"	1/2"	23/32"	1-3/16"	1-7/16"
2-1/2	3/32"	15/32"	29/32"	1-3/8"	2-1/32"	3-3/8"	4-3/32"	1/16"	7/32"	13/32"	5/8"	29/32"	1-1/2"	1-13/16"
3	1/8"	9/16"	1-3/32"	1-5/8"	2-15/32"	4-3/32"	4-29/32"	1/16"	1/4"	1/2"	23/32"	1-3/32"	1-25/32"	2-5/32"
3-1/2	1/8"	5/8"	1-9/32"	1-29/32"	2-27/32"	4-3/4"	5-11/16"	1/16"	9/32"	9/16"	7/8"	1-9/32"	2-1/8"	2-9/16"
4	5/32"	23/32"	1-7/16"	2-5/32"	3-1/4"	5-13/32"	6-15/32"	1/16"	11/32"	21/32"	1"	1-1/2"	2-15/32"	2-15/16"
5	3/16"	29/32"	1-13/16"	2-11/16"	4-1/32"	6-3/4"	8-3/32"	3/32"	13/32"	13/16"	1-1/4"	1-7/8"	3-3/32"	3-23/32"
6	7/32"	1-1/16"	2-5/32"	3-1/4"	4-27/32"	8-1/16"	9-11/16"	3/32"	1/2"	1"	1-1/2"	2-1/4"	3-23/32"	4-15/32"
8	9/32"	1-7/16"	2-27/32"	4-9/32"	6-13/32"	10-11/16"	12-13/16"	1/8"	11/16"	1-11/32"	2-1/32"	3-1/32"	5-1/32"	6-1/32"
10	3/8"	1-25/32"	3-9/16"	5-11/32"	8"	13-11/32"	16"	5/32"	27/32"	1-11/16"	2-1/2"	3-25/32"	6-5/16"	7-9/15"
12	7/16"	2-1/8"	4-1/4"	6-3/8"	9-9/16"	15-31/32"	19-5/32"	7/32"	1"	2-1/32"	3-1/16"	4-9/16"	7-19/32"	9-1/8"
14	1/2"	2-7/16"	4-7/8"	7-5/16"	11"	18-5/16"	22"	1/4"	1-7/32"	2-7/16"	3-21/32"	5-1/2"	9-5/32"	11"
16	9/16"	2-13/16"	5-19/32"	8-3/8"	12-9/16"	20-15/16"	25-1/8"	9/32"	1-13/32"	2-13/16"	4-3/16"	6-9/32"	10-15/32"	12-5/8"
18	5/8"	3-1/8"	6-9/32"	9-7/16"	14-1/8"	23-9/16"	28-9/32"	5/16"	1-9/16"	3-1/8"	4-23/32"	7-1/16"	11-25/32"	14-1/8"
20	11/16"	3-1/2"	7"	10-15/32"	15-23/32"	26-3/16"	31-13/32"	11/32"	1-3/4"	3-1/2"	5-1/4"	7-27/32"	13-3/32"	15-11/16"
22	3/4"	3-27/32"	7-11/16"	11-17/32"	17-9/32"	28-13/16"	34-9/16"	3/8"	1-29/32"	3-27/32"	5-3/4"	8-5/8"	14-3/8"	17-9/32"
24	27/32"	4-3/16"	8-3/8"	12-9/16"	18-27/32"	31-13/32"	37-11/16"	13/32"	2-3/32"	4-3/16"	6-9/32"	9-7/16"	15-11/16"	18-27/32"
26	29/32"	4-17/32"	9-3/32"	13-5/8"	20-13/32"	34-1/32"	40-27/32"	15/32"	2-9/32"	4-17/32"	6-13/16"	10-7/32"	17-1/32"	20-13/32"
30	1-1/32"	5-1/4"	10-15/32"	15-3/4"	23-9/16"	39-1/4"	47-1/8"	17/32"	2-5/8"	5-1/4"	7-7/8"	11-25/32"	19-5/8"	23-9/16"

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CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

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1. SCOPE

1.1. This standard identifies filler metal manufacturers and products with which the Company has had satisfactory experience and which are pre-authorized for use in the A.W.S. classifications indicated.

2. GENERAL

2.1. This standard does not preclude the use of other manufacturer's products where their performance has been or can be demonstrated to be satisfactory to Engineering.

2.2. Other manufacturers and products meeting the specified A.W.S. classification may be used under the following conditions.

2.2.1. Product performance has been proven satisfactory when used by welders engaged in Company welding activities in accordance with Company welding procedures and the filler metal is approved in writing. Such approval will be required on a case-by- case basis.

2.3. For A.W.S. classifications that are not listed in this procedure, any brand of filler material may be used.

3. CARBON STEEL FILLER MATERIAL

3.1. Covered Electrodes

3.1.1. A.W.S. class E6010

3.1.1.1. Bohler: Fox Cel

3.1.1.2. Hobart: Pipemaster 60

3.1.1.3. Lincoln Electric: Fleetweld 5, Fleetweld 5P, and Fleetweld 5P+

3.1.1.4. Thyssen: Phoenix Cel 70

3.1.2. A.W.S. class E7010

3.1.2.1. Lincoln Electric: Shield-Arc 85, Shield-Arc 85P, Shield-Arc HYP

3.1.2.2. Hobart: Pipemaster 70

3.1.3. A.W.S. class E7018

3.1.3.1. Airco: Easy-Arc 7018

3.1.3.2. Atom-Arc: 7018

3.1.3.3. Hobart: LH 7018

3.1.3.4. Lincoln Electric: LH 70, LH 72, LH-78, and Murex 7018

3.1.3.5. Messer: MG 7018

3.1.4. A.W.S. class E8010

3.1.4.1. Alloy Rods: XP-80

3.1.4.2. Bohler: Fox Cel 85

3.1.4.3. Chemtron: 8010

3.1.4.4. Hobart: Pipemaster 80

3.1.4.5. Lincoln Electric: Shield-Arc 70+

3.1.4.6. Thyssen: Phoenix Cel 80

3.1.5. A.W.S. class E8018C-3

3.1.5.1. Atom-Arc: 8018

3.1.6. A.W.S. class E9010

3.1.6.1. Alloy Rods: XP-90

3.1.6.2. Bohler: Fox Cel 90

3.1.6.3. Thyssen: Phoenix Cel 90

3.2. Solid wire electrodes

3.2.1. A.W.S. class ER70S-2

3.2.1.1. Linde Division, Union Carbide Corporation: Linde 65

3.2.2. A.W.S. class ER80S-D2

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3.2.2.1. Airco: A608

3.2.2.2. Hobart: HB 18

3.2.2.3. Linde Division, Union Carbide Corporation: Linde 83

3.2.2.4. Murex: 1313 MO

3.2.2.5. National Standard Company: NS102

3.2.2.6. Page Division of Aaco Page: AS18

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LONESTAR PIPELINE COMPANY

CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

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1.	SCOPE	2
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4.	MULTIPLE QUALIFICATION	4
5.	VISUAL EXAMINATION OF A QUALIFICATION WELD	5
6.	DESTRUCTIVE TESTING	6
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8.	RETESTING	9
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1. SCOPE

1.1. The purpose of the welder qualification test is to determine the ability of the welder to make sound welds using previously qualified welding procedures.

1.2. This is a summary of the welder qualification requirements of API 1104 with the API 1104 option of testing tensile specimens as nick break specimens.

1.3. Welders may be qualified using "plain" API 1104, i.e. tensile tests, with the permission of Engineering. Refer to API 1104 for the details of the required testing.

1.4. Refer to API 1104 for qualification of welding operators.

2. PRELIMINARY

2.1. The qualification of welders shall be conducted in the presence of the welding inspector.

2.2. No welder whose qualification is based on nondestructive testing may weld compressor station pipe and components.

2.3. It is preferred that all welders shall qualify by destructive testing.

NOTE: Due to concerns that welders qualified by nondestructive testing might inadvertently be used to weld in compressor stations, welders qualifying by nondestructive testing must qualify for each job unless approved by Engineering.

2.4. API 1104 allows for both single qualification and multiple qualification. It is up to the welding inspector to determine how the welders are qualified.

2.4.1. Any welder who may reasonably be expected to weld on a variety of pipe sizes are strongly encouraged to be multiple qualified. Welding procedures ETC-A221A and ETC-A221A-F may be used on 12" OD, 0.250" minimum wall, to multiple qualify for all cellulosic welding. Welding procedures ETC-A223A and ETC-A223A-F may be used on 12" OD, 0.250" minimum wall, to multiple qualify for all low-hydrogen welding. Use all four procedures to multiple qualify a welder to weld on all pipe sizes with any of the Company shielded metal arc welding procedures, including the use of weld procedures that use both low-hydrogen and cellulosic electrodes to complete a single weld.

2.5. Before starting the qualification test, the welder shall be allowed reasonable time to adjust the welding equipment used in the test. The welder shall use the same welding techniques

and proceed at the same speed which will be used if the welder passes the qualification test and is permitted to do production welding.

3. SINGLE QUALIFICATION

3.1. For single qualification, a welder shall make a test weld using a qualified welding procedure to join pipe nipples or segments of pipe nipples. When segments of pipe nipples are used, they shall be supported so that typical flat, vertical, and overhead welds are produced.

3.1.1. The welder shall make a butt weld in the fixed position with the axis of the pipe either in the horizontal plane, in the vertical plane, or inclined from the horizontal plane at an angle not exceeding 45 degrees.

3.1.2. The preferred minimum diameter for welder qualification is 6-5/8 inches (168.3 mm) diameter. This provides a sufficient amount of weld for examination to evaluate the welder's ability and allows this test to apply towards future multiple qualification of the welder.

3.1.3. A welder making a single-qualification test for branch connections, fillet welds, or other similar configurations, shall follow the specific procedure specification.

3.1.4. The weld shall be acceptable if it meets the requirements of Paragraph 5 and either Paragraph 6 (preferred choice) or Paragraph 7 (not allowed for compressor station work).

3.2. A welder who has successfully completed the qualification test described in Paragraph 3.1 shall be qualified within the limits of the essential variables described below. If any of these essential variables are changed, the welder using the new procedure shall be re-qualified.

3.2.1. A change from one welding process to any other welding process or combination of welding processes;

3.2.2. A change in the direction of welding from vertical uphill to vertical downhill or vice versa;

3.2.3. A change of filler metal classification from either of Group 1 or 2 to Group 3, or from Group 3 to either Group 1 or 2, as shown in Table 1;

3.2.4. A change in diameter group from one group to another group. These groups, in outside diameter in inches (mm), are:

3.2.4.1. Under 2-3/8 (60.3);

3.2.4.2. From 2-3/8 to 12-3/4 (60.3 to 323.8), inclusive; and

3.2.4.3. Over 12-3/4 (323.8).

3.2.5. A change in nominal pipe wall thickness from one group to another group. Wall thickness groups in inches (mm) are:

3.2.5.1. Less than 3/16 (4.78);

3.2.5.2. From 3/16 to 3/4 (4.78 to 19.05), inclusive; and

3.2.5.3. Over 3/4 (19.05).

3.2.6. A change in position other than that already qualified for (for example: a change from rolled to fixed, or a change from vertical to horizontal or vice versa). A welder who successfully passes a butt weld qualification test in the fixed position with the axis inclined 45 degrees from the horizontal plane shall be qualified to do butt welds in all positions.

3.2.7. A change in the joint design (for example: the elimination of a backing strip or a change from V-bevel to U-bevel).

4. MULTIPLE QUALIFICATION

4.1. For multiple qualification, a welder shall successfully complete the two tests described as follows, using qualified procedures:

4.2. The welder shall first make a butt weld in the fixed position with the axis of the pipe either in the horizontal plane or inclined from the horizontal plane at an angle not exceeding 45 degrees. This butt weld shall be made on pipe having a diameter of at least 6-5/8 inches (168.3 mm) and a wall thickness of at least 1/4 inch (6.35 mm) without a backing strip.

4.3. The butt weld shall be acceptable if it meets the requirements of Paragraph 5 and either Paragraph 6 (preferred choice) or Paragraph 7 (not allowed for compressor station work).

4.4. For the second test, the welder shall lay out, cut, fit, and weld a full-size, branch-on-pipe connection. This test shall be made with pipe of at least 6-5/8 inches (168.3 mm) diameter and nominal wall thickness of at least 1/4 inch (6.35 mm). A full-size hole shall be cut in the run.

4.4.1. The weld shall be made with the run pipe axis in the horizontal position, and the branch pipe axis extending vertically downward from the run.

4.4.2. The finished weld shall exhibit a neat uniform workmanlike appearance.

4.4.3. The weld must exhibit complete penetration around the entire circumference. Completed root beads shall not contain any burn-through exceeding 1/4 inch (6.35 mm). The sum of the maximum dimensions of separate unrepaired burn-through in any continuous 12 inch (304.8 mm) length of weld shall not exceed 1/2 inch (12.7 mm).

4.4.4. The fillet weld shall be acceptable if it meets the requirements of Paragraph 6.

4.5. A welder who has successfully completed the butt weld qualification test on pipe having a diameter of 12-3/4 inches (323.8 mm) or larger and a full size branch connection weld on pipe 12-3/4 inches (323.8 mm) or larger in diameter shall be qualified to weld in all positions, on all wall thicknesses, joint designs, fittings, and on all pipe diameters. A welder who has successfully completed the butt weld and branch connection requirements on pipe less than 12-3/4 inches (323.8 mm) in diameter shall be considered qualified to weld in all positions, on all wall thicknesses, joint designs, fittings, and on all pipe diameters equal to or less than that which the welder used in the qualification tests. If any of the following essential variables are changed in a welding procedure specification, the welder using the new procedure shall be re-qualified.

4.5.1. A change from one welding process to any other welding process or combination of welding processes.

4.5.2. A change in the direction of welding from vertical uphill to vertical downhill or vice versa.

4.5.3. A change of filler metal classification from Group 1 or 2 to Group 3, or from Group 3 to Group 1 or 2 (see Table 1).

5. VISUAL EXAMINATION OF A QUALIFICATION WELD

5.1. WARNING: These visual examination requirements are different than those for a production weld. They are also different than those for the branch weld made as part of a multiple qualification test.

5.2. For a qualification test weld to meet the requirements for visual examination, the weld must be free of cracks, inadequate penetration, un-repaired burn through, and other defects, and must present a neat, workmanlike appearance.

5.3. Undercutting adjacent to the final bead on the outside of the pipe shall not exceed 1/32 inch (0.79 mm) in depth or 12.5 percent of the pipe wall thickness, whichever is smaller, and there shall not be more than 2 inches (50.8 mm) of undercutting in any continuous 12 inch (304.8 mm) length of weld.

5.4. When automatic or semiautomatic welding is used, filler wire protruding into the inside of the pipe shall be held to a minimum.

additional testing.

6. DESTRUCTIVE TESTING

6.1. To test butt welds, specimens shall be cut from each test weld. If the test weld is a complete circumferential weld then the locations from which the specimens should be removed are shown in Figure 1. If the test weld consists of segments of pipe nipples, an approximately equal number of specimens shall be removed from each segment. The total number of specimens and the tests to which each shall be submitted are shown in Table 2.

6.2. The specimens shall be air-cooled to ambient temperature before testing.

6.3. For pipe 1-5/16 inch (33.4 mm) and smaller, one full pipe section specimen may be substituted for the root bend and nick break specimens.

6.4. The procedure for the nick break testing of butt welds is as follows:

6.4.1. The specimens (Figure 4) shall be approximately 9 inches 230 mm) long and 1 inch (25 mm) wide, and they may be machine cut or oxygen cut. They shall be notched with a hacksaw on each side of the center of the weld and each notch shall be approximately 1/8 inch (3.18 mm) deep.

6.4.2. Nick break specimens prepared in this manner from welds made with certain automatic and semiautomatic processes may fail through the pipe instead of the weld. When previous testing experience indicates failures through the pipe are to be expected, the external reinforcement may be notched to a depth not to exceed 1/16 inch (1.59 mm) measured from the original weld surface.

6.4.3. The specimens shall be broken by pulling in a tensile machine, by supporting the ends and striking the center, or by supporting one end and striking the other end with a hammer. The exposed area of the fracture shall be at least 3/4 inch (19.0 mm) wide.

6.4.4. The dimensions of the discontinuities shall be measured as shown in Figure 5.

6.4.5. The exposed surfaces of each specimen shall show complete penetration and fusion.

6.4.6. The combined area of all gas pockets shall not exceed 2% of the exposed nick break fracture area with the greatest dimension of any gas pocket not to exceed 1/16 inch (1.59 mm).

6.4.7. Slag inclusions shall not be more than 1/32 inch (0.8 mm) in depth nor 1/8 inch (3.18 mm) or one-half the nominal wall thickness in length, whichever is shorter.

slag inclusions.

6.4.9. If any specimen shows discontinuities exceeding those allowed above, the welder shall be disqualified.

6.4.10. Fisheyes, as defined in AWS A3.0, are not cause for rejection.

6.5. The procedure for the bend testing of butt welds is as follows:

6.5.1. The root and face bend specimens (Figure 6) shall be approximately 9 inches (230 mm) long by 1 inch (25 mm) wide and the long edges should be rounded. They may be machine cut or oxygen cut. The cover and root bead reinforcement shall be removed flush with the surface of the specimen. These surfaces shall be smooth and any scratches which exist shall be light and transverse to the weld.

6.5.2. The side bend specimens (Figure 7) shall be approximately 9 inches (230 mm) long by 1/2 inch (12.7 mm) wide and the long edges should be rounded. They shall be machine cut or they may be oxygen cut to approximately a 3/4 inch (19.0 mm) width and then machined or ground to the 1/2 inch (12.7 mm) width. The sides shall be smooth and parallel. The cover and root bead reinforcements shall be removed flush with the surfaces of the specimen.

6.5.3. The specimens shall be bent in a guided bend test jig similar to that shown in Figure 8. Each specimen shall be placed on the die with the weld at mid-span. Face bend specimens shall be placed with the face of the weld directed toward the gap. Root bend specimens shall be placed with the root of the weld directed toward the gap. Side bend specimens shall be placed with the face of the weld at 90 degrees to the gap. The plunger shall be forced into the gap until the curvature of the specimen is approximately U-shaped.

6.5.4. Each specimen subjected to the bend test shall meet the following requirements:

6.5.4.1. The bend test shall be considered acceptable if no crack or other defect exceeding 1/8 inch (3.18 mm) or one-half the nominal thickness, whichever is smaller, in any direction is present in the weld, or between the weld and the fusion zone after bending.

6.5.4.2. Cracks which originate along the edges of the specimen during testing and which are less than 1/4 inch (6.4 mm) measured in any direction shall not be cause for rejection unless obvious defects are observed.

6.5.5. Welds in high test pipe may not bend the full U-shape. These shall be considered acceptable if the specimens which crack are broken apart and their exposed surfaces meet the requirements of the nick break test.

6.5.6. The evaluation allowed by 6.5.5 shall be allowed only if the welding inspector is satisfied that the cracking is due to the pipe and not the welder.

6.5.7. Should one of the bend test specimens fail to meet these requirements and, in the opinion of the welding inspector, the lack of penetration observed is not representative of the weld, the test specimen may be replaced by an additional specimen cut adjacent to the one that failed. The welder shall be disqualified if the additional specimen also shows defects exceeding the specified limits.

6.5.8. If any specimen shows defects exceeding those above, the welder shall be disqualified.

6.6. The procedure for the tensile testing of butt welds in pipe 1-5/16 inch (33.4 mm) and smaller is as follows:

6.6.1. Tensile test specimens shall be broken under tensile load. The tensile strength is not required to be determined for welder qualification.

6.6.2. If the full section specimen breaks in the weld or at the junction of the weld and the parent metal and fail to meet the requirements for soundness set forth in the nick break test, the welder shall be disqualified.

6.7. The procedure for testing of fillet welds is as follows:

6.7.1. The locations from which the specimens are to be removed are shown in Figure 2. The specimens shall be air-cooled to ambient temperature before testing.

6.7.2. The specimens shall be prepared as shown in Figure 3. They may be machine cut or oxygen cut. They shall be sufficiently long so that they can be broken in the weld.

6.7.3. For pipe under 2-3/8 inches (60.3 mm) in diameter, it may be necessary to make two test welds to obtain the required number of test specimens. The specimens shall be air-cooled to ambient temperature prior to testing.

6.7.4. The specimens shall be broken by supporting both ends of the specimen and striking the center or by supporting one end and striking the other. The specimens shall be broken so that the root of the weld is subjected to the greater strain.

6.7.5. Each specimen shall meet the following requirements:

6.7.5.1. The exposed surfaces of the specimen shall show complete penetration.

6.7.5.2. The combined area of all gas pockets shall not exceed 2% of the exposed nick break fracture area with the greatest dimension of any gas pocket not to exceed 1/16 inch (1.59 mm)

6.7.5.3. Slag inclusions shall not be greater than 1/32 inch (0.8 mm) in depth, or 1/8 inch (3.18 mm) or one-half the nominal wall thickness of the thinner member in length, whichever is the smaller, and shall be separated by at least 1/2 inch (12.7 mm) of sound metal (see Figure 5).

7. QUALIFICATION BY RADIOGRAPHY (BUTT WELDS ONLY)

WARNING: This option is not allowed by DOT for welding to be performed, either in the field or in a shop, on compressor station piping or components.

7.1. The procedures and requirements for the radiographic inspection of test welds shall be as follows:

7.1.1. Radiographs shall be made of each of the test welds. The welder shall be disqualified if any of his test welds do not meet the radiographic acceptance standards contained in API Standard 1104 .

7.1.2. Radiographic inspection shall not be used for the purpose of locating sound areas or areas containing discontinuities and subsequently making tests of such areas to qualify or disqualify a welder.

8. RETESTING

8.1. If, in the mutual opinion of the welding inspector and contractor representatives, failure of a welder to pass the qualification test was because of unavoidable conditions or conditions beyond his control, such a welder may be given a second opportunity to qualify.

8.2. Welders who fail to qualify shall not be allowed to test again for 6 months without submitting proof of subsequent welder training acceptable to the Manager of Laboratory Services.

9. RECORDS

9.1. A record shall be made of the tests given to each welder and of the detailed results of each test, whether pass or fail.

9.2. The welder test records are to be submitted to the Welding/NDE/Material Testing Group.

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TABLE 1

FILLER METAL GROUPS

Group	AWS Specification	Electrode	Flux
1	A5.1	E6010, E6011	
	A5.5	E7010, E7011	
2	A5.5	E8010, E8011	
3	A5.1 or A5.5	E7015, E7016, E7018	
	A5.5	E8015, E8016, E8018	
4	A5.17	EL8	P6XZ
		EL8K	F6X0
		EL12	F6X2
		EM5K	F7XZ
		EM12K	F7X0
		EM13K	F7X2
		EM15K	
5	A5.18	ER70S-2	
6	A5.18	ER70S-6	
7	A5.28	ER80S-D2	
8	A5.2	RG60	
	A5.2	RG65	

NOTES:

1. Other electrodes, filler metals and fluxes may be used but shall require separate procedure qualification.
2. Any combination of flux and electrode in Group 4 may be used to qualify a procedure. The combination shall be identified by its complete AWS Classification Number such as, F71-EL12 or F62-

EM12K. Only substitutions which result in the same AWS Classification Number are permitted without re-qualification.

3. A shielding gas is to be used with electrodes in Groups 5, 6, and 7.

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TABLE 2

BUTT WELDS

TYPE AND NUMBER OF TEST SPECIMENS FOR WELDER QUALIFICATION TEST AND FOR DESTRUCTIVE TESTING OF PRODUCTION WELDS

Pipe Size, Outside Diameter - In Inches (mm)	Number of Specimens per Welder: Nick Break	Root Bend	Face Bend	Side Bend	Total
	Wall Thickness - 1/2 inch (12.7 mm) and Under				
Under 2-3/8 (60.3)	2	2	0	0	4*
2-3/8 (60.3) to 4-1/2 (114.3) inclusive	2	2	0	0	4
Over 4-1/2 (114.3) to 12-3/4 (323.8) inclusive	4	2	0	0	6
Over 12-3/4 (323.8)	8	2	2	0	12
	Wall Thickness - Over 1/2 inch (12.7 mm)				
4-1/2 (114.3) and smaller	2	0	0	2	4
Over 4-1/2 (114.3) to 12-3/4 (323.8) inclusive	4	0	0	2	6
Over 12-3/4 (323.8)	8	0	0	4	12

* For pipe 1-5/16 inches (33.4 mm) and smaller, obtain from two welds or use one full-pipe section tensile specimen.

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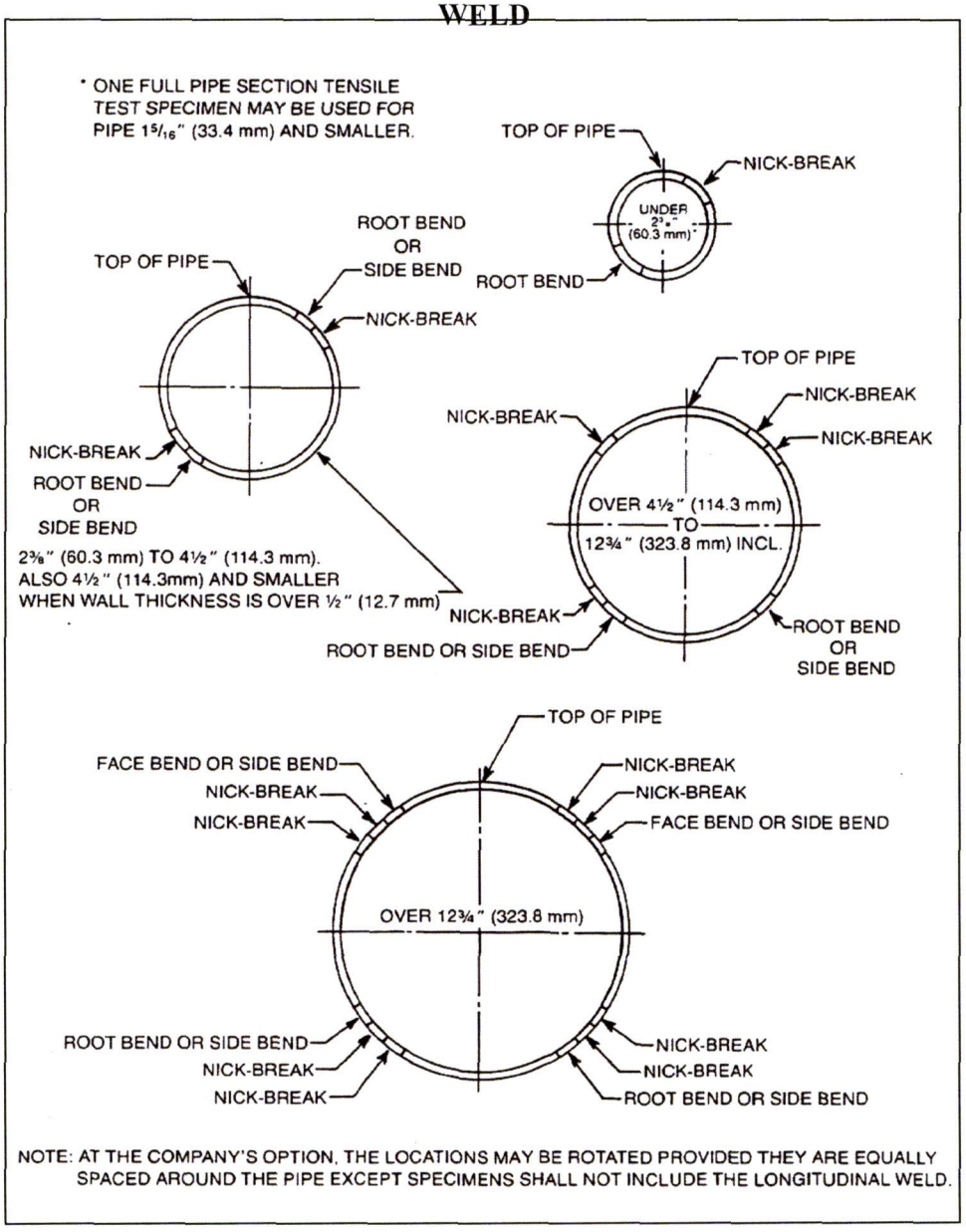
FIGURE 1

LOCATION OF TEST SPECIMENS - BUTT WELD WELDER QUALIFICATION TEST WELD



NOTE: AT THE COMPANY'S OPTION, THE LOCATIONS MAY BE ROTATED PROVIDED THEY ARE EQUALLY SPACED AROUND THE PIPE EXCEPT SPECIMENS SHALL NOT INCLUDE THE LONGITUDINAL WELD.

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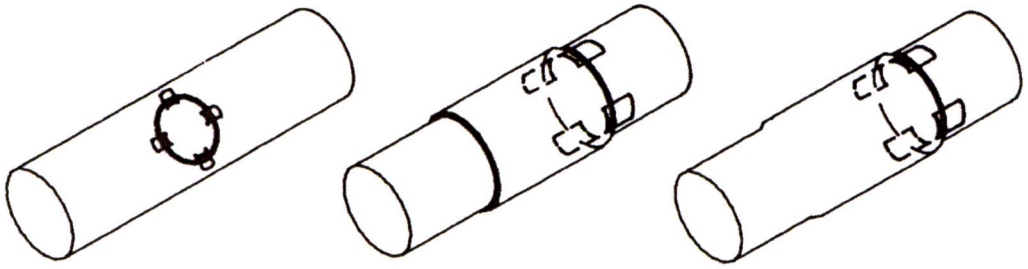
FIGURE 2

LOCATION OF NICK BREAK SPECIMENS

FILLET WELDS PROCEDURE AND WELDER QUALIFICATION TEST WELDS



2 3/8"(60.3MM) AND LARGER
FOR JOINTS UNDER 2 3/8" CUT NICK-BREAK SPECIMENS FROM THE SAME GENERAL LOCATION BUT REMOVE TWO SPECIMENS FROM EACH OF TWO TEST WELDS.
NOTE: THE COMPANY MAY REQUIRE ADDITIONAL SPECIMENS TO BE TAKEN.

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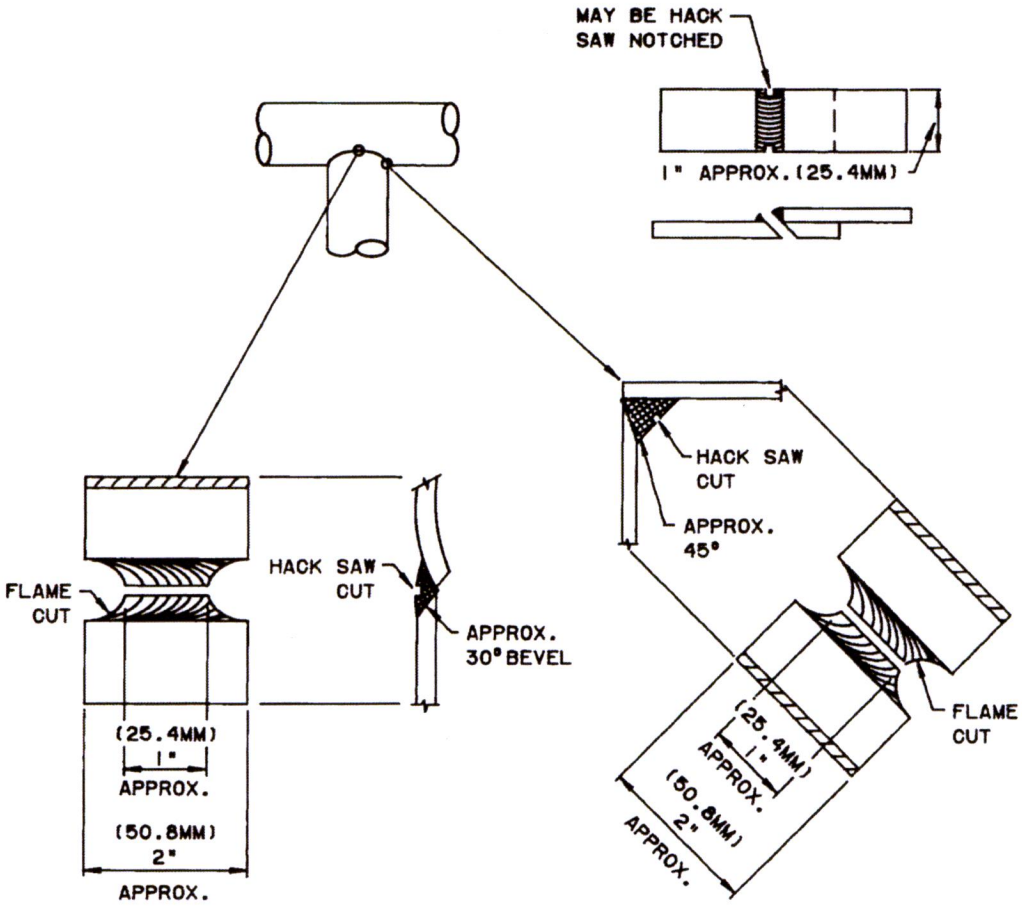
FIGURE 3

LOCATION AND PREPARATION OF FILLET WELD SPECIMENS



LOCATION OF NICK-BREAK TEST SPECIMENS - FILLET WELDS PROCEDURE AND WELDER QUALIFICATION TEST WELDS INCLUDING SIZE TO SIZE BRANCH CONNECTION WELDER QUALIFICATION TEST.

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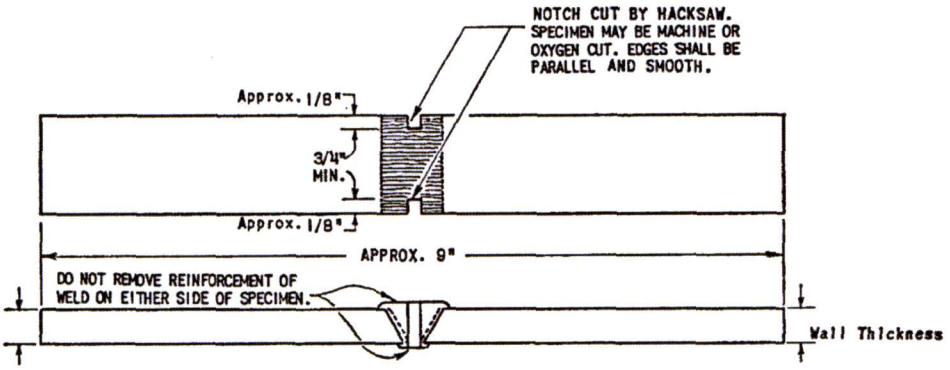
FIGURE 4

NICK BREAK TEST SPECIMEN



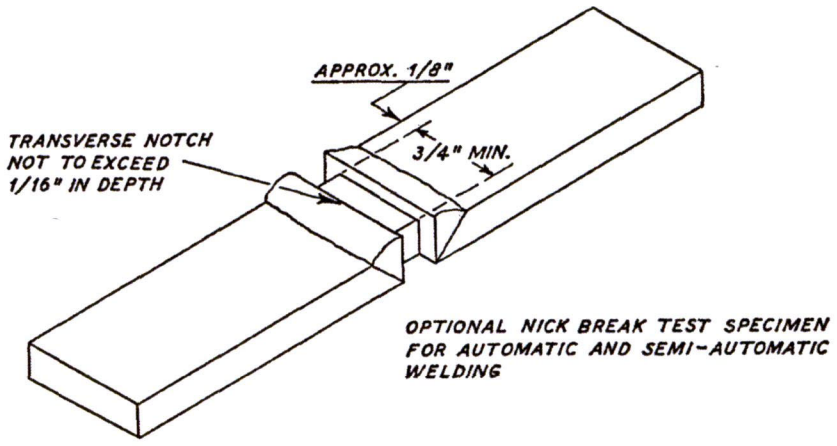


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FIGURE 5

DIMENSIONS OF DISCONTINUITIES IN WELD SPECIMENS

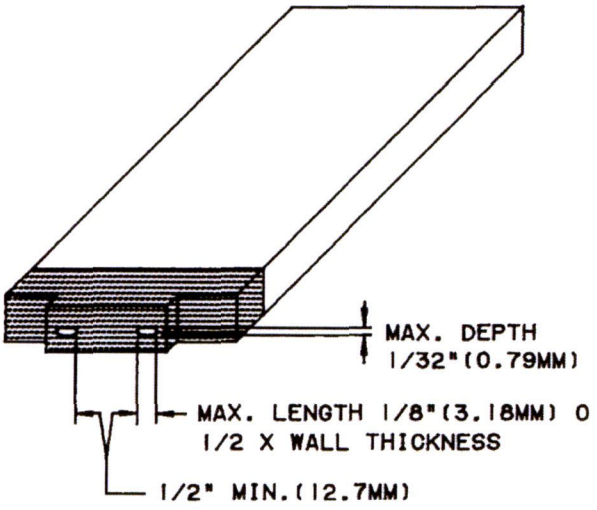

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FIGURE 6

ROOT BEND AND FACE BEND TEST SPECIMEN

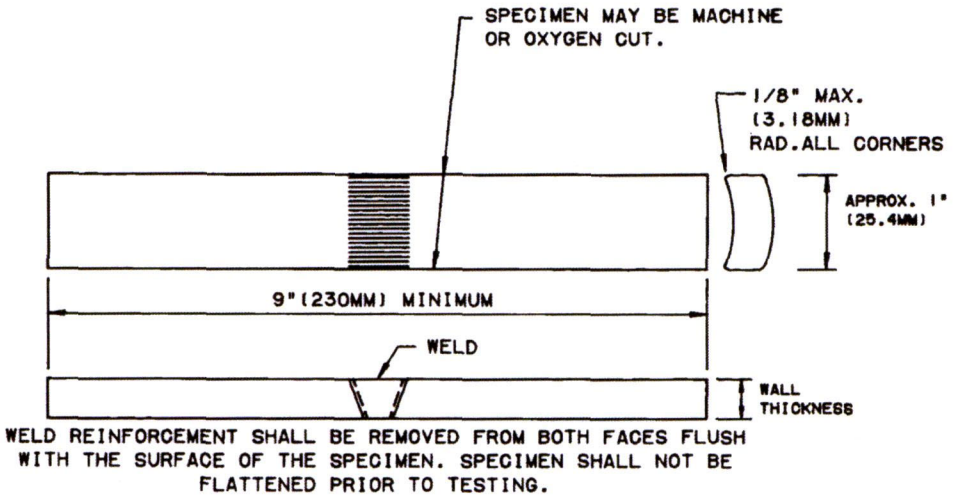

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FIGURE 7

SIDE BEND TEST SPECIMEN

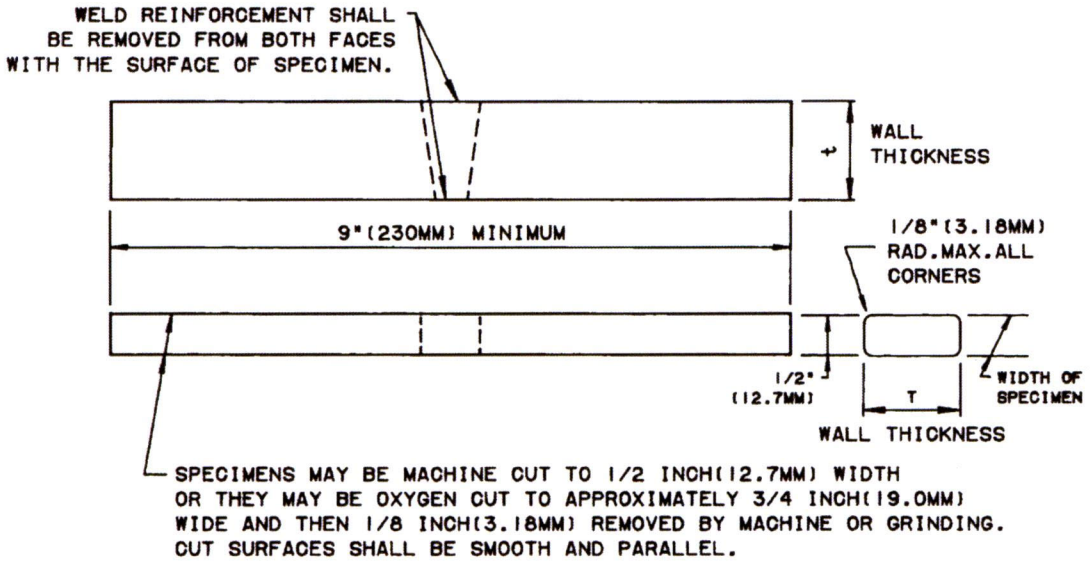

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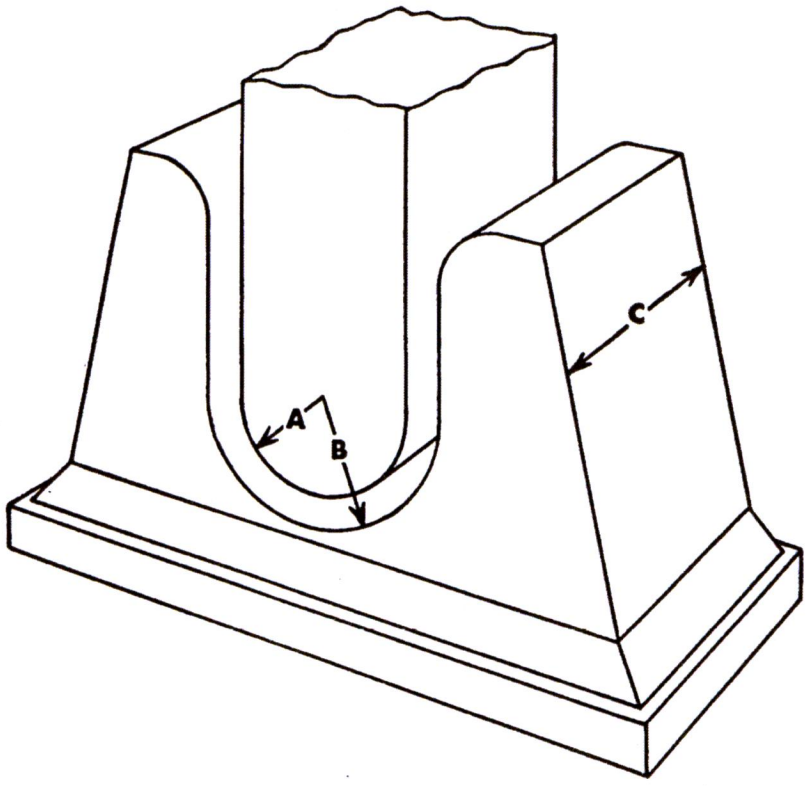
FIGURE 8

JIG FOR GUIDED BEND TESTS

Radius of Plunger **A** = $1\frac{3}{4}$ inches

Radius of Die **B** = $2\frac{5}{16}$ inches

Width of Die **C** = 2 inches



LONESTAR PIPELINE COMPANY

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2. **PRELIMINARY** 2

3. **TEST WELD** 2

4. **TESTING PROCEDURE** 3

5. **RETEST** 4

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1. SCOPE

1.1. The purpose of the welder qualification test is to determine the ability of the welder to make sound welds using previously qualified welding procedures.

1.2. This is only a partial summary of the requirements of Section IX of the ASME Boiler and Pressure Vessel Code. It is intended for welder qualification by destructive testing using carbon steel pipe in the 6G position (1G for the SAW process). For other types of qualification, refer to the ASME Code.

2. PRELIMINARY

2.1. Before starting the qualification test, the welder shall be allowed reasonable time to adjust the welding equipment used in the test. The welder shall use the same welding techniques and proceed with the same speed which will be used if the welder passes the qualification test and is permitted to do production welding.

2.2. The qualification of welders shall be conducted in the presence of the welding inspector.

2.3. For welding other than an ASME code stamped item, no welder whose qualification is based on nondestructive testing may weld compressor station pipe and components.

3. TEST WELD

3.1. A welder qualifying to the requirements of this procedure shall make a test weld(s) fulfilling all requirements specified in the welding procedure.

3.2. For the SMAW, GTAW, GMAW and FCAW processes the welder shall make a butt weld in the fixed position with the axis of the pipe in the 6G position (45 degree).

3.3. For the SAW process the welder shall make a butt weld with the pipe axis horizontal and the pipe rolled (1G position).

3.4. To qualify to weld pipe less than 2 7/8" O.D., test welds must be made on pipe less than 2 7/8" O.D. without a backing strip or consumable insert. See items I and J under Limits of Qualification. Two test welds are required to allow for the removal of the required number of specimens.

3.5. To qualify to weld pipe 2 7/8" O.D. and above, the test weld shall be made on pipe at least 2 7/8" O.D. without a backing strip or consumable insert. When qualifying on carbon steel,

the pipe shall have a nominal diameter of at least 6" and a wall thickness of at least .432".

4. TESTING PROCEDURE

4.1. Refer to ASME Section IX for welder qualification by nondestructive examination.

4.2. Visual Examination

4.2.1. The weld must be free of cracks, inadequate penetration, nonfusion, unrepaired burn-through and other rejectable defects and it must present a neat workmanlike appearance. Undercutting adjacent to the final bead on the outside of the pipe shall not exceed 1/32" in depth or 12 1/2% of the pipe wall thickness whichever is smaller regardless of length, and, for regions having depths up to 1/32" or 12 1/2% of the pipe wall thickness whichever is smaller, the amount of external undercutting shall not exceed a total of 2" in length or 1/6 of the length of the weld whichever is smaller.

4.2.2. When automatic or semi-automatic welding is used, filler wire protruding into the inside of the pipe shall be held to a minimum.

4.2.3. Failure to meet the requirements of the visual examination shall be adequate cause to deny qualification without additional testing.

4.3. Destructive Testing

4.3.1. The type and number of test specimens are:

Nominal WT	Side	Face	Root
Less than 0.375"		2	2
0.375" to less than 0.750"		2*	2*
0.750" and larger	4		
*Four side bend specimens may be used instead of the root and face bend specimens			

4.3.2. The specimens are to be cut from the test weld at the positions shown in Figure 1. If the test pipe is 2 7/8" O.D. or less, cut the specimens from the same general positions as shown in Figure 1, but cut two specimens from each of two test welds.

4.3.3. The bend specimens shall be prepared as shown in Figures 2 and 3. If the surfaces of

the side bend specimens are gas cut, any resulting surface roughness shall be dressed by machining or grinding. The cover and root pass reinforcements shall be

removed flush with the surface of the specimen by machining or grinding. The surface that is to be on the convex, or outer surface of the bend is to be smooth and any scratches which exist shall be light and transverse to the weld. The edges of the specimens should be rounded.

4.3.4. The specimen is to be bent in an ASME type guided bend test jig. See Figure 4. The face, root or side of the weld, depending on the type of specimen, is to be turned towards the gap of the jig.

4.3.5. The specimen is to be bent until a 1/8" diameter wire cannot be inserted between the specimen and the jig die.

4.3.6. In order to pass the test, guided-bend specimens shall have no cracks or other open defects in the weld or heat affected zone exceeding 1/8" measured in any direction on the convex surface of the specimen after bending, except that cracks occurring on the corners of the specimen during testing shall not be considered, unless there is definite evidence that they result from slag inclusions or other internal defects.

5. RETEST

5.1. If, in the mutual opinion of the welding inspector and contractor representatives, failure of a welder to pass the test was because of unavoidable conditions or conditions beyond his control, such a welder may be given a second opportunity to qualify. The retest shall consist of the welder making twice the number of welds required by Section 3 of this procedure. Each of these welds must fulfill all of the requirements of this Procedure.

5.2. Welders who fail to qualify shall not be allowed to test again for 6 months without submitting proof of subsequent welder training acceptable to the Superintendent of Materials Testing.

6. RECORDS

6.1. A record shall be made of the tests given to each welder and of the detailed results of each test, whether pass or fail.

6.2. The welder test records are to be submitted to the Welding/NDE/Material Testing Group.

7. LIMITS OF WELDER QUALIFICATION

7.1. General

7.1.1. A welder qualified on a pipe butt weld is qualified for fillet welds with no

restrictions on size or thickness for the fillet welds.

7.1.2. SAW is restricted to the flat position since the welder qualifies in the 1G position.

7.1.3. A welder qualified on pipe in the 6G position is qualified for pipe and plate in all positions.

7.1.4. A welder qualified on pipe in the 1G position is qualified for plate in the flat position.

7.2. Essential Variables

7.2.1. The essential variable for the SAW process are items A, H, I and J below.

7.2.2. The essential variables for the SMAW process are items A, B, E, H, I and J below.

7.2.3. The essential variables for the GMAW and FCAW processes are items A, B, D, E, F, H, I and J below.

7.2.4. The essential variables for the GTAW process are items A, B, C, D, E, G, H, I, J, K, and L below.

7.2.5. If any of the essential variables, or the welding process, are changed from those already qualified, the welder must be re-qualified to use the new procedure.

A. A change in filler metal from one F Number to another F Number or to a filler metal not listed shall require independent qualification, except as noted below. [See the ASME Code for detailed listing of electrodes.]

Steel Filler Metal F Numbers for Welder Qualification	
F Number	Electrode Classification Number

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F1 Exx20, Exx24, Exx27, Exx28

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F2	Exx12, Exx13, Exx14
F3	Exx10, Exx11
F4	non-austenitic Exx15, Exx16, Exx18 [these are magnetic]
F5	austenitic Exx15, Exx16 [these are non-magnetic, stainless steel]
F6	basically the rest of the AWS steel filler metal classifications including GTAW, GMAW, FCAW, SAW

NOTE: Qualification of a welder for any given F Number, 1 through 4, qualifies for any lower F Number WITH BACKING, but not vice versa.

B. A change of direction of welding, other than the cap pass, from upward to downward or vice versa.

C. The omission or addition of consumable inserts.

D. The omission of inert gas backing.

E. For groove welds, the omission of backing. Note - A groove weld made from both sides is considered a weld with backing. A partial penetration groove or fillet weld is considered a weld with backing.

F. A change from spray arc, globular arc or pulsating arc to short circuiting arc or vice versa.

G. A change from AC to DC or vice versa; and in DC welding, a change from straight polarity to reverse polarity or vice versa.

H. A change in base metal from one P or S Number group to another. For the most part, low alloy carbon ASTM steels are P number 1. API 5L line pipe is S number 1. Welder qualification on a P number qualifies the same S number, and vice versa. [See the ASME Code for detailed listing of P and S number groups.]

I. Pipe Diameter

Test Pipe Diameter	Pipe Diameter Qualified to Weld
Less than 1" O.D.	Size tested on and larger
1" O.D. to less than 2-7/8" O.D	1" O.D. and larger

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2-7/8" O.D. and over	2-7/8" O.D. and larger

J. Thickness

Deposited thickness	Maximum qualified to deposit per weld
Less than ¾"	Twice that deposited in the test weld. For short circuit GMAW, if the deposited thickness is less than ½", the welder is limited to 1.1 times the deposited thickness
¾" and over	No thickness limit

Since this is deposited weld metal thickness, there is no minimum thickness. There are no limits on the actual pipe/plate thickness.

If different welding processes are used for the test weld, it is up to the welding inspector to document the different thicknesses deposited.

K. The addition or deletion of filler metal.

L. A change from solid or metal core filler metal to flux cored, or vise versa.

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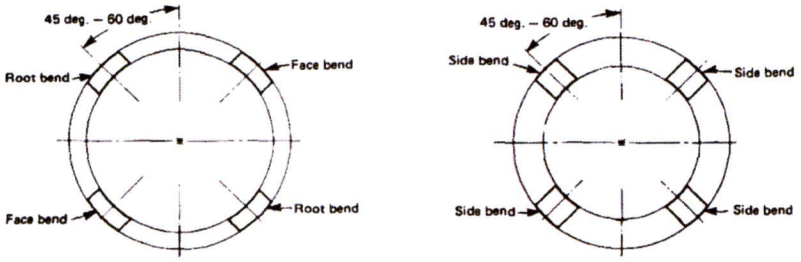

Figure 1

Test Specimen Location

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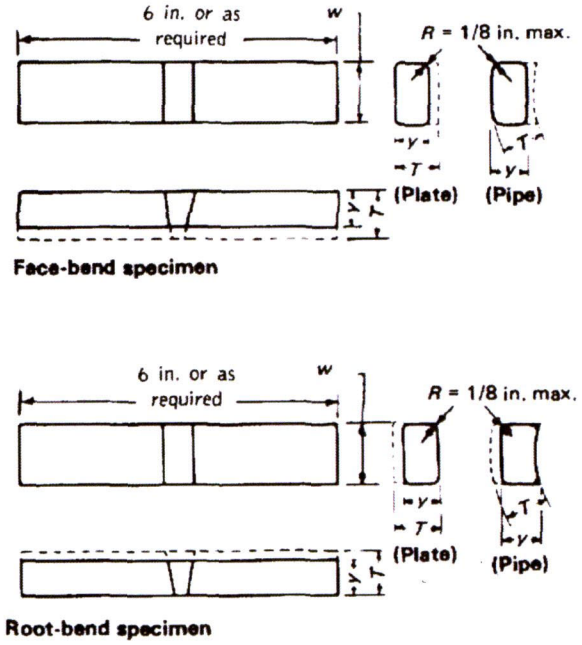
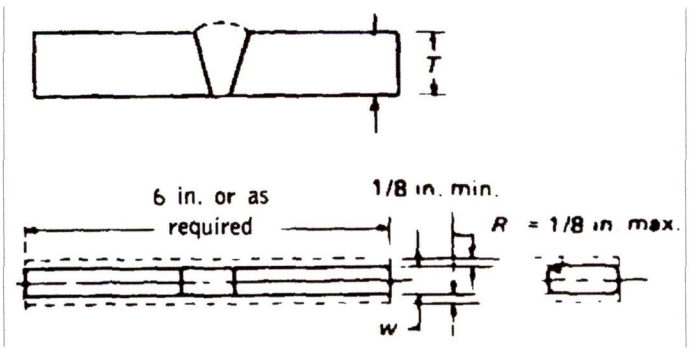


Thickness, T	y
3/8" and less	T
Over 3/8"	3/8"

Pipe Size	w
Over 4"	1 ½"
2" to 4"	¾"
Over 1" to 2"	3/8"
1" and less	Quarter pipe section

Figure 2

Root and Face Bend Specimens



Thickness, T	w
3/8" and less	T
Over 3/8"	3/8"

Figure 3

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Side Bend Specimen

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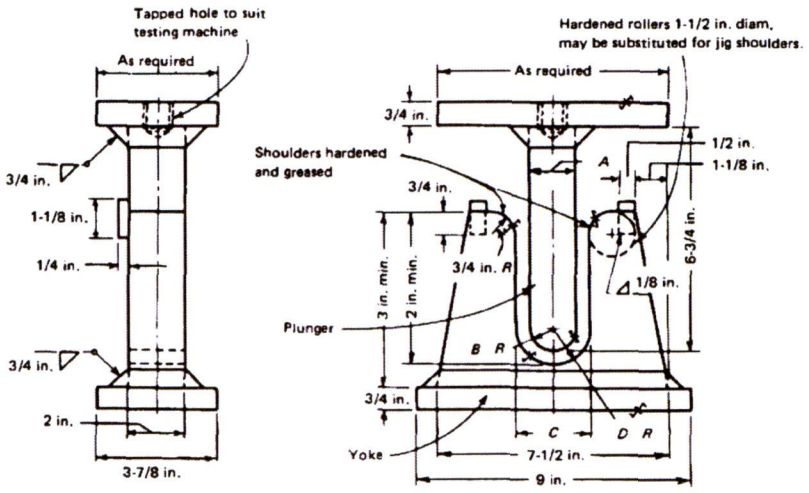

Specimen Thickness	A inches	B inches	C inches	D inches
3/8"	1 ½"	¾"	2 3/8"	1 3/16"
Less than 3/8"	4t	2t	6t +1/8"	3t + 1/16"

Figure 4

Bend Test Jig

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1. SCOPE 2

2. QUALIFICATION ON PIPE 2

3. QUALIFICATION ON PLATE 3

4. TESTING 4

5. RETEST 5

6. PERIOD OF EFFECTIVENESS 5

7. RECORDS 5

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1. SCOPE 2

2. QUALIFICATION ON PIPE 2

3. QUALIFICATION ON PLATE 3

4. TESTING 4

5. RETEST 5

6. PERIOD OF EFFECTIVENESS 5

7. RECORDS 5

2.2. The test weld shall be made on pipe, without backing. The pipe shall be in the 6G position (pipe at a 45 degree axis), as shown in Figure 1.

2.3. The weld shall be visually examined.

2.3.1. The weld shall be free from cracks.

2.3.2. All craters shall be filled to the full cross section of the weld.

2.3.3. The face of the weld shall be at least flush with the pipe and shall merge smoothly with the pipe. Undercut shall not exceed 1/32" in depth. The weld reinforcement shall not exceed 1/8" above the pipe.

2.3.4. The root of the weld shall have no incomplete fusion or inadequate joint penetration. Root concavity, not to exceed 1/16" is permitted, provided that the total weld thickness is at least equal to that of the pipe. The maximum burn through shall not exceed 1/8".

2.4. Remove 4 bend specimens from the pipe, as shown in Figure 2. Note that root and face bend specimens are used for thicknesses up to, but not including 3/8". For thicknesses 3/8" and larger, side bend specimens are used.

2.5. Face and root bend specimens from pipe size 4" and less shall be 1" wide. Face and root bend specimens from pipe size greater than 4" shall be 1-1/2" wide. The specimens may be oxygen cut or machine cut. Both root reinforcement and cap reinforcement shall be ground flush with the pipe. See Figure 3

2.6. Side bend specimens may be either machine cut to a width of 3/8", or they may be oxygen cut to a width of 5/8" and then 1/8" machined or ground from both oxygen cut sides. Both root reinforcement and cap reinforcement shall be ground flush with the pipe. See Figure 4.

3. QUALIFICATION ON PLATE

3.1. The tests described below will qualify a welder for:

3.1.1. the welding process used in qualification test,

3.1.2. shielded metal arc welding, qualification with low hydrogen electrodes will qualify the welder for cellulosic electrodes,

3.1.3. fillet welds on plate,

3.1.4. butt welds on plate with a backing strip,

3.1.5. all positions,

3.1.6. thicknesses from 1/8" to 3/4".

3.2. The test welds shall be made using 3/8" thick plate, with backing, as shown in Figure 5.

3.3. Two welds shall be required, one in the 3G position and one in the 4G position, as shown in Figure 6.

3.4. The welds shall be visually examined.

3.4.1. The weld shall be free from cracks.

3.4.2. The weld shall be completely fused.

3.4.3. The maximum porosity shall not exceed 3/32" in diameter and no more than one pore in 4"

3.4.4. Undercut depth shall not exceed 1/32"

3.5. One face bend and one root bend specimen shall be removed from each test weld, as shown in Figure 1. The bend specimens shall be 1-1/2" wide.

4. TESTING

4.1. The backing, cap and root pass reinforcements shall be removed flush with the surface of the specimen by machining or grinding. The surface that is to be on the convex, or outer surface of the bend is to be smooth and any scratches which exist should be light and transverse to the weld. The edges of the specimens should be rounded.

4.2. The specimen is to be bent in an ASME type guided bend test jig. See Figure 7. The face, or root of the weld, depending on the type of specimen, is to be turned towards the gap of the jig.

4.3. The specimen is to be bent a U shape.

4.4. The convex surface of the specimen shall be visually examined after bending. To be acceptable, the weld or heat affected zone of the bend specimens shall have no discontinuities exceeding:

4.4.1. 1/8" measured in any direction except as provided for corner cracks as allowed by 2.8.3,

4.4.2. 3/8" for the sum of the greatest dimension of all discontinuities,

4.4.3. 1/4" for cracks occurring on the corners of the specimen provided they do not result from slag inclusions or other fusion defects. Note: If the crack is greater than 1/4" and the specimen is free of slag inclusions or other fusion defects, the test specimen may be disregarded and replaced with another specimen from the same weld.

5. RETEST

5.1. Immediate Retest: The welder may make one attempt to immediately retest by making two welds of each position that the welder failed. All retest specimens shall meet all of the specified requirements, or the welder fails and cannot retest without further training or practice acceptable to the local Superintendent.

5.2. Retest after Training or Practice: A retest may be made after the welder has had further training or practice. A retest of the positions failed shall be made. If the welder fails again, the welder can not test again for at least three months.

6. RECORDS

6.1. A record shall be made of the tests given to each welder and of the detailed results of each test, whether pass or fail.

6.2. The welder test records are to be submitted to the Welding/NDE/Material Testing Group.

7. PERIOD OF EFFECTIVENESS

7.1. The welder's qualification for a welding process remain in effect indefinitely unless:

7.1.1. the welder does not weld with the process for six months or more; or

7.1.2. there is reason to question the welder's ability.

7.2. The welder is to keep a weld log to document compliance with 6.1 for each welding process the welder is qualified in.

7.3. If the welder's qualification expires because of 6.1.1, the welder may re-qualify by making one weld in any position and having it tested and found acceptable.

7.4. If the welder's qualification expires because of 6.1.2, a complete re-test in both the 3G and 4G positions is required.

8. Records

8.1. The local superintendent is responsible for retaining the qualification test reports for Company personnel.

8.2. Qualification reports for contract welders are to be kept in the project file.

Table 1

FOR TESTING ON AWS D1.1 STANDARD TEST SIZES			
Nominal Pipe Size	Schedule or Nominal WT	Pipe size qualified	Pipe or plate thickness
2 [2-3/8" OD]	Sch 80 [0.218"]	4 or smaller	1/8" to 0.674"
3 [3-1/2" OD]	Sch 40 [0.218"]	4 or smaller	1/8" to 0.674"
6 [6-5/8" OD]	Sch 120 [0.562"]	4 or larger	3/16" to unlimited
8 [8-5/8" OD]	Sch 80 [0.500"]	4 or larger	3/16" to unlimited
FOR TESTING ON JOB SIZE PIPE			
Nominal Pipe Size	Schedule or Nominal WT	Pipe size qualified	Pipe or plate thickness
4 or less	Any	3/4" to 4"	1/8" to 0.674"
Over 4	Less than 3/8"	Minimum is 1/2 tested size but no less than size 4. No maximum.	1/8" to 0.674"
Over 4	3/8" or thicker	Minimum is 1/2 tested size but no less than size 4. No maximum.	3/16" to unlimited

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Figure 1

Pipe Test Weld

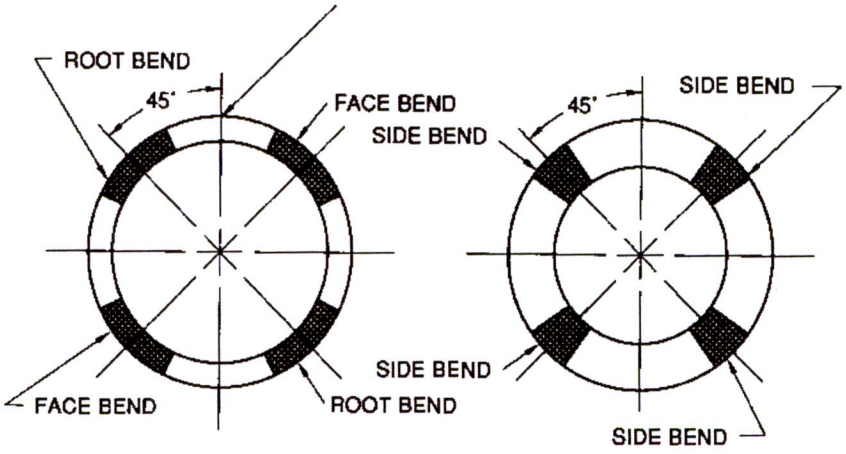

Figure 2

Pipe Test Specimen Location

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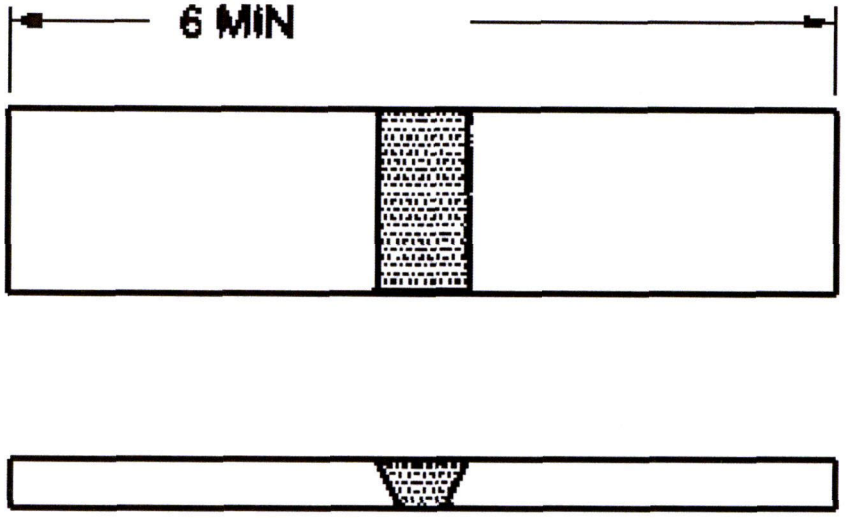

Figure 3
Root and Face Bend Specimens

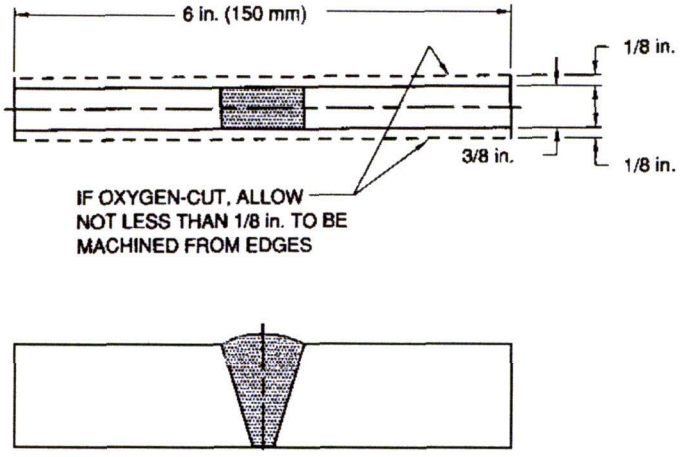

Figure 4
Side Bend Specimens

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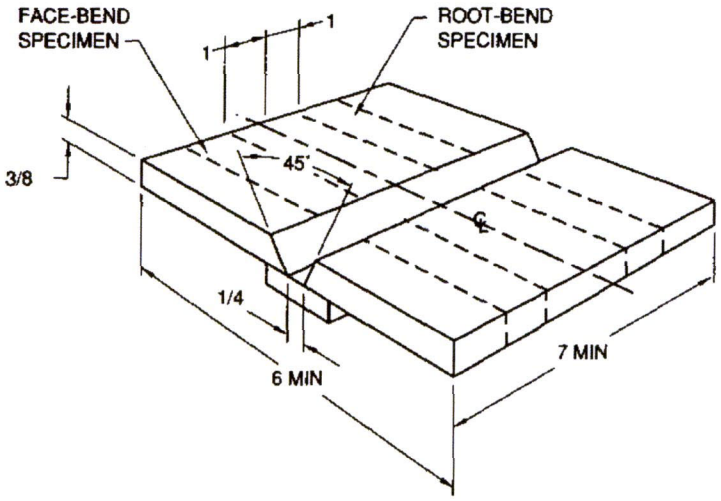

Figure 5
Plate Test Weld and Specimen Location

Note: Backing is to be 1" minimum wide with a thickness of 1/4" to 3/8"

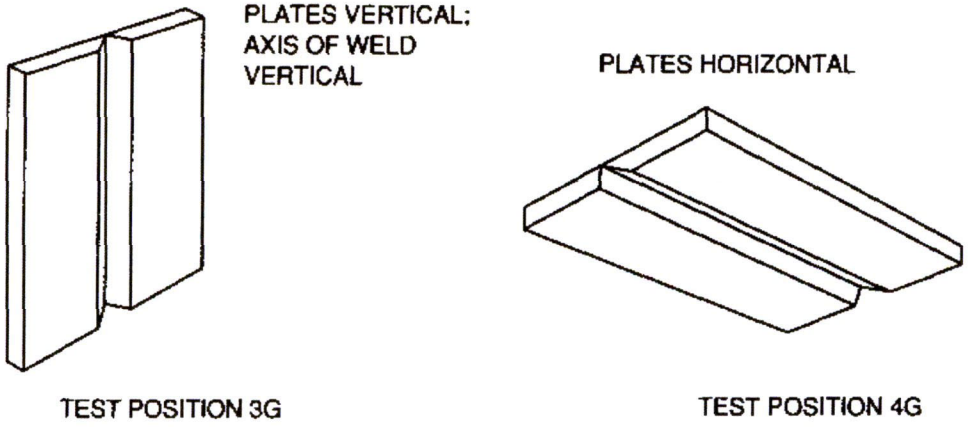

Figure 6
Plate Test Positions

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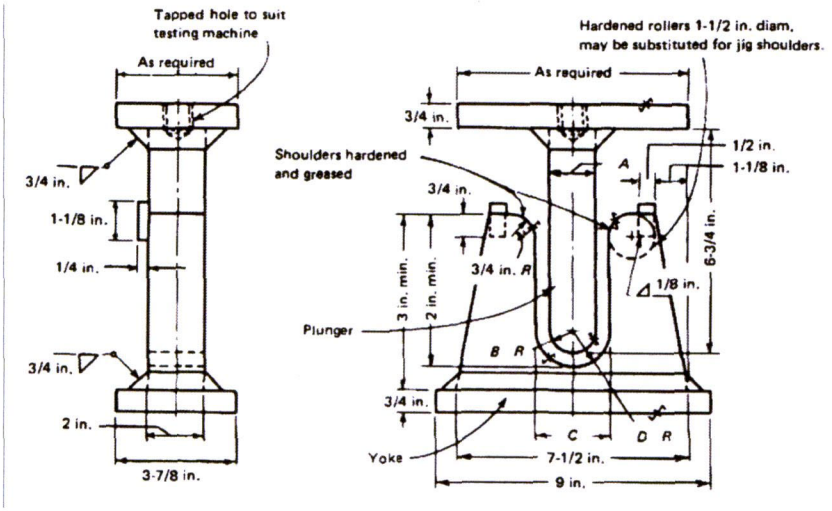

Specimen Thickness	A inches	B inches	C inches	D inches
3/8"	1 ½"	¾"	2 3/8"	1 3/16"
Less than 3/8"	4t	2t	6t +1/8"	3t + 1/16"

Figure 7

Bend Test Jig

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1. SCOPE

1.1. This procedure applies to Welding Inspectors for field construction. These Welding Inspectors may also conduct welding inspection in fabrication shops and plants.

2. QUALIFICATION

2.1. Welding inspectors shall have, within the previous three years, a visual examination to assure natural or corrected near distance acuity. The inspector should be capable of reading standard J-1 letters on Jaeger test charts for near vision.

2.2. Welding inspectors shall have acceptable work history and:

2.2.1. A current Certified Welding Inspector (CWI) certification issued by the American Welding Society (AWS), or

2.2.2. Shall meet the following requirements to the satisfaction of Engineering:

2.2.2.1. Possess a thorough knowledge of Company welding policies, procedures, and records;

2.2.2.2. Possess a thorough knowledge of the following applicable codes: a) The Company's Operating and Maintenance Manual (O&M);

b) API Standard 1104, current applicable edition;

c) Code of Federal Regulations (CFR), Title 49, Parts 192 and 195;

d) ASME Boiler & Pressure Vessel Code, Section IX;

2.2.2.3. Possess the ability to review welders' qualifications and to conduct welder qualifications.

2.2.2.4. Possess the ability to review radiographers' qualifications and to judge radiographic film quality.

2.2.2.5. Possess ability in the use of material, fitting, and design drawing specifications.

2.2.2.6. Pass a written examination.

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3. INSPECTION OF OWN WORK

3.1. Welders who meet the requirements of a welding inspector and who are Company welders or have remained qualified to weld for the previous two consecutive years may inspect their own production welding. This does not apply to welds made for qualification, re-qualification, or to DOT 6 month proficiency welds.

4. RECORDS

4.1. Records of the welding inspector's qualification shall be maintained by Engineering. Records shall include education and experience, training, and results of any qualification examinations.

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1. GENERAL

1.1. Welding procedures shall be qualified to produce welds meeting the requirements of this section. The quality of the test welds used to qualify the procedure shall be determined by destructive testing.

2. QUALIFICATION OF WELDING PROCEDURES

2.1. Prior to the start of production welding, a detailed written procedure specification shall be established and qualified to demonstrate that welds having suitable mechanical properties and soundness can be made by this procedure. The quality of the procedure qualification test welds shall be determined by destructive testing.

2.2. Each welding procedure must be recorded in detail during the qualifying tests. The record shall show complete results of the procedure qualification testing. This record must be retained and followed whenever the procedure is used.

2.3. API Standard 1104 shall be the preferred standard for qualification of field welding procedures. ASME BPV Section IX can be used where applicable. Other codes and standards may be used when authorized by Engineering.

2.4. Unless otherwise specified by Engineering, the following additional testing is required for qualification of welding procedures.

2.4.1. Charpy V Notch Impact Testing

2.4.1.1. Charpy V notch testing of the weld and heat affected zone (HAZ) shall be conducted at 32° F [0° C] unless another temperature is specified by the Company.

2.4.1.2. The minimum average Charpy V notch absorbed energy shall be 25 ft-lbs. [34 J].

2.4.1.3. The average shear area on the HAZ Charpy specimens shall not be less than 60%.

2.4.1.4. There is no shear area requirement for the weld metal Charpy specimens.

2.4.2. Microhardness

2.4.2.1. A Vicker's microhardness measurement survey shall be made using at least a 1 kg load (10 kg is preferred). Figure 1 shows the locations for the

microhardness indentations. The maximum hardness shall not exceed 325 VHN.

3. Qualification of API 1104 Repair Procedures

3.1. Qualification of repair procedures is not required for the initial repair of defects, including cracks, that are made with the same process used to make the initial weld.

3.2. Qualification of repair procedures is required for:

3.2.1. repair of a repair, or

3.2.2. any repair not made with the same process used to make the initial weld

3.3. Qualification of testing shall be performed to demonstrate that the repaired weld will have acceptable mechanical properties and soundness.

3.4. Qualification tests shall include

3.4.1. one tensile test

3.4.2. one nick break test

3.4.3. depending on wall thickness, either

3.4.3.1. one root bend and one face bend or

3.4.3.2. one side bend

3.4.4. toughness testing and microhardness testing per section 2.4

3.5. The qualified repair procedure may be used on both butt welds and fillet welds.

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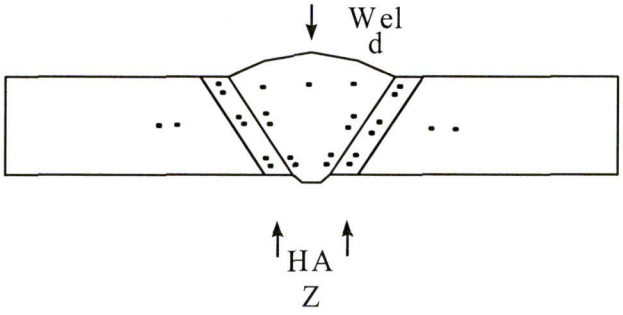
Figure 1



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5. PIPE SURFACE PREPARATION AND NDE REQUIREMENTS 4
6. CHECKING THE TAPPING MACHINE 5
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1. SCOPE

This procedure contains the minimum requirements for welded hot taps. Nondestructive inspections shall be performed by a NDE technician certified as Level II or III in the applicable method. Welding on in-service lines shall be performed by qualified welding personnel with experience in in-service welding.

2. PRELIMINARY CONSIDERATIONS

2.1. The proposed hot tap design shall be submitted to the appropriate project manager for review and approval before the hot tap may be performed. Prior to making a hot tap, it shall be determined by the project engineer or coordinator, in consultation with the location supervisor, if any condition exists that would require special control of, or restrictions on, pressure, flow rate, or welding heat input. No-flow conditions can be hazardous and should be avoided unless it is determined to be safe.

2.2. If restrictions on pressure or flow rate are required, permission shall be obtained from the Gas Control Department to adjust the pressure/flow before hot tapping.

2.3. Hot taps on mainline piping shall be of the type where the valve is welded directly to the branch pipe or hot tap fitting unless Engineering approves the use of a flanged connection.

2.4. The hot tap valve shall be a full opening valve.

2.5. Hot taps may be made in any position around the circumference of the carrier pipe.

2.6. If the hot tap would require cutting the longitudinal seam of the carrier pipe it should be relocated to avoid the seam. If it is determined not possible to avoid the seam, the tap must be approved by Engineering and the seam inspected according to this procedure.

2.7. If the hot tap would require cutting or welding within 12 inches of a girth weld, the tap shall be relocated to avoid the girth weld. If this is determined not to be possible, then the tap must be approved by Engineering.

2.8. The branch connection shall be perpendicular (90 degrees) to the carrier pipe.

2.9. Between the carrier pipe and the hot tap valve, the branch pipe wall thickness shall be at least extra strong [XS].

2.10. Unless a piece of pre-tested pipe is used between the carrier pipe and the hot tap valve, this assembly shall be welded together and hydrostatically tested prior to welding to the carrier pipe.

2.11. Hot taps are not to be installed except by crews qualified by training and experience. In addition, personnel making hot taps must be familiar with the particular tapping machine to be used.

2.12. A written procedure must be available on the construction site indicating the sequence of events to be followed and the tools and materials required. This procedure must incorporate the manufacture's equipment operating and maintenance procedures. Written procedures are to be strictly adhered to.

2.13. Hot tapping entails obvious risks, not only to the safety of the hot tap crew, but also to the continuous operation of the pipelines. Safety is of paramount importance, and all safety precautions shall be carefully noted and followed.

2.14. Before the start of a tapping operation, a Hot Work Permit must be obtained.

2.15. Adequate support of the hot tap machine shall be provided to prevent any undue or excessive weight or stresses from being placed on the weld during the hot tap operation. After completion of the hot tap, adequate support of the hot tap valve shall be provided.

2.16. All tapping machines that cut coupons shall have provision for coupon retention.

2.17. Standard hot tap cutter sizes are listed in Table 1.

2.18. Special applications requiring non-standard hot tap cutter sizes, required for custom meter installations, are allowable, if determined to be acceptable under ASME B31.8. Consideration should be given to ID protrusion of the root bead, removal of any coupon, and possible misalignment of the bore of the tapping machine with the bore of the branch pipe. For a 2" valve size, a 1-3/4" cutter diameter is acceptable.

3. REINFORCEMENT TYPES

3.1. Engineering shall determine the size of the reinforcements for any branch connection two inches or greater in accordance with ASME B31.8 Appendix F.

3.2. The saddles and full-encirclement saddle/sleeve shall have approximately one-quarter (1/4) inch pressure relief holes.

3.3. A saddle pad may be used for reinforcement if the branch connection nominal diameter is no more than one-quarter (1/4) of the nominal diameter of the carrier pipe.

3.4. A full encirclement saddle or a full encirclement sleeve with a saddle pad may be used for reinforcement if the branch connection nominal diameter is no more than one-half (1/2) of the nominal diameter of the pipe. Unless the valve to branch pipe weld is to be made after welding the reinforcement to the carrier pipe, the full-encirclement saddle or full

encirclement sleeve shall be the type which is split through the nozzle, i.e., Fleet Line Part 1, or Part 5 or equivalent. Hot tap sizes greater than ½ of the carrier pipe size can affect the ability to pig the line.

3.5. A hot tap fitting or stopple fitting may be used when the branch connection is up to the full size of the carrier pipe.

3.6. The use of other types of reinforcement requires the approval of Engineering.

3.7. When a full encirclement saddle or a full encirclement sleeve with a saddle pad is used, it is preferred that the ends of the full encirclement saddle/sleeve be seal welded to the carrier pipe. In areas with little corrosion, the seal welds may be omitted, in which case Brutum 33 epoxy putty, or equivalent, may be used for sealing.

4. WELDING AND INSPECTION REQUIRMENTS

4.1. All hot tap welds shall be made using low hydrogen welding process. Welding procedures shall be approved by Engineering.

4.2. Inspection is required for all welds, regardless of size. Inspection procedures are located in the company's NDE Manual.

4.3. Any carrier pipe to be tapped under pressure with a wall thickness less than 0.250", as measured ultrasonically, shall be welded using no larger than 3/32" electrodes for at least the first pass.

5. PIPE SURFACE PREPARATION AND NDE REQUIREMENTS

5.1. In the area to be welded and hot tapped, all coating, rust, and foreign material on the pipe are to be removed to clean metal. If the carrier pipe has FBE coating, this coating need only be removed from areas that will be affected by welding. Sand blasting is not required.

- The area for a stopple fitting or hot tap fitting shall be checked for out-of-roundness and flat areas to assure a good fit for the stopple fitting.

- If any part of the area to be welded, tapped or covered by reinforcement contains a longitudinal seam, the seam shall be inspected using radiography or angle beam ultrasonics for a distance of at least ten (10) inches past any point to be involved in the tapping, welding, or covered by reinforcement. The location of the longitudinal seam on ERW pipe is not always obvious. If a reasonable search does not detect it, radiographic inspection of the seam is not required. If any slag inclusion or porosity observed in the weld exceeds the limits of API 1104, or if any other defect is present, the hot tap shall be moved to another location and the Welding/NDE/Material Testing Group and the Area Manager shall be notified immediately.

- If the reinforcements cover any portion of a longitudinal seam weld, that portion of the weld may be ground to conform to the pipe curvature.

5.2. Except for hot taps on above ground piping, the area to be welded and tapped is to be inspected for stress corrosion cracking using the magnetic particle method. If any evidence of stress corrosion cracking is present, Engineering and the Area Manager shall be notified immediately prior to any further action.

5.3. The area to be welded and tapped shall be inspected using the ultrasonic method for wall thickness measurement and evidence of lamination, internal corrosion, or other defects. If any lamination or other defects are present, the hot tap shall be moved to a different location, and Engineering and the Area Manager shall be notified immediately. The wall thickness in the hot tap area must be verified with a suitable, properly calibrated ultrasonic thickness gauge. This verification is required even though the wall thickness is indicated in pipeline records. If internal corrosion or other wall loss is found, it shall be evaluated prior to tapping.

6. CHECKING THE TAPPING MACHINE

6.1. Prior to any welding to the carrier pipe, the tapping machine shall be attached to the valve assembly and run into and out of the assembly to verify proper travel. The valve shall be closed afterwards to assure proper retraction.

6.2. When making side taps, the size of the hot tapping machine shall be taken into account when considering clearances between the pipeline and other adjacent facilities.

6.3. Hot tap cutters have been known to catch the edge of a flex-a-talic gasket and unwind the gasket. If this type of gasket is used, check for adequate clearance prior to tapping.

6.4. Calculate the travel distance of the cutter to ensure that the tap can be completed.

6.5. Check that the cut will be stopped before the cutter or pilot drill touches the opposite side of the pipe.

6.6. Check that the retrieved cut out coupon can be retracted far enough to allow the hot tap valve to be closed.

7. TAP WITH WELDED BRANCH AND REINFORCEMENT

7.1. Welding of the Hot Tap Valve to the Branch Pipe or Hot Tap Fitting

7.1.1. If pre-tested pipe is used for the branch piping, so that hydrostatic testing of the pipe and valve is not required, this weld may be made last, otherwise, it shall be made

first so that the branch pipe and valve can be hydrostatically tested prior to the branch being welded to the carrier pipe.

7.1.2. The valve shall be welded by a qualified welder to the branch pipe according to an approved applicable welding procedure.

7.1.3. The butt-weld between the valve and the pipe stub or fitting shall be nondestructively examined. See "Visual and Nondestructive Examination" in the Welding Manual.

7.1.4. Any defects shall be repaired according to the Welding Manual. Only one repair shall be permitted. Back-welding shall not be permitted.

7.1.5. The entire branch connection assembly (with the valve in partially open position) shall be hydrostatically strength tested. Pre-tested pipe may be used in lieu of hydrostatically testing the entire branch connection assembly.

7.2. Welding of the Branch Connection Assembly to the Carrier Pipe

7.2.1. The end preparation of the branch connection assembly shall be inspected to assure that the proper bevel is present and that the fit-up is adequate to provide complete penetration without burn-through.

7.2.2. Immediately prior to welding, the saddled-cut end of the branch connection pipe and the carrier pipe shall be dried by heating.

7.2.3. The branch connection assembly shall be welded to the carrier pipe (Weld #2) in accordance with an approved applicable procedure. A minimum of two (2) welders shall be used for hot taps that are eight (8) inches or larger in diameter.

7.2.4. The fillet weld between the carrier pipe and nipple (Weld #2) may be ground smooth to facilitate inspection. Inspect the weld using either the magnetic particle method or the liquid penetrant method. See "Visual and Nondestructive Examination" in the Welding Manual. Defects, except cracks, shall be repaired according to the Welding Manual. If a crack is detected, tapping shall be terminated and Engineering and the Area Manager shall be notified immediately.

7.2.5. Pads or saddles shall be installed in accordance with the following appropriate parts of this Procedure.

7.3. When a Saddle Pad (Figure 1) is used:

7.3.1. Install branch pipe to carrier pipe (Weld #1) according to the previous parts of this Procedure.

7.3.2. The saddle pad shall be placed in position and the fillet weld between the saddle pad and the carrier pipe (Weld #2) shall be made according to an approved applicable welding procedure.

7.3.3. After Weld #2 has cooled to ambient temperature, the fillet weld between the saddle pad and branch pipe (Weld #3) shall be made according to an approved applicable welding procedure.

7.3.4. The pressure relief hole shall not be welded.

7.3.5. Fillet Welds #2 and 3 may be ground smooth to facilitate inspection and are to be inspected using either the magnetic particle method or the liquid penetrant method. See "Visual and Nondestructive Examination" in the Welding Manual. Defects other than cracks shall be repaired according to the Welding Manual. If a crack is detected, the tapping shall be terminated and Engineering and the Area Manager shall be notified immediately.

7.4. When a Full-Encirclement Saddle (Figure 2) is used:

7.4.1. Install branch pipe to carrier pipe according to the previous parts of this Procedure.

7.4.2. If the ends of the full encirclement saddle are not to be seal welded apply Brutum 33 epoxy putty, or equivalent, to the carrier pipe in the area, which will be covered by the full encirclement saddle.

7.4.3. Before the full-encirclement saddle is welded, a chain and jack shall be utilized to ensure the proper line-up of the encirclement saddle around both the carrier pipe and the nipple. The full-encirclement saddle may be fitted by grinding, if necessary. Do not grind on the carrier pipe body.

7.4.4. The longitudinal butt welds that split the full-encirclement saddle (Weld #2) shall be made according to an approved applicable welding procedure. If the saddle is of the type that is split through the nozzle, the longitudinal weld shall be made first, then the other longitudinal welds. Steel shims or backup tape shall be used to prevent these welds from fusing to the nozzle or carrier pipe. For hot taps eight (8) inches in diameter or larger, two (2) welders shall weld at opposite locations on the full-encirclement saddle at the same time. Inspect the longitudinal welds using either the magnetic particle method or the liquid penetrant method.

7.4.5. As an alternative to making longitudinal butt welds, a fillet welded strip may be used as shown in Figure 2. This alternative design is not allowed if the ends of the full encirclement saddle are to be welded to the carrier pipe. Inspect the fillet welds using either the magnetic particle method or the liquid penetrant method. See "Visual and Nondestructive Examination" in the Welding Manual.

7.4.6. If the ends of the full-encirclement saddle are seal welded (Welds #3 and #4) to the carrier pipe, the seal weld shall be at least three (3) passes.

7.4.7. Welds #3 and #4 may be ground smooth to facilitate inspection and are to be inspected using either the magnetic particle method or the liquid penetrant method. See "Visual and Nondestructive Examination" in the Welding Manual. Defects other than cracks shall be repaired according to the Welding Manual. If a crack is detected, tapping shall be terminated and the Director of Pipeline Services and the Area Manager shall be notified immediately.

7.4.8. After all welds have cooled to ambient temperature, the fillet weld between the full-encirclement saddle and the nipple (Weld #5) shall be made according to an approved applicable welding procedure.

7.4.9. Weld #5 may be ground smooth to facilitate inspection and is to be inspected using either the magnetic particle method or the liquid penetrant method. Defects other than cracks shall be repaired according to MES Section 405. If a crack is detected, tapping shall be terminated and Engineering and the Area Manager shall be notified immediately.

7.5. When a Full-Encirclement Sleeve and a Saddle (Figure 3) is Used:

7.5.1. When this combination of reinforcement is used, emergency pipe, or another appropriately tested and documented piece of pipe shall be used for the branch pipe. The hot tap valve may be welded to the branch pipe after all other welds are complete.

7.5.2. Install the branch to carrier pipe (Weld #1) according to the previous parts of this Procedure.

7.5.3. If the ends of the full encirclement saddle are not to be seal welded, apply Brutum 33 epoxy putty, or equivalent to the carrier pipe in the area, which will be covered by the full encirclement saddle.

7.5.4. Before the full-encirclement sleeve is welded, a chain and jack shall be utilized to ensure the proper line-up of the encirclement pad around both the carrier pipe and the nipple. The full-encirclement sleeve may be fitted by grinding, if necessary. Do not grind on the carrier pipe body.

7.5.5. The longitudinal welds that secure the full-encirclement sleeve (Weld #2) shall be made according to an approved applicable welding procedure. Steel shims or backup tape shall be used to prevent the longitudinal welds from fusing to the nozzle or carrier pipe. For hot taps eight (8) inches in diameter or larger, two (2) welders shall weld at opposite locations on the full-encirclement pad at the same time.

Inspect the longitudinal welds using either the magnetic particle method or the liquid penetrant method.

7.5.6. As an alternative to making longitudinal butt welds, a fillet welded strip may be used as shown in Figure 3. Inspect the fillet welds using either the magnetic particle method or the liquid penetrant method.

7.5.7. If the ends of the full-encirclement sleeve are seal welded (Welds #3 and #4) to the carrier pipe, the seal weld shall be at least three (3) passes.

7.5.8. Welds sealing the ends of the full-encirclement sleeve may be ground smooth to facilitate inspection and are to be inspected using either the magnetic particle method or the liquid penetrant method. Defects other than cracks shall be repaired according to the Welding Manual. If a crack is detected, the tapping shall be terminated and Engineering and the Area Manager shall be notified immediately.

7.5.9. After all welds have cooled to ambient temperature, the fillet weld between the full-encirclement sleeve and the branch pipe (Weld #5) shall be made according to an approved applicable welding procedure.

7.5.10. Weld #5 may be ground smooth to facilitate inspection and is to be inspected using either the magnetic particle method or the liquid penetrant method. Defects other than cracks shall be repaired according to the Welding Manual. If a crack is detected, tapping shall be terminated and Engineering and the Area Manager shall be notified immediately.

7.5.11. The saddle pad shall be placed in position and the fillet weld between the saddle pad and the full encirclement sleeve (Weld #6) shall be made according to an approved applicable welding procedure.

7.5.12. After Weld #6 has cooled to ambient temperature the fillet weld between the saddle pad and branch pipe (Weld #7) shall be made according to and approved applicable welding procedure.

7.5.13. The pressure relief holes shall not be welded.

7.5.14. Fillet Welds #6 and #7 shall be ground smooth to facilitate inspection and are to be inspected and are to be inspected using either the magnetic particle method or the liquid penetrant. Defects other than cracks shall be repaired according to the Welding Manual. If a crack is detected, the tapping shall be terminated and Engineering and the Area Manager shall be notified immediately.

7.5.15. Valve shall be welded to the branch pipe according to the previous parts of this Procedure.

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8. TAP WITH HOT TAP FITTING OR STOPPLE FITTING

8.1. Welding the Fitting (Figure 4)

8.1.1. The fitting shall be installed using a chain and jack to ensure a tight fit around the carrier pipe. If the ends of the fitting are identified by paint band, stamped numbers, or any other method, be certain that the halves of the fitting are turned properly. The fitting shall be tack-welded in position after the fit-up is correct.

8.1.2. All moisture or condensation shall be dried from the fitting and carrier pipe before welding starts.

8.1.3. If possible, the beveled edges of the fitting shall be preheated to 300 degrees F before welding is started. If preheating of the beveled edges is not possible, the fitting should be warmed as much as possible.

8.1.4. For hot taps eight (8) inches in diameter or larger, two (2) welders shall weld at opposite locations (Welds #1) at the same time. Do not allow the longitudinal welds to fuse to the carrier pipe. Steel shims or backup tape shall be used.

8.1.5. After the longitudinal welds have been allowed to cool, the fillet weld at one end of the fitting (Weld #2 or #3) shall be made according to an approved applicable welding procedure.

8.1.6. After the second weld has cooled, the fillet weld at the other end of the fitting (Weld #2 or #3) shall be made according to an approved applicable welding procedure.

8.1.7. If the fitting is pressure containing, the fillet welds on the ends must be full welds, not the seal welds allowed for full encirclement sleeves/saddles.

8.2. Inspection of the Welded Fitting

8.2.1. Each of the welds may be ground smooth to facilitate inspection and they are to be inspected using either the magnetic particle method or the liquid penetrant method. Defects, except cracks, shall be repaired according to the Welding Manual. If a crack is detected, the hot tap/stopple procedure shall be terminated and Engineering and the Area Manager notified immediately.

8.3. Weld Hot Tap Valve to Fitting/Stopple

8.3.1. The valve shall be welded by a qualified welder to the fitting according to an approved applicable welding procedure (Weld #4).

8.3.2. The butt weld between the valve and the fitting shall be nondestructively examined. See "Visual and Nondestructive Examination" in the Welding Manual.

9. TAPPING, PURGING AND COMPLETION

9.1. When using the tapping machine, grease or lard may be packed into the branch or a magnet may be used to retain shavings, allowing them to be withdrawn with the drill or be cleaned out of the assembly during purging. If a stopple tap is being made, it is not recommended that any lubricant be used, as it would cause difficulty in sealing the gas flow.

9.2. Prior to cutting the coupon out of the carrier pipe or proceeding with this installation procedure, the tapping machine shall be installed and a leak test shall be imposed when the branch connection is 2-3/8" and larger, using an inert gas such as nitrogen. The leak test is to be applied for not less than thirty (30) minutes. Water or other test media may be used when the use of nitrogen may be hazardous. The test pressure imposed shall be at sufficient pressure above the internal line pressure to detect all potentially hazardous leaks in the segment being tested, but no more than fifty 10% greater than the internal pressure of the pipeline at the time the leak test is being made. If a leak is detected, the tapping operation is to be terminated and Engineering and the Area Manager shall be notified immediately.

9.3. Proceed to complete the tap.

9.4. After the coupon is cut, the cutter head retracted, and the valve closed, the side valve section must be completely blown down before attempting to remove the tapping machine.

9.5. When saddle pads and/or full encirclement saddles/sleeves are used:

9.5.1. The pressure relief holes shall be examined for any evidence of leakage at normal operating pressure. If a leak is detected, Engineering and the Area Manager shall be notified immediately.

9.5.2. A watertight non-pressure containing seal, using silicone sealant, shall be applied to the pressure relief holes. Welding these holes is NOT allowed.

9.6. The completed assembly is to be cleaned and, recoated according to Company Coating Specifications.

9.7. The hot tap valve for underground installation will normally be factory coated with approved Company coatings. Field repair of this coating shall be made with approved Company coatings. Exceptions shall be approved by Corrosion Forman.

9.8. All risers shall be coated from the carrier pipe to a distance of 1 foot above ground with approved Company coatings. . Exceptions shall be approved by Corrosion Forman.

9.9. The internal surface of the coupon is to be examined and the condition documented. If corrosion is found, the coupon shall be sent to Engineering.

10. RECORDS AND REPORTS

10.1. A record of the location, size of hot tap valve used, the tap hole size, and branch and reinforcement sizes shall be maintained in the location office, and a copy shall be sent to Engineering Records.

10.2. The results of the inspection of the affected area of the carrier pipe to be tapped shall be reported on an appropriate Inspection Report.

10.3. The welding procedures used, the welder's names, testing of welds, added or replaced pipe, and other significant information shall be reported on an appropriate Pipe Repair Report.

CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Welding Procedures Manual			
Specification No. LP-09	Issue Date: May 25th 2018	Revision Date:	

Table 1	
Standard Hot Tap Cutter Sizes	
Valve Size	Cutter Diameter
2"	1 7/16"
3"	2 7/16"
4"	3 7/16"
6"	5 15/32"
8"	7 5/16"
10"	9 1/2"
12"	11 1/2"
14"	12 3/4"

CONSTRUCTION SPECIFICATION
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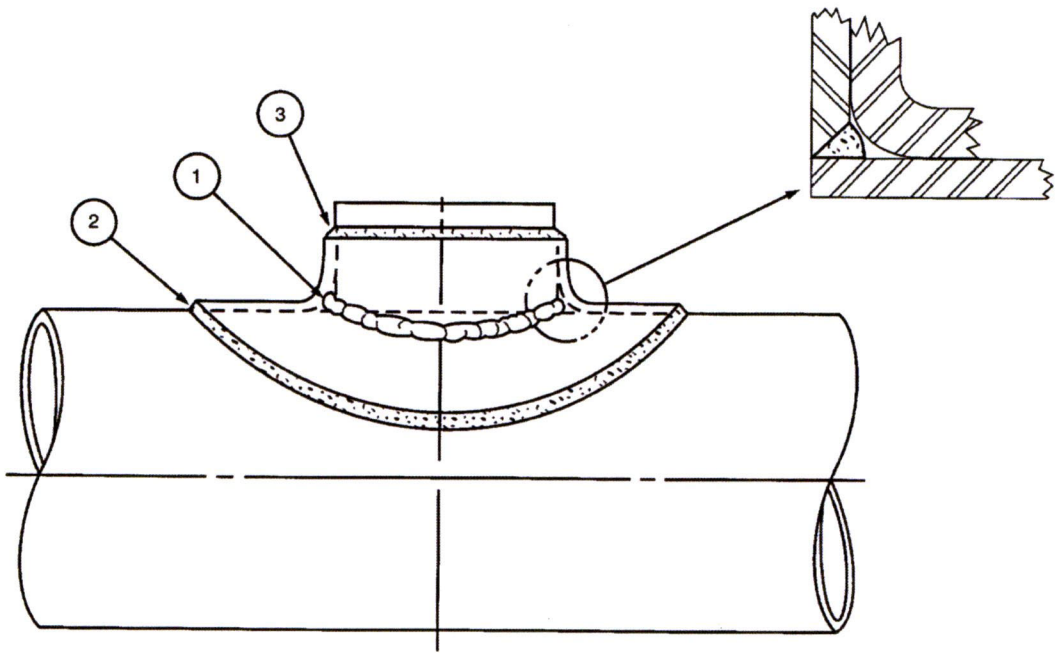

Figure 1

CONSTRUCTION SPECIFICATION
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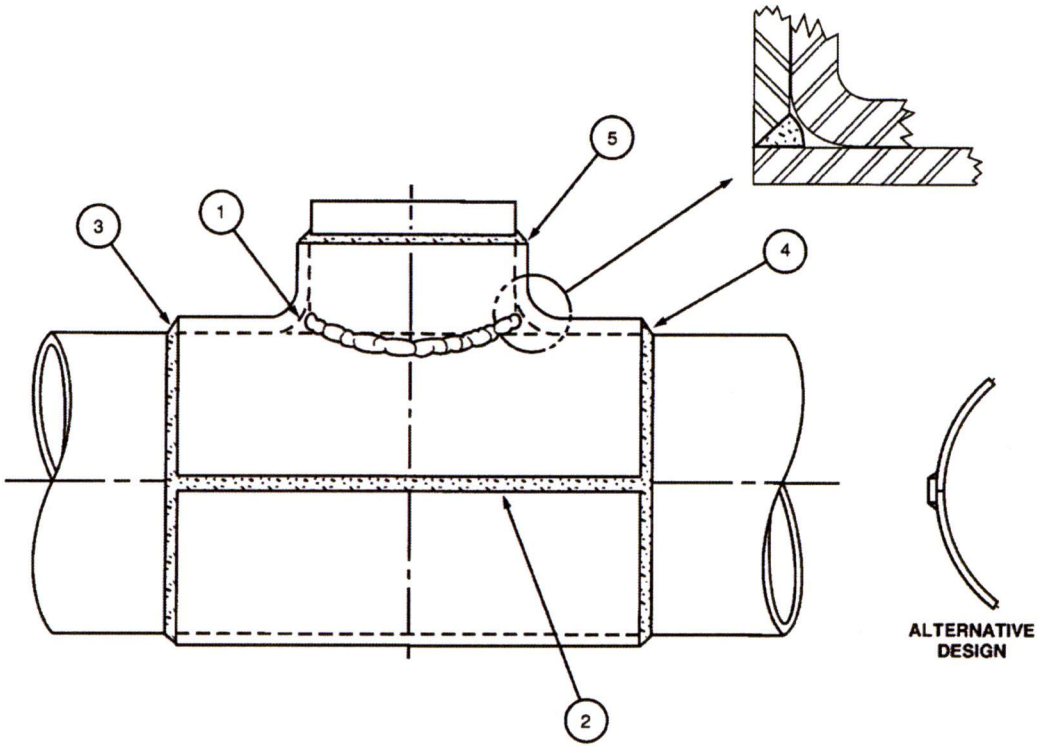

Figure 2

CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

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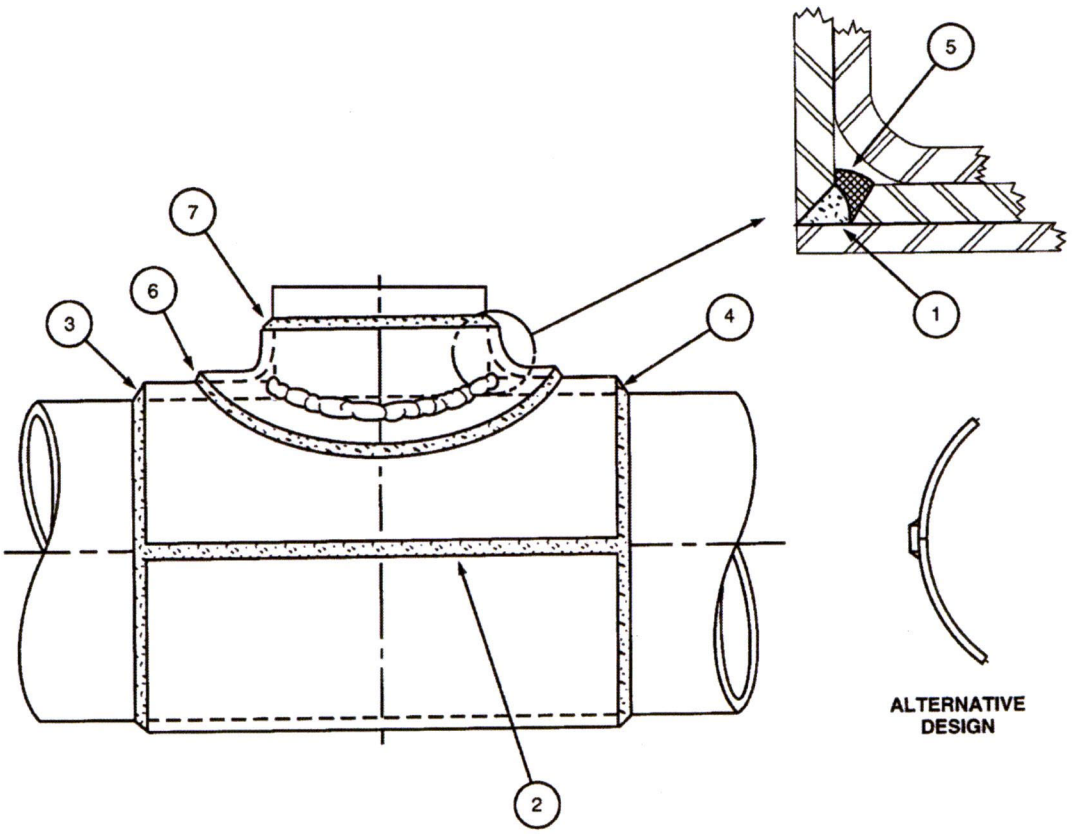

Figure 3

Specification Title: Welding Procedures Manual			
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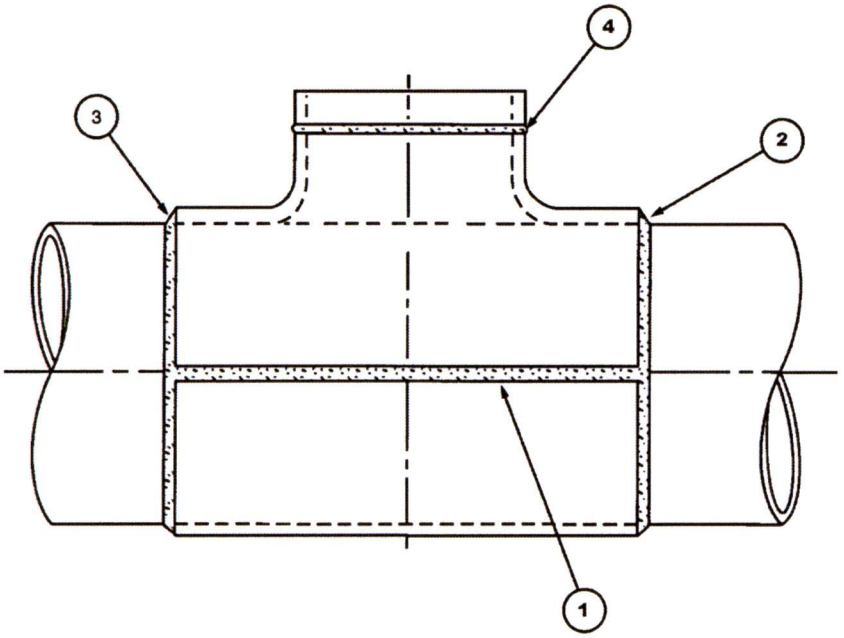

Figure 4

CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Welding Procedures Manual			
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API 1104 Welding Procedures
FORMAT: ETC-
L1#1#2#3L2-Ls

Letter (L1)
Main grouping letter
API 1104; A = SMAW process, B = GMAW process; C = SAW process

Number (#1)
API welder qualification WT group
1 = up to 3/4"
2 = 3/4 to less than 1 1/2"
3 = 1 1/2" and greater

Number (#2)
API Filler Metal Groups
1 = Group1
2 = Group 2
3 = Group 3

Number (#3) If Used
API Filler Metal Groups
1 = Group1
2 = Group 2
3 = Group 3

Letter (L2)
Sequential letter, starting with "A", assigned to avoid duplicate procedures.

Suffix Letter (Ls)
F = fillet [includes BOTH branch and sleeve]
R = roll weld
S = sleeve type only

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Example:
ETC-A113A-F

A = API 1104, SMAW process
1 = All wall thickness up to 3/4"
1 = (E6010, E6011, E7010, or E7011)
3 = (EXX15, EXX16, or EXX18
A = first procedure with the above combination
F = fillet weld

CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

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ASME Welding Procedures
FORMAT: ETC-
P#1L1#2L2

P
all ASME procedures start with "P"

Number (#1)
The highest ASME P Number covered by the procedure. If the procedure is limited to S number materials, insert "S" before the number.

Letter (L1)
The main welding process used by the procedure. The letters are assigned in the order the processes are listed in the procedure qualification section of ASME Section IX.

A	OFW	Oxyfuel Gas Welding
B	SMAW	Shielded Metal-Arc Welding
C	SAW	Submerged-Arc Welding
D	GMAW and FCAW	Gas Metal-Arc & flux core
E	GTAW	Gas Tungsten-Arc Welding

Number (#2)
The highest ASME F number [filler metal] for the main welding process.

Letter (L2)
Sequential letter, starting with "A", assigned to avoid duplicate procedures.

Example:

P1B3A

P = ASME
1 = P No. 1
B = SMAW
3 = F No. 3 [Exx10, Exx11 electrodes]
A = first procedure with the above combination

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API 1104 SHIELDED METAL ARC WELDING (SMAW)					
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
BUTT WELD	All	≤0.750	A-X70	6010/8010	ETC-A112A
	All	>0.750 to <1.250	X42-X52	6010/8010	ETC-A212A
	All	≥1.250			
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
FILLET WELD	All	≤0.750	A-X70	6010/8010	ETC-A112A-F
	All	>0.750 to <1.250			
	All	≥1.250			
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
BUTT WELD	All	≤0.750	>42-X70	8010	ETC-A12A
	All	>0.750 to <1.250			
	All	≥1.250			
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
FILLET WELD	All	≤0.750	X52, X65, X70	8010	ETC-A12A-F
	All	>0.750 to <1.250			
	All	≥1.250			
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
BUTT WELD	All	≤0.750	>42-X52	6010/7018	ETC-A113A
	All	>0.750 to <1.250			
	All	≥1.250			
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
FILLET WELD	All	≤0.750	>42-X52	6010/7018	ETC-A113A-F
	All	>0.750 to <1.250			
	All	≥1.250			
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
BUTT WELD	All	≤0.750	A-X60	8010/8018	ETC-A123A
	All	>0.750 to <1.250			
	All	≥1.250			
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
FILLET WELD	All	≤0.750			
	All	>0.750 to <1.250			
	All	≥1.250			
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
BUTT WELD	All	≤0.750	A-X60	7016/7018	ETC-A13A
	All	>0.750 to <1.250			
	All	≥1.250			
TYPE	**DIAMETER (in.)**	**WT (in.)**	**GRADES**	**REMARKS**	**PROCEDURE**
FILLET WELD ***	All	≤0.750	A-X70	7016/7018 or 8018	ETC-A13A-F
	All	>0.750 to <1.250			
	All	≥1.250			

*** Approved for in service welding. (e.g. hot tap, repair sleeve) Welders shall be multiple qualified for in-service welding.

LONESTAR PIPELINE COMPANY

CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

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ASME BPV Section IX				
Base Metal	**Process**	**WT (in.)**	**Remarks**	**Procedure**
Carbon Steel	SMAW		6010/8010	ETC-P1B3A
Carbon Steel	SMAW		6010/7018	ETC-P1B4A
Stainless Steel	GTAW		ER308L	ETC-P8E6A

AWS D1.1 Structural Welding			
Base Metal	**Process**	**Remarks**	**Procedure**
Carbon Steel	SMAW	NA	NA

LONESTAR PIPELINE COMPANY

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Welding Procedure Specifications

WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

Process (Manual, Semiautomatic/SMAW, GMAW, etc.)	**Manual SMAW**
Material Grade (yield in psi)	**Low alloy steel**
42,000 and Less	**X**
Over 42,000 to 60,000	**X**
65,000	**X**
70,000	**X**
80,000	
Diameter Group (inches)	
Under 2-3/8	**X**
2-3/8 to 12-3/4	**X**
Over 12-3/4	**X**
Wall Thickness Group (inches)	
Up to 3/4 (.000 to .750)	**X**
Over 3/4 and Less Than 1 1/4 (.750 to <1.250)	
1 1/4 and Over (1.250 and Over)	
Position	**Fixed – horizontal and vertical pipe axis**
Filler Metal Classification	**E6010 & E8010, see Welding Manual for approved brands**
Current Type and Polarity	**DC reverse polarity (pipe negative)**
Joint Design	**See sketch**
Max. Time Between End of Root and Start of 2nd Bead	**5 minutes**
Direction for Vertical Welding	**Vertical down**
Shielding Gas and Flow Rate	**none**
Shielding Flux (Type and Size)	**none**
Speed of Travel (Range in/min)	**6-13 in/min**
Alignment	**1/16" max. high-low unless due to dimensional differences**

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

Line-Up Clamp (Internal, External or None)	**internal or external clamps**
Removal of Line-Up Clamp (Percent of root pass completed)	**50% min.**
Number of Welders	**For pipe 14"OD and larger, two or more for both the root pass and the hot pass.**
Deposited Thickness Per pass	**1/8" max.**
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; remove all slag or flux after each pass**
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**Propane burner or other method approved by welding inspector**
Pipe	**200F for grades X65 and higher**
Valves, Flanges, and Fittings	**300F for grades X65 and higher**
Min. Temp.	**40F or higher as needed to keep dry**
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

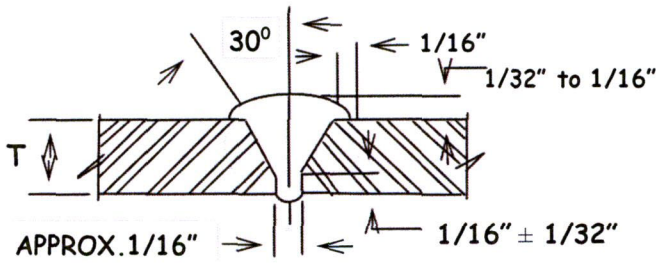
ELECTRICAL CHARACTERISTICS

ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
1/8" E6010	**18-38**	**90-130**
5/32" E6010	**18-38**	**90-175**
1/8" E8010	**18-38**	**90-130**
5/32" E8010	**18-38**	**120-180**
3/16" E8010	**18-38**	**140-220**

BEAD SEQUENCE

BEAD	ELECTRODE
RP	**E6010**
HP	**E8010**
Fill	**E8010**
Cap	**E8010**

JOINT DESIGN SKETCH



REMARKS: **Number of beads will vary with wall thickness.**
Arc striking (arc burn) on the base metal is prohibited.

WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

Process (Manual, Semiautomatic/SMAW, GMAW, etc.)	**Manual SMAW**
Material Grade (yield in psi)	**Low alloy steel**
42,000 and Less	
Over 42,000 to 60,000	***52,000 max***
65,000	
70,000	
80,000	
Diameter Group (inches)	
Under 2-3/8	**X**
2-3/8 to 12-3/4	**X**
Over 12-3/4	**X**
Wall Thickness Group (inches)	
Up to 3/4 (.000 to .750)	
Over 3/4 and Less Than 1 1/4 (.750 to <1.250)	**X**
1 1/4 and Over (1.250 and Over)	
Position	**Fixed – horizontal and vertical pipe axis**
Filler Metal Classification	**E6010 & E8010, see Welding Manual for approved brands**
Current Type and Polarity	***DC reverse polarity (pipe negative)***
Joint Design	**See sketch**
Max. Time Between End of Root and Start of 2nd Bead	**5 minutes**
Direction for Vertical Welding	**Vertical down**
Shielding Gas and Flow Rate	**none**
Shielding Flux (Type and Size)	**none**
Speed of Travel (Range in/min)	**6-13 in/min**
Alignment	***1/16" max. high-low unless due to dimensional differences***

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

Line-Up Clamp (Internal, External or None)	**internal or external clamps**
Removal of Line-Up Clamp (Percent of root pass completed)	**50% min.**
Number of Welders	**For pipe 14"OD and larger, two or more for both the root pass and the hot pass.**
Deposited Thickness Per pass	***1/8" max.***
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; remove all slag or flux after each pass**
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**Propane burner or other method approved by welding inspector**
Pipe	
Valves, Flanges, and Fittings	
Min. Temp.	***40F or higher as needed to keep dry***
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

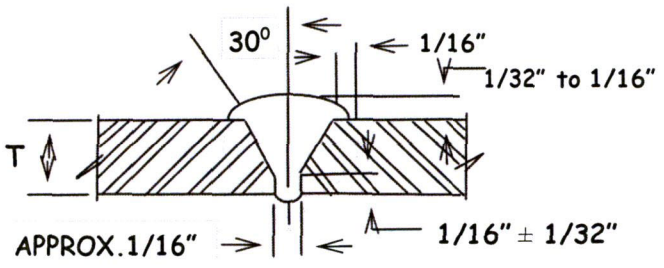
ELECTRICAL CHARACTERISTICS

ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
1/8" E6010	**18-38**	**90-130**
5/32" E6010	**18-38**	**90-175**
1/8" E8010	**18-38**	**90-130**
5/32" E8010	**18-38**	**120-180**
3/16" E8010	**18-38**	**140-220**

BEAD SEQUENCE

BEAD	ELECTRODE
RP	**E6010**
HP	**E8010**
Fill	**E8010**
Cap	**E8010**

JOINT DESIGN SKETCH



REMARKS: **Number of beads will vary with wall thickness.**
Arc striking (arc burn) on the base metal is prohibited.

WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

Process (Manual, Semiautomatic/SMAW, GMAW, etc.)		**Manual SMAW**	
Material Grade (yield in psi)	**Low alloy steel**	**Branch/Fillet**	**Carrier Pipe**
42,000 and Less		**X**	**X**
Over 42,000 to 60,000		**X**	**X**
65,000		**X**	**X**
70,000		**X**	**X**
80,000			
Diameter Group (inches)		**Branch/Fillet**	**Carrier Pipe**
Under 2-3/8		**X**	**X**
2-3/8 to 12-3/4		**X**	**X**
Over 12-3/4		**X**	**X**
Wall Thickness Group (inches)			
Up to 3/4	(.000 to .750)	**X**	
Over 3/4 and Less Than 1 1/4	(.750 to <1.250)		
1 1/4 and Over	(1.250 and Over)		
Position		**Fixed**	
Filler Metal Classification		**E6010 & E8010, see Welding Manual for approved brands**	
Current Type and Polarity		**DC reverse polarity (pipe negative)**	
Joint Design		**See sketch**	
Max. Time Between End of Root and Start of 2nd Bead		**5 minutes**	
Direction for Vertical Welding		**Vertical down**	
Shielding Gas and Flow Rate		**none**	
Shielding Flux (Type and Size)		**none**	
Speed of Travel (Range in/min)		**6-13 in/min**	

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

Line-Up Clamp (Internal, External or None)	**none required**
Removal of Line-Up Clamp (Percent of root pass completed)	**When clamps are used, 50% min.**
Number of Welders	**One or more**
Deposited Thickness Per pass	**1/8" max.**
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; remove all slag or flux after each pass**
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**Propane burner or other method approved by welding inspector**
Pipe	**200F for grades X65 and higher**
Valves, Flanges, and Fittings	**300F for grades X65 and higher**
Min. Temp.	**40F or higher as needed to keep dry**
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

ELECTRICAL CHARACTERISTICS

ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
1/8" E6010	**18-38**	**90-130**
5/32" E6010	**18-38**	**90-175**
1/8" E8010	**18-38**	**90-130**
5/32" E8010	**18-38**	**120-180**
3/16" E8010	**18-38**	**140-220**

BEAD SEQUENCE

BEAD	ELECTRODE
RP	**1/8" or 5/32" E6010**
HP	**1/8" or 5/32" E8010**
Fill	**5/32" or 3/16" E8010**
Cap	**5/32" or 3/16" E8010**

REMARKS

Number of beads will vary with wall thickness.

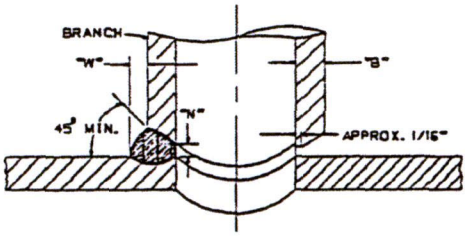
Arc striking (arc burn) on the base metal is prohibited.

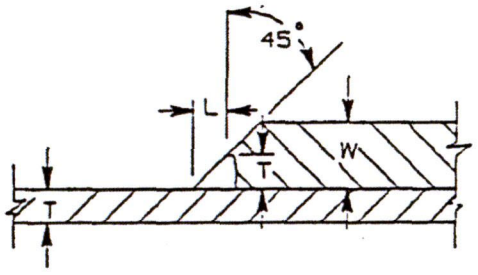
W = 3/8 B (but not less than ¼"); N = 1/16" to 3/16"

L (min.) = ½ W (but not less the ¼")

If W > T, taper W as shown to approximately equal T.

JOINT DESIGN SKETCH





WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

Process (Manual, Semiautomatic/SMAW, GMAW, etc.)	**Manual SMAW**
Material Grade (yield in psi)	**Low alloy steel**
42,000 and Less	
Over 42,000 to 60,000	**X**
65,000	**X**
70,000	**X**
80,000	
Diameter Group (inches)	
Under 2-3/8	**X**
2-3/8 to 12-3/4	**X**
Over 12-3/4	**X**
Wall Thickness Group (inches)	
Up to 3/4 (.000 to .750)	**X**
Over 3/4 and Less Than 1 1/4 (.750 to <1.250)	
1 1/4 and Over (1.250 and Over)	
Position	**Fixed – horizontal and vertical pipe axis**
Filler Metal Classification	**E8010, see Welding Manual for approved brands**
Current Type and Polarity	**DC reverse polarity (pipe negative)**
Joint Design	**See sketch**
Max. Time Between End of Root and Start of 2nd Bead	**5 minutes**
Direction for Vertical Welding	**Vertical down**
Shielding Gas and Flow Rate	**none**
Shielding Flux (Type and Size)	**none**
Speed of Travel (Range in/min)	**6-13 in/min**
Alignment	**1/16" max. high-low unless due to dimensional differences**

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

Line-Up Clamp (Internal, External or None)	**internal or external clamps**
Removal of Line-Up Clamp (Percent of root pass completed)	**50% min.**
Number of Welders	**For pipe 14"OD and larger, two or more for both the root pass and the hot pass.**
Deposited Thickness Per pass	**1/8" max.**
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; remove all slag or flux after each pass**
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**Propane burner or other method approved by welding inspector**
Pipe	**200F for grades X65 and higher**
Valves, Flanges, and Fittings	**300F for grades X65 and higher**
Min. Temp.	**40F or higher as needed to keep dry**
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

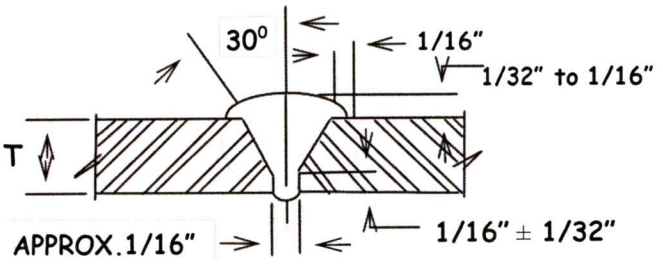
ELECTRICAL CHARACTERISTICS

ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
1/8" E8010	**18-38**	**90-130**
5/32" E8010	**18-38**	**90-175**
1/8" E8010	**18-38**	**90-130**
5/32" E8010	**18-38**	**120-180**
3/16" E8010	**18-38**	**140-220**

BEAD SEQUENCE

BEAD	ELECTRODE
RP	**E8010**
HP	**E8010**
Fill	**E8010**
Cap	**E8010**

JOINT DESIGN SKETCH



REMARKS: **Number of beads will vary with wall thickness.**

Arc striking (arc burn) on the base metal is prohibited.

WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

Process (Manual, Semiautomatic/SMAW, GMAW, etc.)	**Manual SMAW**	
Material Grade (yield in psi) **Low alloy steel**	**Branch/Fillet**	**Carrier Pipe**
42,000 and Less	**X**	
Over 42,000 to 60,000	**X**	**52,000 max**
65,000	**X**	**X**
70,000	**X**	**X**
80,000		
Diameter Group (inches)	**Branch/Fillet**	**Carrier Pipe**
Under 2-3/8	**X**	**X**
2-3/8 to 12-3/4	**X**	**X**
Over 12-3/4	**X**	**X**
Wall Thickness Group (inches)		
Up to 3/4 (.000 to .750)	**X**	
Over 3/4 and Less Than 1 1/4 (.750 to <1.250)		
1 1/4 and Over (1.250 and Over)		
Position	**Fixed**	
Filler Metal Classification	**E8010, see Welding Manual for approved brands**	
Current Type and Polarity	**DC reverse polarity (pipe negative)**	
Joint Design	**See sketch**	
Max. Time Between End of Root and Start of 2nd Bead	**5 minutes**	
Direction for Vertical Welding	**Vertical down**	
Shielding Gas and Flow Rate	**none**	
Shielding Flux (Type and Size)	**none**	
Speed of Travel (Range in/min)	**6-13 in/min**	

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

Line-Up Clamp (Internal, External or None)	**none required**
Removal of Line-Up Clamp (Percent of root pass completed)	**When clamps are used, 50% min.**
Number of Welders	**One or more**
Deposited Thickness Per pass	**1/8" max.**
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; remove all slag or flux after each pass**
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**Propane burner or other method approved by welding inspector**
Pipe	**200F for grades X65 and higher**
Valves, Flanges, and Fittings	**300F for grades X65 and higher**
Min. Temp.	**40F or higher as needed to keep dry**
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

ELECTRICAL CHARACTERISTICS

ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
1/8" E8010	**18-38**	**90-130**
5/32" E8010	**18-38**	**90-175**
1/8" E8010	**18-38**	**90-130**
5/32" E8010	**18-38**	**120-180**
3/16" E8010	**18-38**	**140-220**

BEAD SEQUENCE

BEAD	ELECTRODE
RP	**1/8" or 5/32" E8010**
HP	**1/8" or 5/32" E8010**
Fill	**5/32" or 3/16" E8010**
Cap	**5/32" or 3/16" E8010**

REMARKS

Number of beads will vary with wall thickness.

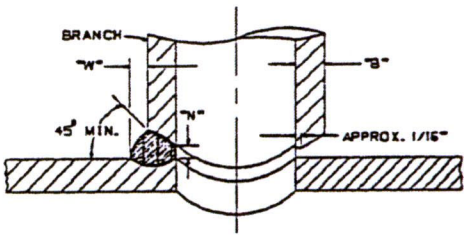
Arc striking (arc burn) on the base metal is prohibited.

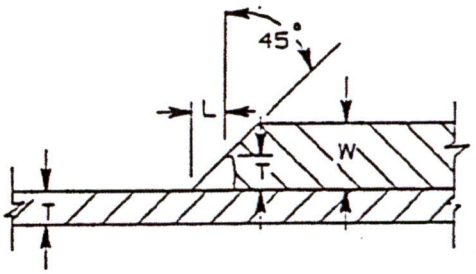
W = 3/8 B (but not less than ¼"); N = 1/16" to 3/16"

L (min.) = ½ W (but not less the ¼")

If W > T, taper W as shown to approximately equal T.

JOINT DESIGN SKETCH





WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

Process (Manual, Semiautomatic/SMAW, GMAW, etc.)	**Manual SMAW**
Material Grade (yield in psi)	**Low alloy steel**
42,000 and Less	
Over 42,000 to 60,000	**52,000 max**
65,000	
70,000	
80,000	
Diameter Group (inches)	
Under 2-3/8	**X**
2-3/8 to 12-3/4	**X**
Over 12-3/4	**X**
Wall Thickness Group (inches)	
Up to 3/4 (.000 to .750)	**X**
Over 3/4 and Less Than 1 1/4 (.750 to <1.250)	
1 1/4 and Over (1.250 and Over)	
Position	**Fixed– horizontal and vertical pipe axis**
Filler Metal Classification	**E6010 and E7018, see Welding Manual for approved brands**
Current Type and Polarity	**DC reverse polarity (pipe negative)**
Joint Design	**See sketch**
Max. Time Between End of Root and Start of 2nd Bead	**5 minutes**
Direction for Vertical Welding	**E6010 vertical down; E7018 vertical up**
Shielding Gas and Flow Rate	**none**
Shielding Flux (Type and Size)	**none**
Speed of Travel (Range in/min)	**3-13 in/min**
Alignment	**1/16" max. high-low unless due to dimensional differences**

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

Line-Up Clamp (Internal, External or None)	**none required**
Removal of Line-Up Clamp (Percent of root pass completed)	
Number of Welders	**One or more**
Deposited Thickness Per pass	**1/8" max.**
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; remove all slag or flux after each pass**
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**not required**
Pipe	
Valves, Flanges, and Fittings	
Min. Temp.	**40F or higher as needed to keep dry**
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

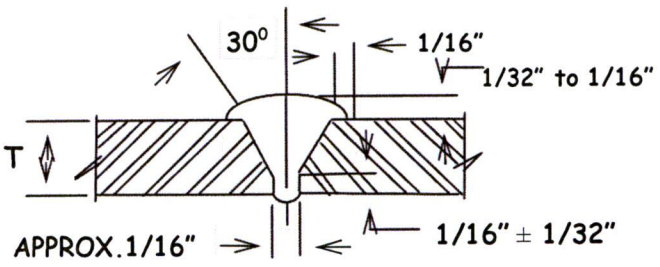
ELECTRICAL CHARACTERISTICS

ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
1/8" E6010	**18-38**	**90-130**
5/32" E6010	**18-38**	**90-175**
1/8" E7018	**18-38**	**90-130**
5/32" E7018	**18-38**	**120-180**
3/16" E7018	**18-38**	**140-220**

BEAD SEQUENCE

BEAD	ELECTRODE
RP	**E6010**
HP	**E7018**
Fill	**E7018**
Cap	**E7018**

JOINT DESIGN SKETCH



REMARKS: **Number of beads will vary with wall thickness.**
Arc striking (arc burn) on the base metal is prohibited.

WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

Procedure A113A-F

ESSENTIAL VARIABLES

Process (Manual, Semiautomatic/SMAW, GMAW, etc.)		**Manual SMAW**	
Material Grade (yield in psi)	**Low alloy steel**	**Branch/Fillet**	**Carrier Pipe**
42,000 and Less		**X**	
Over 42,000 to 60,000		**X**	**52,000 max**
65,000			
70,000			
80,000			
Diameter Group (inches)		**Branch/Fillet**	**Carrier Pipe**
Under 2-3/8		**X**	**X**
2-3/8 to 12-3/4		**X**	**X**
Over 12-3/4		**X**	**X**
Wall Thickness Group (inches)			
Up to 3/4	(.000 to .750)	**X**	
Over 3/4 and Less Than 1 1/4	(.750 to <1.250)		
1 1/4 and Over	(1.250 and Over)		
Position		**Fixed**	
Filler Metal Classification		**E6010 & E7018, see Welding Manual for approved brands**	
Current Type and Polarity		**DC reverse polarity (pipe negative)**	
Joint Design		**See sketch**	
Max. Time Between End of Root and Start of 2nd Bead		**5 minutes**	
Direction for Vertical Welding		**E6010 vertical down, E7018 vertical up**	
Shielding Gas and Flow Rate		**none**	
Shielding Flux (Type and Size)		**none**	
Speed of Travel (Range in/min)		**6-13 in/min**	

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

Line-Up Clamp (Internal, External or None)	**none required**
Removal of Line-Up Clamp (Percent of root pass completed)	**When clamps are used, 50% min.**
Number of Welders	**One or more**
Deposited Thickness Per pass	**1/8" max.**
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; remove all slag or flux after each pass**
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**Propane burner or other method approved by welding inspector**
Pipe	
Valves, Flanges, and Fittings	
Min. Temp.	**40F or higher as needed to keep dry**
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

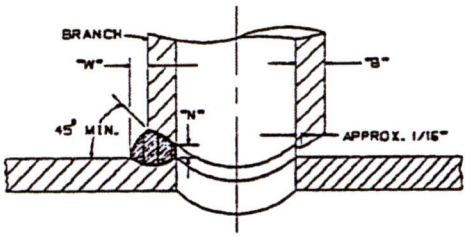
ELECTRICAL CHARACTERISTICS

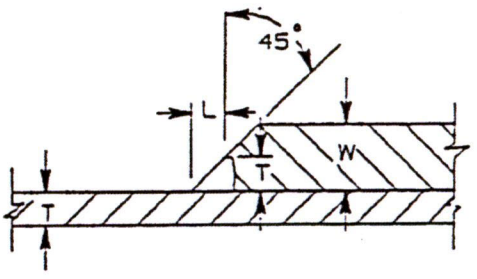
ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
1/8" E6010	**18-38**	**70-140**
5/32" E6010	**18-38**	**90-175**
3/32" E7018	**18-30**	**60-100**
1/8" E7018	**18-30**	**80-150**

BEAD SEQUENCE

BEAD	ELECTRODE
RP	**E6010**
HP	**E7018**
Fill	**E7018**
Cap	**E7018**

JOINT DESIGN SKETCH





REMARKS

Number of beads will vary with wall thickness.

Arc striking (arc burn) on the base metal is prohibited.

W = 3/8 B (but not less than ¼"); N = 1/16" to 3/16"

L (min.) = ½ W (but not less the ¼")

If W > T, taper W as shown to approximately equal T.

WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

Procedure A123A

ESSENTIAL VARIABLES

Process (Manual, Semiautomatic/SMAW, GMAW, etc.)	**Manual SMAW**
Material Grade (yield in psi)	**Low alloy steel**
42,000 and Less	**X**
Over 42,000 to 60,000	**X**
65,000	
70,000	
80,000	
Diameter Group (inches)	
Under 2-3/8	**X**
2-3/8 to 12-3/4	**X**
Over 12-3/4	**X**
Wall Thickness Group (inches)	
Up to 3/4 (.000 to .750)	**X**
Over 3/4 and Less Than 1 1/4 (.750 to <1.250)	
1 1/4 and Over (1.250 and Over)	
Position	**Fixed – horizontal and vertical pipe axis**
Filler Metal Classification	**E6010 then E8018, see Welding Manual for approved brands**
Current Type and Polarity	**DC reverse polarity (pipe negative)**
Joint Design	**See sketch**
Max. Time Between End of Root and Start of 2nd Bead	**5 minutes**
Direction for Vertical Welding	**E6010 - vertical down; E8018 - vertical up**
Shielding Gas and Flow Rate	**none**
Shielding Flux (Type and Size)	**none**
Speed of Travel (Range in/min)	**3-13 in/min**
Alignment	**1/8" max. high-low unless due to dimensional differences**

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

Line-Up Clamp (Internal, External or None)	**internal or external clamps**
Removal of Line-Up Clamp (Percent of root pass completed)	**50% min.**
Number of Welders	**One or more**
Deposited Thickness Per pass	**1/8" max.**
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; remove all slag or flux after each pass**
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**Propane burner or other method approved by welding inspector**
Pipe	
Valves, Flanges, and Fittings	
Min. Temp.	**40F or higher as needed to keep dry**
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

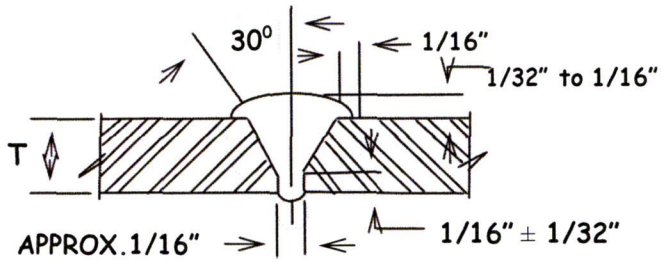
ELECTRICAL CHARACTERISTICS

ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
5/32" E8010	**18-38**	**90-175**
3/32" E8018	**18-26**	**80-120**
1/8" E8018	**18-28**	**90-140**

BEAD SEQUENCE

BEAD	ELECTRODE
RP	**5/32" E6010**
HP	**3/32" E8018**
Remainder of Weld	**1/8" E8018**

JOINT DESIGN SKETCH



REMARKS: **Number of beads will vary with wall thickness.**

Arc striking (arc burn) on the base metal is prohibited.

WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

Process (Manual, Semiautomatic/SMAW, GMAW, etc.)	**Manual SMAW**
Material Grade (yield in psi)	**Low alloy steel**
42,000 and Less	**X**
Over 42,000 to 60,000	**X**
65,000	
70,000	
80,000	
Diameter Group (inches)	
Under 2-3/8	**X**
2-3/8 to 12-3/4	**X**
Over 12-3/4	**X**
Wall Thickness Group (inches)	
Up to 3/4 (.000 to .750)	**X**
Over 3/4 and Less Than 1 1/4 (.750 to <1.250)	
1 1/4 and Over (1.250 and Over)	
Position	**Fixed– horizontal and vertical pipe axis**
Filler Metal Classification	**E7016 & E7018, see Welding Manual for approved brands**
Current Type and Polarity	**DC reverse polarity (pipe negative)**
Joint Design	**See sketch**
Max. Time Between End of Root and Start of 2nd Bead	**5 minutes**
Direction for Vertical Welding	**Vertical up**
Shielding Gas and Flow Rate	**none**
Shielding Flux (Type and Size)	**none**
Speed of Travel (Range in/min)	**3-8 in/min**
Alignment	**1/8" max. high-low unless due to dimensional differences**

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

Line-Up Clamp (Internal, External or None)	**None required**
Removal of Line-Up Clamp (Percent of root pass completed)	
Number of Welders	**For pipe 20"OD and larger, two or more for both the root pass and the hot pass**
Deposited Thickness Per pass	**1/8" max.**
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; *remove all slag or flux after each pass***
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**Not required**
Pipe	
Valves, Flanges, and Fittings	
Min. Temp.	**40F or higher as needed to keep dry**
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

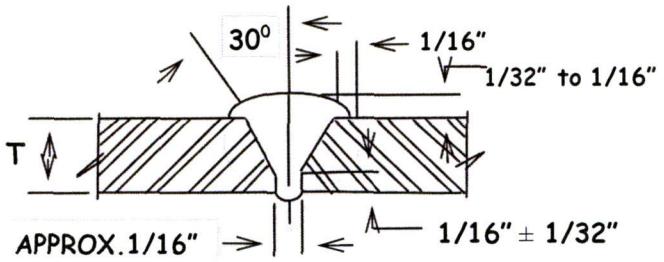
ELECTRICAL CHARACTERISTICS

ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
3/32" E7016	**18-24**	**60-90**
1/8" E7016	**20-25**	**80-120**
3/32" E7018	**20-25**	**80-120**
1/8" E7018	**22-29**	**90-140**
5/32" E7018	**23-30**	**115-185**
3/16"E7018	**25-32**	**170-230**

BEAD SEQUENCE

BEAD	ELECTRODE
RP	**3/32 or 1/8" E7016 or E7018**
HP	**3/32" or 1/8" E7018**
Fill	**3/32" through 3/16" E7018**
Cap	**3/32" through 3/16" E7018**

JOINT DESIGN SKETCH



REMARKS: **Number of beads will vary with wall thickness.**

Arc striking (arc burn) on the base metal is prohibited.

WELDING PROCEDURE SPECIFICATION

BASED ON API 1104

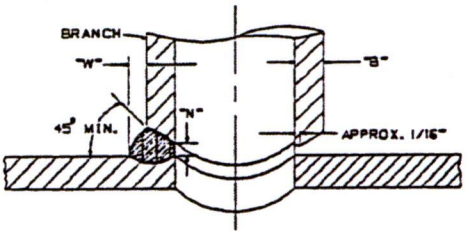
Process (Manual, Semiautomatic/SMAW, GMAW, etc.)	Manual SMAW	
Material Grade (yield in psi) **Low alloy steel**	**Branch/Fillet**	**Carrier Pipe**
42,000 and Less	X	X
Over 42,000 to 60,000	X	X
65,000	X	X
70,000		
80,000		
Diameter Group (inches)	**Branch/Fillet**	**Carrier Pipe**
Under 2-3/8	X	X
2-3/8 to 12-3/4	X	X
Over 12-3/4	X	X
Wall Thickness Group (inches)		
Up to 3/4 (.000 to .750)	X	
Over 3/4 and Less Than 1 1/4 (.750 to <1.250)		
1 1/4 and Over (1.250 and Over)		
Position	**Fixed**	
Filler Metal Classification	**E7016 or E7018 may be used for root, see Welding Manual for approved brands**	
Current Type and Polarity	**DC reverse polarity (pipe negative)**	
Joint Design	**See sketch**	
Max. Time Between End of Root and Start of 2nd Bead	**5 minutes**	
Direction for Vertical Welding	**Vertical up**	
Shielding Gas and Flow Rate	**none**	
Shielding Flux (Type and Size)	**none**	
Speed of Travel (Range in/min)	**3-8 in/min**	

MINIMUM PRACTICES (Welding Inspector May Require More Restrictive Practices)

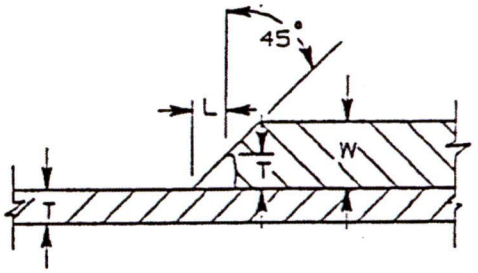
Line-Up Clamp (Int. Ext. or None)	**none required**
Removal of Line-Up Clamp (Percent of root pass completed)	**When clamps are used, 50% min.**
Number of Welders	**For branch pipe 20"OD and larger, two or more for both the root pass and the hot pass**
Deposited Thickness Per pass	**1/8" max.**
Cleaning (Hand or Power Tools)	**Prior to welding grind or wire brush ½" back on ID and OD; remove all slag or flux after each pass**
Max. Time Between End of Hot Pass and Start of Other Passes	**Unlimited**
Preheat (Methods, Min. Temp, etc.)	**none required**
Pipe	
Valves, Flanges, and Fittings	
Min. Temp.	**40F or higher as needed to keep dry**
Post-heat (Methods, Temp., etc.)	**none required**
Min. Temp.	

ELECTRICAL CHARACTERISTICS

ELECTRODE SIZE	VOLTS (RANGE)	AMPS (RANGE)
3/32" E7016	**18-24**	**60-90**
1/8" E7016	**20-25**	**80-120**
3/32"	**20-25**	**80-120**
1/8"	**22-29**	**90-140**
5/32"	**23-30**	**115-185**
3/16"	**25-32**	**170-230**



BEAD	ELECTRODE	A-X60	X65-X70
RP	**3/32 or 1/8" [3/32" if WT<0.250"]**	**E7016 or E7018**	**E7016 or E8018**
HP	**3/32 or 1/8"**	**E7018**	**E8018**
Fill	**3/32" through 3/16"**	**E7018**	**E8018**
Cap	**3/32" through 3/16"**	**E7018**	**E8018**



REMARKS

Number of beads will vary with wall thickness.

Arc striking (arc burn) on the base metal is prohibited.

W = 3/8 B (but not less than ¼"); N = 1/16" to 3/16"

L (min.) = ½ W (but not less the ¼")

If W > T, taper W as shown to approximately equal T.

WELDING PROCEDURE SPECIFICATION
BASED ON ASME BPV SECTION IX

Welding Type/Process(es) [manual, semiautomatic, automatic / GMAW, GTAW, SAW, FCAW, SMAW, etc.]
Manual SMAW

BASE METALS (QW-403)

P No. 1 & S-1 Group _____ to P No. 1 & S-1 Group _____

or

Specification: _____ to Specification: _____

For P No. 1 Base Metal: Maximum Grade or Maximum Specified Tensile Strength API 5L X70

Base Metal Thickness Range: Groove: 0.1875" to .864" [0.750" for B31.3 work since no PWHT] Fillet: all

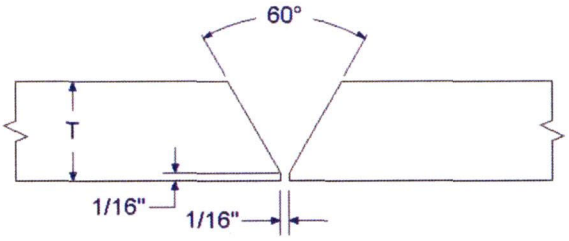
Pipe Diameter Range: Groove: all Fillet: all

JOINTS (QW-402)

Joint Design: See sketch for butt welds, dimensions shown are approximate; All fillet designs are allowed

Backing Required: ☐ Yes ☒ No

If used, backing material: _____



FILLER METALS (QW-404)

Process	SMAW		
SFA Spec. No.	5.1, 5.5		
AWS Classification	E6010, E8010		
F No.	1		
A No. [AWS No. per QW-404.5]	E6010, E8010		
SAW Electrode-Flux Class	N/A		
SAW Flux Trade Name	N/A		
Maximum Weld Metal Thickness	.864"+root and cap		
Welding Direction [up or down]	down		

POSITIONS (QW-405)

Groove: all

Fillet: all

PREHEAT (QW-406)

Min. Preheat Temperature See Notes below Max. Preheat

Interpass temperature N/A

Maintenance N/A Other

Notes If WT > 0.750", 200F minimum preheat

For pipe grades above X60, 200F minimum preheat

For valves, flanges, and fitting 20" OD and larger or any size in grades above F60/Y60, 300F minimum preheat

WELDING PROCEDURE SPECIFICATION
BASED ON ASME BPV SECTION IX

POSTWELD HEAT TREATMENT (QW-407)

Temperature Range none
Time Range _____
Other Notes _____

GAS (QW-406)

	Gas Composition	Flow Rate (CFH)
Shielding	N/A	
Trailing		
Backing		

ELECTRICAL CHARACTERISTICS (QW-409)

GTAW: Tungsten Electrode Size and Type [pure tungsten, 2% thoriated, etc.] _____ GMAW: Metal Transfer Mode [spray arc, short circuiting arc, etc.] _____ Electrode Wire Feed Speed Range _____

Pass	Class
first	E6010
remainder	E8010

Diameter	Type (AC/DC) & Polarity	Amp. Range	Voltage Range	Travel Speed (ipm)
1/8"	DCEP	80-130	20-30	6-13
5/32"	DCEP	120-180	20-30	6-13
3/16"	DCEP	140-220	20-30	6-13

TECHNIQUE (QW-410)

Orifice or Gas Cup Size	N/A
Initial and Interpass Cleaning [brushing, grinding, etc.]	Initial: Wire brush or grind to clean metal Interpass: Wire brush or grind to remove slag
Method of Back Gouging	N/A
Oscillation	N/A
Contact Tube to Work Distance	N/A
Multiple or Single Pass [per side]	Multiple
Multiple or Single Electrodes	Single
Peening	Not allowed
Other	No pass greater than 1/2"

WELDING PROCEDURE SPECIFICATION
BASED ON ASME BPV SECTION IX

Welding Type/Process(es) [manual, semiautomatic, automatic / GMAW, GTAW, SAW, FCAW, SMAW, etc.]
Manual SMAW

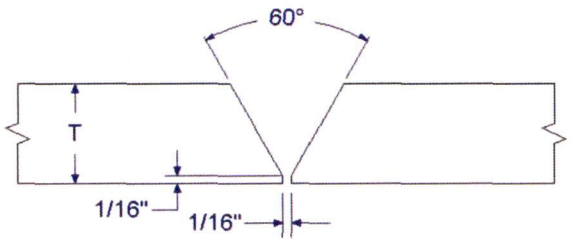
BASE METALS (QW-403)

P No. 1 & S-1 Group _____ to P No. 1 & S-1 Group _____
or
Specification: _____ to Specification: _____

For P No. 1 Base Metal: Maximum Grade or Maximum Specified Tensile Strength API 5L X65
Base Metal Thickness Range: Groove: 0.1875" to .864" [0.750" for B31.3 work since no PWHT] Fillet: all
Pipe Diameter Range: Groove: all Fillet: all

JOINTS (QW-402)

Joint Design: See sketch for butt welds, dimensions shown are approximate; All fillet designs are allowed
Backing Required: ☐ Yes ☒ No
If used, backing material: _____



FILLER METALS (QW-404)

Process	SMAW		
SFA Spec. No.	5.1, 5.5		
AWS Classification	E6010, E7018		
F No.	1, 4		
A No. [AWS No. per QW-404.5]	E6010, E7018		
SAW Electrode-Flux Class	N/A		
SAW Flux Trade Name	N/A		
Maximum Weld Metal Thickness	.864"+root and cap		
Welding Direction [up or down]	Up [including 6010]		

POSITIONS (QW-405)

Groove: all
Fillet: all

PREHEAT (QW-406)

Min. Preheat Temperature See Notes below Max.
Interpass temperature N/A Preheat
Maintenance N/A Other
Notes If WT > 0.750", 200F minimum preheat
For pipe grades above X60, 200F minimum preheat
For valves, flanges, and fitting 20" OD and larger or any size in grades above F60/Y60, 300F minimum preheat

WELDING PROCEDURE SPECIFICATION
BASED ON ASME BPV SECTION IX

POSTWELD HEAT TREATMENT (QW-407)

Temperature Range none
Time Range _____
Other Notes _____

GAS (QW-406)

	Gas Composition	Flow Rate (CFH)
Shielding	N/A	
Trailing		
Backing		

ELECTRICAL CHARACTERISTICS (QW-409)

GTAW: Tungsten Electrode Size and Type [pure tungsten, 2% thoriated, etc.] _____ GMAW: Metal Transfer Mode [spray arc, short circuiting arc, etc.] _____ Electrode Wire Feed Speed Range _____

Pass	Class
first	E6010
second	E6010
remainder	E7018

Diameter	Type (AC/DC) & Polarity	Amp. Range	Voltage Range	Travel Speed (ipm)
for E6010				
1/8"	DCEP	80-130	20-30	6-13
5/32"	DCEP	120-180	20-30	6-13
for E7018				
1/8"	DCEP	90-140	20-29	3-8
5/32"	DCEP	115-185	23-30	3-8
3/16"	DCEP	170-230	25-32	3-8

TECHNIQUE (QW-410)

Orifice or Gas Cup Size	N/A
Initial and Interpass Cleaning	Initial: Wire brush or grind to clean metal
[brushing, grinding, etc.]	Interpass: Wire brush or grind to remove slag
Method of Back Gouging	N/A
Oscillation	N/A
Contact Tube to Work Distance	N/A
Multiple or Single Pass [per side]	Multiple
Multiple or Single Electrodes	Single
Peening	Not allowed
Other	No pass greater than 1/2"

WELDING PROCEDURE SPECIFICATION
BASED ON ASME BPV SECTION IX

Qualified per B31.3 for design temperatures down to –320°F

Welding Type/Process(es) [manual, semiautomatic, automatic / GMAW, GTAW, SAW, FCAW, SMAW, etc.]
Manual GTAW

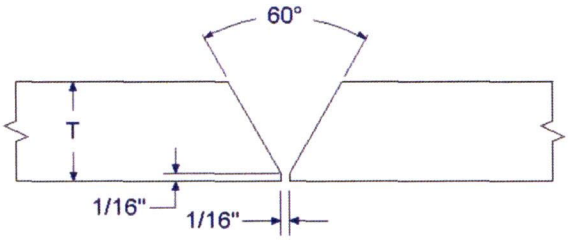
BASE METALS (QW-403)

P No. 8 Group _____ to P No. 8 Group _____
or
Specification: _____ to Specification: _____

For P No. 1 Base Metal: Maximum Grade or Maximum Specified Tensile Strength N/A
Base Metal Thickness Range: Groove: 0.0625" to 1.000" [0.750" for B31.3 work since no PWHT] Fillet: all
Pipe Diameter Range: Groove: all Fillet: all

JOINTS (QW-402)

Joint Design: See sketch for butt welds, dimensions shown are approximate; All fillet designs are allowed
Backing Required: ☐ Yes ☒ No
If used, backing material: _____



FILLER METALS (QW-404)

Process	GTAW		
SFA Spec. No.	5.9		
AWS Classification	ER-308L		
F No.	6		
A No.	8		
SAW Electrode-Flux Class	N/A		
SAW Flux Trade Name	N/A		
Maximum Weld Metal Thickness	1.000"+root and cap		
Welding Direction [up or down]	up		

POSITIONS (QW-405)

Groove: all
Fillet: all

PREHEAT (QW-406)

Min. Preheat Temperature 60°F Max.
Interpass temperature 350°F Preheat
Maintenance N/A Other
Notes _____

WELDING PROCEDURE SPECIFICATION
BASED ON ASME BPV SECTION IX

POSTWELD HEAT TREATMENT (QW-407)

Temperature Range none
Time Range
Other Notes

GAS (QW-406)

	Gas Composition	Flow Rate (CFH)
Shielding	100% Argon	27-36
Trailing		
Backing	100% Argon	14-18

ELECTRICAL CHARACTERISTICS (QW-409)

GTAW: Tungsten Electrode Size and Type [pure tungsten, 2% thoriated, etc.] 1/16" – 3/16" EW Th-2
GMAW: Metal Transfer Mode [spray arc, short circuiting arc, etc.]
Electrode Wire Feed Speed Range

Pass	Class
all	ER308L

Diameter	Type (AC/DC) & Polarity	Amp. Range	Voltage Range	Travel Speed (ipm)
1/16"	DCEN	80-90	12-14	2-4
3/32"	DCEN	120-140	12-14	3-4
1/8"	DCEN	130-275	14-18	varies

TECHNIQUE (QW-410)

Orifice or Gas Cup Size	#5 to #10
Initial and Interpass Cleaning	Initial: Stainless steel wire brush or grind to clean metal. Carbon steel brush not allowed. Do NOT USE brush or grinding wheel that has been used on carbon steel.
[brushing, grinding, etc.]	Interpass: Wire brush or grind to remove slag
Method of Back Gouging	N/A
Oscillation	2 times rod diameter
Contact Tube to Work Distance	N/A
Multiple or Single Pass [per side]	Multiple
Multiple or Single Electrodes	Single
Peening	Not allowed
Other	No pass greater than 1/2"

Insert Welding Inspection Forms and Documents

WELDING COUPON TEST REPORT

Location weld made at: _____ Report Date: _____

Contractor _____ Address: _____

Project ID: _____ Line: _____ Inspector: _____

Position: ☐ Rolled ☐ Fixed (horiz. axis) ☐ Fixed (vert. axis) ☐ 45° (6G) Direction: ☐ Uphill ☐ Downhill ☐ Horizontal

Welder: _____ Welder's SSN. _____ Business Phone: _____

Welder's Business Address: _____

Weld date: _____ Welding time: Temperature: Wind break used:

Weather condition: _____ Weld joint design. Butt ☐ Fillet / Branch ☐ _____

Voltage: Root _____ Hot _____ Other _____ Amperage: Root _____ Hot _____ Other _____

Type of welding machine: _____ Size:

Filler metal (brand name): _____

Pipe Mfr.: _____ Grade: _____ Wall thickness (in.): _____ Dia. O.D.(in.): _____

Procedure No. _____	Bead Number 1	2	3	4	5	6	7
Size of Electrode							
A.W.S. No. of Electrode							
PROCEDURE TENSILE TEST ONLY							
Coupon Number	1	2	3	4	5	6	7
Wall thickness of coupon (in.)							
Original width of coupon (in.)							
Orig. area of plate (inches squared)							
Maximum load							
Tensile strength (max. load/orig. plate area)							
Fracture location							

☐ Procedure qualification ☐ Welder qualification by destructive testing ☐ Welder renewal by destructive testing ☐ Welder qualification or renewal by radiography

Procedure or welder was:
☐ Qualified Disqualified

Radiographer:
Date radiographer certified:
Radiograph identification number of test weld:

☐ ☐ ☐ ☐ _____

Standard: API 1104 ASME IX AWS D1.1 Other: _____

Remarks on tensile:
1.
2.
3.
4.

Remarks on Bend Tests:

☐ Root Side	☐ Face Side
1.	1.
2.	2.
3.	3.
4.	4.

Remarks on Nick Tests: _____

1.	5.
2.	6.
3.	7.
4.	8.

Tested at: _____ By: Date: _____

By: _____ Return Copy to: _____

Data Base Entry:

LAND PIPELINE CONSTRUCTION — WELDING INSPECTION REPORT

Section 1

LOCATION:	M.P.	PROJECT NO.	DATE:

JOB DESCRIPTION:

Section 2 Document all welders utilized during project

Welders Name	Social Security Number			ID If Assigned

Section 3 Document all welding procedures utilized during project

ETC Welding Procedure No.

(Note) IF an outside agency's welding procedure was approved by Welding Superintendent and utilized attach a copy of procedure.

Section 4 Document Visual Inspection Results

Visual Inspection Results:

Comments:

Section 5 Document total number of welds made, total non-destructively examined, total number rejected, and disposition of rejects. (Attach Supporting Documentation)

Total Number of Production Welds	Total Number of Welds Non-Destructively Examined	Total Number of Welds Rejected	Disposition of Rejected Welds	
			No. Repaired	No. Cut-Out/Replaced

COMPANY INSPECTOR NAME (PRINT)	COMPANY INSPECTOR SIGNATURE

RADIOGRAPHIC PROCEDURE QUALIFICATION

Project _____ Project No _____

Radiographic Contractor _____ Date _____

Radiographer _____ Certification Date _____ Level _____

☐ Procedure Qualification ☐ Personnel Qualification

PIPE DATA	Pipe Diameter: _____ W.T.: _____ Grade & Material: _____
WELDING PROCESS	☐ SMAW ☐ GMAW ☐ Automatic ☐ Other _____
SOURCE	Type Radiation: X-Ray ☐ Gamma-Ray Method: ☐ Internal ☐ External MA: _____ KV: _____ Curies: _____ Focal Spot Size: _____
FILTER	Filter Type & Placement:
SCREENS	Type: Material: Front Thickness: in. Back Thickness: in.
GEOMETRIC ARRANGEMENT	Viewing: SWE/SWV DWE/DWV DWE/SWV Source to Film Distance: in. Offset: in. Offset Angle: deg.
FILM DATA	Film Type: Class: No. Film in Cassette: No. Exposures: ☐ Film Size: ☐ " L X " W Exp. Density of Parent Metal: Exposed Density of Weld Metal: Unexposed Base Density: Cassette Separation: deg. Method: Multiple Film Single Film Film Position:
FILM PROCESSING	Drying Method: Manual Automatic Developing Time/Temp: ☐ ☐ Manufacturer: Rinse Time/Temp: Manufacturer: Fixer Time/Temp: ☐ ☐ Manufacturer: Final Rinse Time/Temp: Manufacturer:
EXPOSURE TIMES	Single Exposure: Total Exposure Time
PENETRAMETER	Penetrometer Material: ID No: Shim Thickness: Type: No./film: Penetrometer Position: Essential Hole:

Remarks: _____

_____

Radiographer _____

Company Approval: _____

CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Bolt Torquing & Flange Make-Up			
Specification No. LP-010	Issue Date: May 25th 2018	Revision Date:	Page 1 of 11

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APPENDIX A - BOLTING PATTERNS 7

*****

1. GENERAL

This specification is general in nature and applicable as a reference to all applications and not as a substitute for the equipment manufacturer's specifications and/or standards.

All threaded fasteners shall be tightened using a torque wrench in accordance to Table 1 and in accordance with Appendix A – Bolting Patterns unless otherwise specified by the equipment manufacturer.

2. MATERIAL

2.1. Threaded fasteners shall be in accordance with ASTM specifications A193 Grade B7 and A194 Grade 2H.

2.2. The shortest bolt shall be used that permits full engagement of the thread through the nut. A minimum of three threads shall protrude beyond the nut face after hand tightening.

2.3. Use of salvaged bolts and nuts is prohibited.

2.4. Threaded fasteners may be reused in certain applications approved by Company's Representative. Reused threaded fasteners must meet all of the following requirements:

2.4.1. Fasteners are clean, free of corrosion, paint, thread damage, teeth marks (such as caused by pipe wrenches) or other signs of damage.

2.4.2. Fasteners have not been used underwater or coated with coal tar products.

2.4.3. Fasteners have not been tightened to or beyond their yield strength. (This condition can be determined by comparing the bolt threads of a used bolt to those of a new bolt. The nut should be capable of being finger tightened over the entire thread length.)

3. SURFACE PREPARATION

3.1. Threads, connecting, and seating surfaces shall be free of dirt, grit, paint, nicks and metal shavings.

3.2. Sharp edges of a drilled hole shall be cleaned before placement of a fastener.

4. LUBRICATION

Lubricant, if required, shall be selected and applied in accordance with the equipment manufacturer's recommendations. If no recommendations are available, Company's Representative shall determine an approved lubricant.

5. GASKETS

5.1. New gaskets shall be used on all new construction and gaskets shall not be reused.

5.2. All damaged gaskets shall be replaced.

5.3. Anti-seize compounds shall not be used unless approved by the Company's Representative.

6. TORQUE WRENCHES

6.1. All torque wrenches shall be properly calibrated to 2% of the full scale reading. Torque wrenches shall be recalibrated after extensive use or at least every six months. Contractor shall have calibration certification available for Company's review.

6.2. Torque wrench selection and application shall be in accordance with the torque wrench manufacturer's recommendations. Torque wrench selection shall have adequate capacity so that the working range is within the mid-quarters of the scale.

6.3. Automatic torque tools shall have the set limits verified with a calibrated manual torque wrench.

7. TORQUING

7.1. All fasteners shall be finger tightened, ensuring the bolt has full thread engagement through the nut.

7.2. On multi-fastener applications, the torque shall be applied in a method that allows the fasteners to be evenly and sequentially tightened, in gradual increments, to the recommended torque value, as indicated on Table 1.

7.3. The torque shall be applied in a minimum of three equal applications following a crisscross bolting pattern until the recommended torque value is attained at all the fasteners. Reference the attached bolt pattern diagrams in Appendix A.

7.4. One-third or a lesser value of the recommended torque value shall be applied on the initial application.

7.5. A written record of the entire process of the flange makeup shall be maintained by the Contractor. Any difficulty in the initial flange alignment or fastener tightening process shall be recorded.

8. TENSIONING

8.1. All flanges that are assembled using bolt tensioning equipment shall be installed employing the procedure recommended by the manufacturer of the bolt tensioning equipment. Contractor shall ensure that all personnel involved in the use of the bolt tensioner equipment onsite are fully trained, have experience, and understand the proper implementation of the bolt tensioning equipment. Certificates signed by manufacturer's technical representative and Contractor shall be presented to Company for all flange assemblies installed using bolt tensioning equipment.

8.2. All tensioning equipment shall be properly calibrated to 2% of the full scale reading. Tensioning equipment shall be recalibrated after extensive use or at least every six months. Contractor shall have calibration certification available for Company's review.

8.3. All insulating gaskets/kits shall be electrically tested in a manner approved by Company after installation to assure proper performance.

9. LEAK TIGHTENING

9.1. The following procedure shall be followed in the event leaks are discovered after the recommended torque has been applied.

9.1.1. All associated pressure equipment shall be blown down and locked out in accordance to applicable lockout/tagout procedure.

9.1.2. Equipment fasteners shall be checked for proper tightness by first marking the position of the bolt head or nut and then by loosening it. The fasteners shall then be re-tightened. If the bolt head or nut advances past its reference position, the fastener was loose and should be closely observed during future tightness checks. It is very important that the position of the bolt head or nut is marked before re-tightening.

9.1.3. Flanges shall be retightened by first verify the correct torque value at each fastener and then retightening in the specified sequence by increasing the specified torque value by 15%.

9.1.4. If the increased torque value does not resolve the leak when pressure is applied, the flange shall be disassembled and inspected. The gasket seal area on the face of the flange shall be cleaned, inspected for damage, and then reassembled with a new gasket.

TABLE 1
RECOMMENDED TORQUE VALUES (FT-LBS)

CAUTION: These values are to be used only when installing stud bolts of ANSI-rated raised-face, flat-face, or ring-type joint flanges.

Bolt Diameter	Clean, Lightly Lubricated (Steel)	Clean Dry As Received [1]		Field Condition [2] No Lubrication	Xylan Coated	ANSI 300 Insulated Flanges [3]	ANSI 600 Insulated Flanges [3]
		Steel	Cadmium Plated				
½"	50	60	60	90	35	-	-
5/8"	95	120	120	180	60	80	95
¾"	150	205	200	315	100	165	150
7/8"	270	340	310	510	165	265	225
1"	405	500	470	765	240	320	350
1-1/8"	595	750	690	1125	350	450	450
1-1/4"	835	1050	950	1580	500	650	660
1-3/8"	1135	1420	1280	2145	660	820	820
1-1/2"	1495	1870	1680	2830	870	1125	1125
1-5/8"	1930	2400	2150	3645	1110	1400	1430
1-3/4"	2435	3040	2700	4605	1400	1700	1775
1-7/8"	3030	3775	3300	5720	1740	-	2230
2"	3700	4630	4060	7000	2110	-	2360
2-1/4"	5815	6610	5820	10115	3000	-	3950
2-1/2"	8000	9090	8030	14035	4100	-	5500
2-3/4"	10700	9090	10730	18855	5460	-	7400

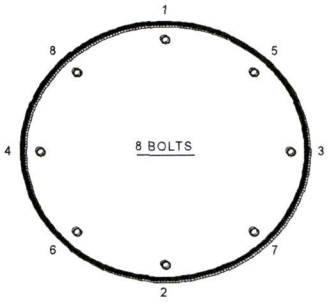
1. **"As Received"** indicates a bolt that has not been used previously, essentially "out of the box".

2. **"Field Condition"** indicates a bolt that has been in service in the field and is suitable for re-use. It is not perfectly clean, but has been cleaned as well as can be done in the field and the bolt has not been lubricated. If lubrication will be applied, use the torque values listed under "clean, lightly lubricated".

3. Column values are for steel bolts to be used with insulated flange kits. If using cadmium-plated or xylan-coated bolts with insulation kits, use the torque values listed in the "cadmium plated" or "xylan coated" columns.

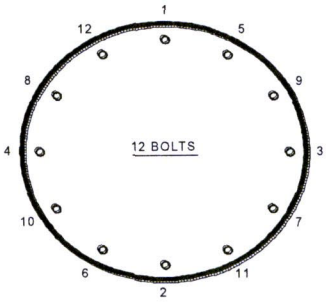
Torque values are ± 3%.

APPENDIX A
BOLTING PATTERNS



SEQUENTIAL ORDER

1-2
3-4
5-6
7-8



SEQUENTIAL ORDER

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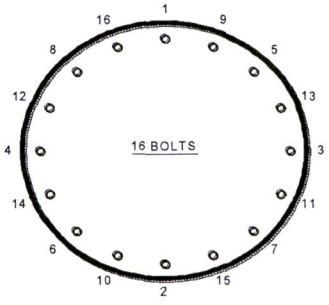
7-8
9-10
11-12



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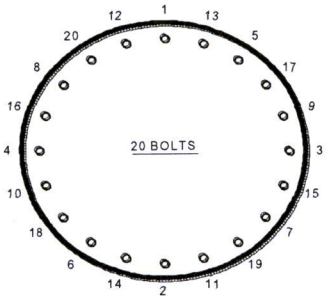
5-6	13-14
7-8	15-16



SEQUENTIAL ORDER

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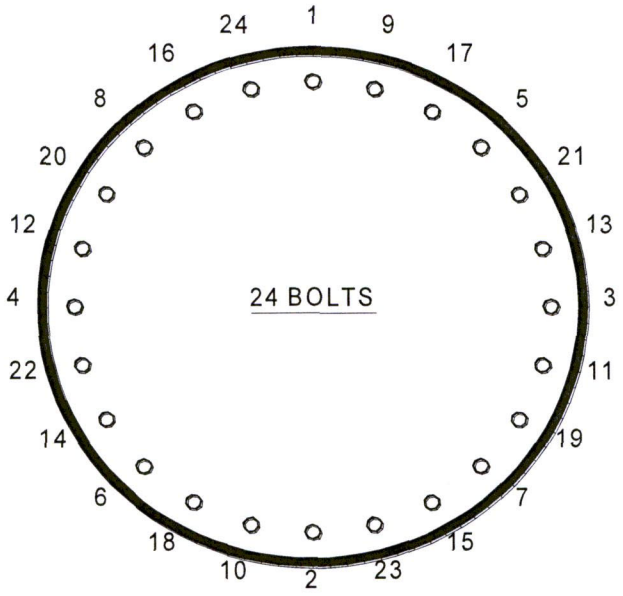
5-6	15-16
7-8	17-18
9-10	19-20

APPENDIX A
BOLTING PATTERNS



SEQUENTIAL ORDER

1-2	13-14
3-4	15-16
5-6	17-18
7-8	19-20
9-10	21-22
11-12	23-24

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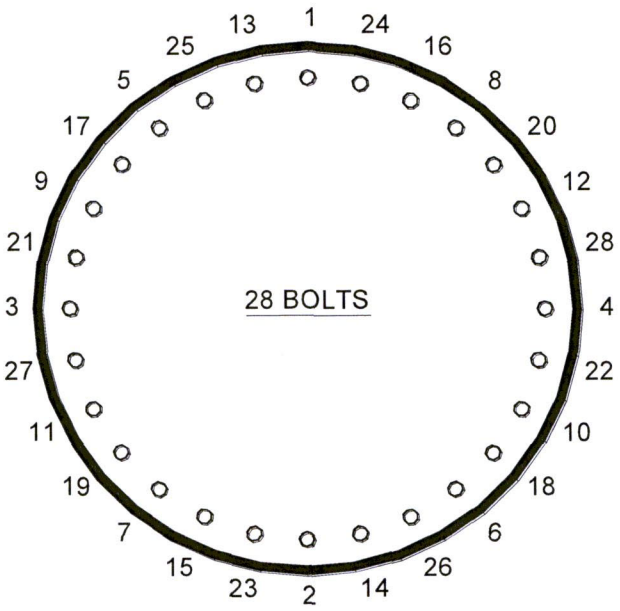
APPENDIX A
BOLTING PATTERNS



SEQUENTIAL ORDER

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7-8	21-22
9-10	23-24
11-12	25-26
13-14	27-28

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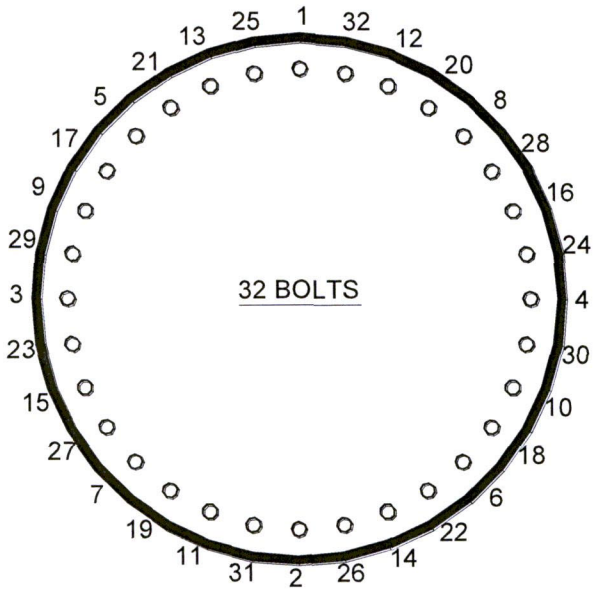
APPENDIX A
BOLTING PATTERNS



SEQUENTIAL ORDER

1-2	17-18
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LONESTAR PIPELINE COMPANY

CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Road & Rail Crossings			
Specification No.	Issue Date:	Revision Date:	Page
LP-011	May 25th 2018		1 of 4

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2. BORED CROSSINGS WITH CASINGS 2
3. BORED CROSSINGS WITHOUT CASINGS 2
4. GROUTING OF BORED AND CASED CROSSINGS 3
5. OPEN CUT CROSSINGS 3

*****

Specification Title: Road & Rail Crossings			
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1. CROSSINGS

The Contractor shall comply with all state and local traffic control requirements including the development of traffic control plans and the use of warning signs and flagman.

2. BORED CROSSINGS WITH CASINGS

2.1. Construction of Crossing

The construction of all crossing with casings designated by Company, including all details incident to the installation of such crossing, shall be in accordance with the Drawings and shall comply with the specifications as may be required by the authority having jurisdiction, and such Specifications herein as may be applicable.

2.2. Casing

Casing shall not be primed or coated in any manner. When dry boring, the cutting head shall not extend beyond the leading end of the casing pipe more than six inches.

2.3. Supports

Special supports shall be provided to the pipeline for all cased crossings. These supports shall be located under the pipeline at a minimum of 5 ft. and a maximum of 8 ft. from the end of the casing and at intervals designated above throughout the boring bell hole area. The supports may be made of sandbags or other material approved by the Company.

2.4. Restrictions

The bored crossing casing should be installed before the ditching and bending operations arrive at the crossing.

3. BORED CROSSINGS WITHOUT CASINGS

3.1. Construction of Crossing

The construction of all crossing designated by Company, including all details incident to the installation of such crossing, shall be in accordance with the Drawings and shall comply with the specifications as may be required by the authority having jurisdiction, and such Specifications herein as may be applicable

3.2. Carrier Pipe

The Carrier pipe shall be coated in accordance with the Specifications. Necessary dummy pipe shall be placed at the leading end of the boring operation. The face end of this dummy pipe can be built up to be approximately one-half inch to three-fourths inch larger in diameter than the carrier pipe. The carrier pipe shall be installed simultaneously with the removal of the dummy pipe.

3.3. Restrictions

The bored crossing casing should be installed before the ditching and bending operations arrive at the crossing.

4. GROUTING OF BORED AND CASED CROSSINGS

When required, bored and cased crossings shall be pressure grouted by the Contractor to completely fill the annular space between the carrier pipe and the earth. The grout shall consist of a sand-cement slurry of at least two sacks of cement/yd^3, or as required by jurisdictional authority.

5. OPEN CUT CROSSINGS

In the event it is necessary to install pipe and/or casing by open cut method, backfill shall be made in the following stages:

5.1. Sidefill

Sidefill shall be 6 in. above the level of the top of the pipe, shall be compacted in 6 in. layers (loose measurement), and shall consist of select material which is free of rocks or other substances which would prove injurious to the pipe coating. Each layer shall be at optimum moisture and compacted by mechanical tamping to a density of 95% as determine by ASTM Designation D 1557 (AASHTO T 180).

5.2. Overfill

Overfill shall be to the former surface grade, shall be placed in layers not more than 10 in. in depth (loose measurement), and shall be compacted to a density comparable to the adjacent, undisturbed material, or to an approved density.

5.3. Pavement

Specification Title: Road & Rail Crossings			
Specification No. LP-011	Issue Date: May 25th 2018	Revision Date:	Page 4 of 4

For backfill of pavement, materials and method of compaction shall be adapted to facilitate the prompt restoration of traffic. Additional cut back of base, surfacing, and transitioning of trench shoulders will be used to minimize the development of a sag in the finish grade of pavement over the trench.

CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Coating			
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*****

1. GENERAL

1.1. Scope

1.1.1. This Specification governs the procedures to be followed for all painting.

1.1.2. The intent of this Specification is to achieve full adhesion of paint to clean, dry, firm surfaces. Careful attention required to the preparation of surfaces to prevent contamination and marring of coating during and after drying, to achieve a uniform, skilled application. All painting shall be done in a neat, workmanlike manner.

1.2. General

1.2.1. All painting and coating materials, except as indicated on the Drawings, shall be furnished by the Contractor and applied by qualified labor.

1.2.2. Wire rope slings and chokers shall not be used to handle coated or painted materials unless adequate padding is used to prevent damage to coatings.

1.2.3. The Contractor shall provide and operate a holiday detector on all piping coated for underground installation. The equipment and operation procedure shall meet the approval of the Company Representative.

1.2.4. The contractor shall provide and operate the following inspection tools: Dry Film Coating Thickness gage, SSPC – VIS 1-89 Visual standards for abrasive blasted cleaned steel or NACE visual abrasive blasted steel, sling psychrometer, wet film coating thickness gage and other inspection tools that may be necessary.

1.3. Material

The source of supply for paint shall be in accordance with this Specification, the Company's **Coating Specification Manual**, the attached "List of Approved Coatings" and the Contract. The contractor will have MSDS sheets on each coating system being used at the job site and available at all times.

1.4. Weather Conditions and Dryness of Surface

1.4.1. Paint shall not be applied to any surface whose temperature is below 40°F, or on surfaces whose temperature is less than 5°F above the dew point. If it is suspected that temperature and humidity conditions are such that moisture is condensing upon the surface, the surface shall be moistened with a damp cloth to apply a clearly defined, thin film of water. If this thin film of water evaporates or decreases in area after 15 minutes, the surface shall be considered safe to paint from the standpoint of continued condensation at that particular time.

1.4.2. Paint shall not be applied after a heavy frost or on extremely cold faces, nor when there is a likelihood of change in weather conditions within two hours after application which would result in a low air temperature or accumulation of moisture in the form of rain, snow, condensation, etc., upon the surface.

1.4.3. The Company Representative shall have the authority to stop or disapprove the application of paint when impending weather conditions may be detrimental to application process.

1.5. Number of Coats

All metal or wood surfaces to be painted shall receive coats of primer and finish coats of the type of paint or enamel specified on the Drawings, in the Scope of Work, in the Contract Documents, or in accordance with this Specification. If in accordance with this specification, primer coats shall be not less than a total of 3 mil dry thickness and finish coats shall be a total of 2 mil dry thickness.

1.6. Stirring, Mixing and Care of Paints

All mixed paints shall be made ready for use by reincorporating settled pigments by means of thorough stirring, boxing and straining so that the paint is in its original homogeneous form, free from large agglomerates and skins greater .01" in diameter. Paint in mixing pots shall be kept covered while not in use to reduce volatile losses and skinning: it always shall be in a completely mixed condition when filled into painter's pots and these fillings always shall be through a strainer of 20 mesh or finer cloth or wire. The paint from painter's pots shall be concentrated into covered mixing pots at the end of the day. Paint that has exceeded its pot life will not be used. The painter's pots shall at no time during the application of paint contain skins

or large agglomerates, and the interior side of pots shall be periodically cleaned free of soft skins which might cling to brushes.

1.7. Thinning

Adjustment of paint consistency by thinning shall be done only in accordance with the manufacturer's recommendation and only after obtaining specific permission from the Company Representative. The general rule for thinning paints shall be that a full hiding coat can be applied without sags or runs, to thoroughly obscure the surface being painted, whether bare metal or undercoat.

1.8. Brush Application

1.8.1. Brush application of paint shall be kept at a minimum. Application data and procedures shown in the Company's Specifications shall be followed and may be changed only with the approval of the Company Representative. The primer coat shall be applied by spraying, except that on small jobs or touch-ups brush application may be used when approved by the Company Representative and only if proper agitation or mixing of the primer is maintained to keep the heavy zinc filler in proper suspension.

1.8.2. Painting shall be done by workmen skilled in the craft of painting. Good workmanship by skilled workmen is evidenced by the following features:

1.8.2.1. All crevices, such as around bolts, sharp angles, etc., are first traced.

1.8.2.2. The entire surface shall be coated without attempt to "lay-off" the paint in one direction, to leave a uniform film, free from runs, sags and brush marks caused by not "feathering" or blending one lap into another. Brushes should be springy and not flabby.

1.8.2.3. Brushes or rollers shall not be permitted to become "seedy" from skins.

1.9. Spray Application

The equipment used for spray painting shall meet the approval of the Company Representative and shall have adequate provision for separation of moisture from the air stream in contact with the paint. Heavy zinc-filled primers shall be continuously agitated or mixed while being applied. The equipment used to apply paint shall deliver at least 50 lbs. per sq. inch air pressure at the gun. All spray guns shall be adequate for the type of painting being used and shall be equipped with suitable spray heads to obtain the application of an even, smooth coat of paint.

1.10. Removal of Improperly Applied Paint

All paint which has been improperly applied, fails to dry or harden properly, fails to adhere tightly to underlying metal, wood, or other paint film, or does not evidence a normal workmanlike appearance shall be remedied or thoroughly removed and replaced. When the final field coat does not have a uniform color and appearance throughout, it shall be corrected by the use of whatever additional coats are necessary. Freshly applied paint which has not yet set shall be removed with an suitable solvent. Dried paint film shall be removed either by abrasive blasting or scraping.

1.11. Protection Against Fire

At the completion of each day's work, all brushes, sprayers and other tools shall be properly cleaned, containers closed, and oily and unusable rags disposed of prior to leaving the job site. If, for any reason, oily rags are kept overnight, they shall be kept in water or covered metal containers.

2. PAINT APPLICATION

2.1. Scope

This Specification, together with the Company's **Coating Specification Manual** governs the preparation of surfaces and the application of paint to wood, steel, concrete and sheetrock.

2.2. Preparation of Surfaces

2.2.1. Steel Surfaces

Throughout paint application, no paint shall be applied over a surface which evidences of a loose or scaly condition. Every effort shall be made by means of the most effective and practical methods to remove all loose mill scale, rust, and dirt as well as other foreign substances which would be deleterious to obtaining a film paint coating. Final preparation of steel surfaces for painting shall be by abrasive blasting to a near-white metal in accordance with NACE 2 or SSPC-SP10. Undesirable contamination which will prevent proper hardening and adhesion of the paint film, such as oil, grease, oily grime or moisture, shall be removed from surfaces prior to paint application. Condensed moisture shall be avoided as specified in the paragraph entitled "Weather Conditions and Dryness of Surface". Grease-like contamination shall be removed with solvents applied with clean rags in a manner which will remove and not simply dilute or spread out the oil over a greater area. Particular attention shall be paid to cleaning of fillets, bolted areas, and drilled holes where loose scale, rust or oil are most likely to be present.

2.2.2. Previously Painted Surfaces

Where the surface to be painted has previously been painted and is in bad condition due to cracking, peeling or chalking, the old paint shall be removed to the satisfaction of the Company Representative.

2.3. Prime Coat (Steel Surfaces)

2.3.1. All piping, tanks, structures, etc., shall be abrasive blasted before painting. The primer coat shall be applied immediately after abrasive blasting. In no case will primer be applied later than the same day.

2.3.2. Piping, tanks, structures, etc., to be installed below grade shall be abrasive blasted and coated in accordance with the Company approved below grade coating specification.

2.3.3. The portion of piping and structure exposed to water spray, i.e. at cooling towers, shall be abrasive blasted clean and coated as specified on the Drawings.

2.3.4. When the material received is already primed and erection work is completed, including all welding, straightening of bent material, etc., the primer surface shall be restored to a serviceable condition acceptable to the Company Representative by preparing the surface as specified and by smoothing and touching up marred places with primer. Heads of bolts, field welds and surrounding unpainted areas, and any other surfaces to be painted which have not yet been painted, shall be painted with primer.

2.4. Field Coat (Steel)

2.4.1. When the prime coat is thoroughly dry, the first field coat of paint or enamel may be applied. Field coats will not be required on the bearing surfaces of bearing plates. These surfaces shall be coated as specified on the Drawings.

2.4.2. When the first coat, including all touching up of marred places, has thoroughly hardened, the finish field coat of paint or enamel may be applied. After application of the finish field coat, the painted portion shall present a uniform color appearance throughout.

3. THIN FILM COATED PIPE (WELD AREA AND HOLIDAY REPAIR)

3.1. General

Pipe shall be furnished to the Contractor with a yard-applied fusion bonded thin film coating. The Contractor is cautioned to use care in handling the coated pipe in order to prevent damage to the coating. All equipment which comes in contact with the pipe shall be padded with rubber, Teflon, neoprene or equal. Skids and blocking shall be padded with rubber, celotex, sand filled sacks or equal and be approved by the Company Representative.

3.2. Coating

The Contractor shall coat the weld areas of the pipeline using heat curable, thermosetting powdered epoxy coating with induction preheat, and fluidized flocked application per approved specification, unless another method is specified in the Project Scope. This coating may be applied by use of a high frequency induction coil and powder application machine. Coating materials and equipment shall be furnished by the Contractor.

3.3. Tie-ins

Every effort shall be made by the Contractor to coat all tie-in welds using induced preheat and fluidized flocked application. Coal tar epoxy, two-part thermosetting epoxy or hot applied wax may be substituted with the approval of the Company Representative.

4. HOLIDAY DETECTION

4.1. The Contractor shall furnish high voltage holiday detectors rated 2,000 volts and the necessary labor and equipment to operate and move such detector along the line prior to lowering-in. (Detector shall be set 125 volts per mil thickness of coating.)

4.2. Pipe surface must be completely dry to accurately detect holidays. [Note: "Pulse" detectors are less sensitive to moisture than straight DC detectors].

4.3. For "thin film" coatings use only Holiday Detectors with settings in the 1200 to 2500 volt range.

4.4. All holidays shall be patched by the Contractor using melt-sticks or ambient temperature cure two-part thermosetting epoxy liquid coating. The melt-sticks or liquid shall be furnished by the Contractor and shall be approved by the Company Representative.

4.5. For Coal Tar Enamel coatings use only Holiday Detectors with settings in the 12,000 to 16,000 volt range.

4.6. The voltage (at concrete yards or in the field) shall be set at a value less than the plant holiday detection voltage (usually 2000 volts) to assure that the holiday detection does not cause coating damage. 125 volts/mil of specified thickness is a rule of thumb.

4.7 Holiday detection equipment shall be calibrated daily and batteries fully charged prior to use.

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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Lowering In & Backfilling			
Specification No. LP-013	Issue Date: May 25th 2018	Revision Date:	Page 1 of 6

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*****

1. LOWERING-IN PIPE

1.1. General

1.1.1. Holiday detection (Jeeping) shall be preformed just prior to lowering in operation and coating shall be closely inspected for possible damage resulting from the lowering in operation.

1.1.2. Lowering in operations shall only be performed in the presence of and with the approval of the Company Representative. Should lowering in be performed in the absence of or without the approval of the Company Representative, Contractor may be required to raise the section of line for inspection at Contractor's expense

1.1.3. Sections of the coated pipe shall not be dragged or pulled into position, unless approved by Company Representative. The length of sections shall be regulated to allow handling without damaging the protective coating at stream crossings or at any other location where it may be necessary to pull or drag sections of pipe into place. The coated pipe shall be properly protected and handled in a manner to prevent damage to the pipe

1.2. Over-bends, Side-bends and Sag-bends

All over-bends shall be made and installed to clear the high point of the bottom of the ditch by at least 12 in. at the point of bend. At side-bends, the pipe shall be bent and lowered to lay against the outside wall at the bottom of the ditch. All sag-bends shall continuously lie on firm ground at the bottom of the ditch.

1.3. Pipe Slings and Cradles

The Contractor shall provide padded slings for handling coated and wrapped pipe. The use of belting reinforced with wire cable shall not be permitted. Any method of lowering-in which prevents damage to the coating shall be acceptable; however, the use of cradles is preferred.

1.4. Condition of Ditch

Prior to lowering-in the Contractor shall provide, to the satisfaction of the Company Representative, a ditch which is free from excess debris, large rocks and roots, welding rods, skids or other such objects which can cause damage to the pipe and its protective coating during lowering-in operations.

1.4.1. Water in Ditch

The Contractor shall pump water from the ditch, bell holes or other tie-in excavations prior to lowering-in.

1.4.2. Rock Ditch Padding

In all cases where rocks 2 in. and larger are encountered in the bottom of the ditch and no additional pipe coating protection is provided, the Contractor shall provide padding material placed evenly and continuously to a minimum depth of 8 in. along the bottom of the ditch as approved by the Company.

1.5. Temporary Negative Buoyancy (Wetlands)

If warranted by the condition of the ditch, and if acceptable to the Company, the Contractor may fill sections of the pipeline with silt-free water to achieve temporary negative buoyancy during lowering-in operations.

2. PIPELINE SUPPORTS

2.1. General

This Specification defines the general requirements necessary for the supporting of pipelines and related facilities to provide installations which remain stress-free subsequent to the backfilling operation and the consolidation of the backfill material.

2.2. Procedures

The Contractor shall construct the pipeline to lie on the bottom of the pipe trench. Additional excavation shall be made as necessary around valves and fittings to provide for continuous support of the mainline by the bottom of the trench. All bends shall be made to fit the pipe ditch.

2.3. Supports

Where pipe cannot be directly supported by the bottom of the trench, support shall be provided by sandbags or other Company approved materials. Sandbags shall be placed at points to provide stress-free support for the pipeline subsequent to backfilling. Spacing intervals for sandbag supports shall be 15 ft. or less as required by the Company.

Supports comprised of materials other than sandbags shall be constructed in strict accordance with the manufacturer's instructions and at spacing intervals no greater than the appropriate maximum interval recommended by the manufacturer. Support shall be placed at points to provide a stress-free installation subsequent to backfill. The Contractor shall not use any support method without the prior approval of the Company and without providing the Company with the manufacturer's recommended installation directions for the specific method being used.

2.4. Cased Crossings

Special supports shall be provided to the pipeline for all cased crossings. These supports shall be located under the pipeline at a minimum of 5 ft. and a maximum of 8 ft. from the end of the casing and at intervals designated above throughout the boring bell hole area. The supports may be made of sandbags or other material approved by the Company.

2.5. Tie-Ins

Sections of the pipeline excavated for tie-ins shall be supported with sandbags or other approved materials at intervals indicated above. Supports shall be placed immediately after final tie-in to provide a stress-free installation subsequent to the backfilling operation.

3. CONCRETE COATING ROCK PROTECTION

In the event the Company supplies bendable concrete coating for use in rock ditch, the Contractor agrees that there are limitations to this product's effectiveness. Although it is not necessary to pad the pipe as required for pipe not protected by this product, care must be exercised to eliminate any ledges or irregularities in the ditch bottom, including potentially damaging loose rock. Loose rock with a diameter two inches or larger shall be removed from the ditch bottom prior to lowering-in operations, and in the event pipe bends are not spaced to provide proper ditch fit, sand bags or other approved supports shall be used in order to avoid damage.

The Contractor shall remove and properly dispose of all plastic wrap use for protection of the pipe during shipment and as an aid to bending operations. Removal and disposal of the plastic wrap is mandatory in order to eliminate potential problems with cathodic protection.

4. BACKFILLING

4.1. After lowering-in has been completed, but before backfilling, the ditch shall be pumped dry in upland areas and the line shall be inspected to ensure that no skids, brush, stumps, trees, boulders or debris are in the ditch. No such materials or debris are to be backfilled into the ditch.

4.2. After the pipe has been inspected and approved by the Company Representative, after all damage to the protective coating has been repaired and after the coating on the pipe has had sufficient time to cure, then the Contractor shall backfill the ditch sufficiently to prevent floating.

4.3. The Contractor shall complete the filling of the ditch to produce a trim backfill. Excavated material shall be placed in the ditch. Topsoil, where it has been segregated, shall be backfilled as close as possible to its original location.

4.4. Rock, two inches in diameter and larger, or like materials shall not be backfilled directly onto the pipe. Where such materials are encountered, the Contractor shall haul, if necessary, sufficient earth or sand to be backfilled around and over the pipe to form a protective padding or cushion as specified in Section 6, Dirt Padding, below or, as otherwise specified in the Scope of Work. Large rock or boulders in excess of 24 in. in diameter, width or length, shall not be backfilled into the ditch. Such rock shall be disposed of properly.

4.5. The Contractor shall not use soil from the right-of-way except from the spoil bank. The Contractor shall keep the completed backfill to within one mile of the lowered-in line unless otherwise approved by the Company.

5. TRENCH BREAKER

5.1. The Contractor shall install erosion breakers in the ditch over, under and around the pipe to provide full protection against backfill washing at various points along the pipeline. Breaker installations and spacing shall comply with the following Specifications as well as Company, local, state, and Federal requirements.

5.2. Breaker materials shall include, but are not be limited to, decomposable bags, sand and any other materials required to facilitate the proper placement of the breaker material in the ditch.

5.3. Breaker installations may be comprised of either a multiple sandbag configuration or by other approved methods. All breaker installations shall meet with the approval of the Company.

5.4. Breaker size is dependent on the extent and condition of the ditch in depth, width, slope and grade. At a minimum, breakers shall extend the width and depth of the ditch.

5.5. Breakers shall be spaced along the ditch in accordance with the Company's environmental standards.

6. DIRT PADDING

6.1. The Contractor shall install rock-free dirt padding in areas designated by the Company. The Contractor shall not take pad dirt from any landowner without prior written approval or as may be covered in the right-of-way easement provisions.

6.1.1. Topsoil shall not be used for padding the ditch.

6.1.2. Dirt padding shall be installed in the bottom of the ditch to a minimum depth of 8 in., prior to lowering-in the pipeline, if other acceptable support for protecting the bottom of the pipe is not utilized.

6.1.3. A minimum of 8 in. of dirt padding shall be installed as cover on top of the line as protection prior to backfilling.

6.1.4. Acceptable rock-free padding material may be obtained directly from the spoil, or by using a padding machine with screens no greater than one inch with material taken directly from the spoil or rock-free padding material can be hauled in by the Contractor.

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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Reinforced Concrete Work			
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CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Reinforced Concrete Work			
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1. SCOPE

This section prescribes the minimum requirements for the design, transportation, mixing, and placing of all concrete to be used in the Company concrete structures. Unless otherwise indicated herein, all design and other work shall conform to and comply with the latest revision of ACI Standard 318 Building Code Requirements for Reinforced Concrete and ACI and ASTM specifications and recommendations references.

2. DEFINITIONS

2.1. "Alkali salt" is a soluble sulfate in water.

2.2. "Alkali soil" is soil which contains sulfates of magnesium, sodium, or carbonate of sodium.

2.3. "Type I: Normal Portland Cement" is general purpose cement suitable for all uses when the special properties of the other types are not required. It can be used in construction of pavements, sidewalks, reinforced concrete buildings, bridges, tanks, reservoirs, sewers, culverts, water pipe, masonry units, and soil-cement mixtures. It should be used if no alkali soil conditions exist.

2.4. "Type II: Modified Portland Cement" is cement that has a lower heat of hydration than Type I and generates heat at a slower rate. It also has improved resistance to sulfate attack. It is intended for use in structures of considerable size where cement of moderate heat of hardening will tend to minimize temperature rise when concrete is placed in warm weather. In cold weather, when the heat generated is advantageous, Type I is preferable. Type II cement is also intended for places where added precaution against sulfate attack is important, as in drainage structures where sulfate concentrations are higher than normal, but are not unusually severe.

2.5. "Type III: High Early Strength Portland Cement" is cement used where high strengths are desired to remove forms as soon as possible or to put the concrete into service as quickly as possible and in cold weather construction to reduce the period of protection against low temperatures.

2.6. "Type IV: Low-Heat Portland Cement" is a special cement for use where the amount and rate of heat generated must be kept low. It is intended for use only in large masses of concrete where temperature rise from heat generated is a critical factor.

2.7. "Type V: Sulfate-Resistant Portland Cement" is a special cement intended for use only in structures exposed to severe sulfate action, such as in soils or waters of high alkali content.

3. MATERIALS

3.1. Cement

All cement shall be Portland Cement and shall conform to ASTM C-150 Type I or II. Other types may be used if approved by the Company prior to use.

3.2. Aggregate

3.2.1. Aggregates shall conform to ASTM C-33 and ASTM C-136 for normal weight and hard rock concrete, shall be chemically inert to the paste, and shall have strength equal to or greater than that of concrete.

Fine aggregate shall consist of natural sand, manufactured sand, or a combination thereof.

Sand shall be clean, sharp, and free from silt, organic matter and all deleterious substances.

Sand shall not contain more than 1½% clay and shall not show darker than very light amber when tested by the Colorimetric method.

The size of the sand shall be such that it shall be uniformly graded between a ⅜ in. and a No. 100 sieve in accordance with ASTM C-33 and shall have no more than 40% retained between any two consecutive sieves.

3.2.2. Coarse Aggregate

Coarse aggregate shall consist of durable rock, gravel, crushed gravel, or crushed stone.

Coarse aggregate shall be uncoated, clean, and shall conform to the requirements for strength, soundness, and compact unit weight indicated in ASTM C-33.

The size of coarse aggregate shall be the smallest of ASTM C-33 Size 357, 1/5 the narrowest dimension between the sides of forms, 1/3 of the depth of slabs, and ¾ of the minimum clear spacing between reinforcing bars.

Aggregate shall be tested for alkali reactivity utilizing ASTM C227 or ASTM C289. Test results must be made available to Company.

3.3. Water

3.3.1. Water used in mixing shall conform to the requirements of ACI 301, ACI 318, and ASTM C94.

3.3.2. Non-potable water shall not be used unless tested in accordance with ACI 318 for non-potable mixing water.

3.3.3. The allowable water content of the concrete shall not exceed 46% by weight.

3.4. Admixtures

3.4.1. No admixture shall be used unless approved by Company Representative.

3.4.2. No admixture containing calcium chloride shall be used.

3.4.3. Air entraining admixtures shall conform to ASTM C260. Water-reducing, retarding, and accelerating admixtures shall conform to ASTM C494 and pozzolanic admixtures shall conform to ASTM C618. Where flyash is used, it shall be Class F and shall be sampled according to ASTM C311.

3.5. Reinforcement

3.5.1. Bar Specifications

All concrete reinforcing steel shall meet the standards of the latest ASTM specifications and shall be deformed to conform to ASTM A-615 Grade 60 and shall be bent cold to shapes indicated on drawings.

Reinforcing material shall be free from scale, oil, concrete, loose rust and structural defects.

3.5.2. Wire Mesh

Wire mesh shall be woven or electrically welded wire fabric or cold drawn steel in accordance with ASTM A-82, ASTM A-185 and as referenced in ACI 318 and shall be lapped at least one mesh.

3.5.3. Fabricating and Placing Reinforcement

The fabricating and placing tolerances, spacing requirements, and concrete protection requirements for steel reinforcement shall conform to the requirements of ACI 301 and ACI 318.

a) Minimum Reinforcement Cover shall be as follows:

	Minimum Cover, in.
Concrete cast against the earth Formed surfaces exposed to weather or in contact with the ground	3
For bar sizes No. 6 or larger	2
For bar sizes No. 5 and smaller, and W31 or D31 wire and smaller	1½
Formed surfaces not exposed to weather or not in contact with the ground:	
Beams, girders, and columns slabs, walls, and joists	1½
For bar sizes No. 11 or smaller	¾
For bar sizes No. 14 and 18	1½

b) All reinforcing steel shall be inspected and approved by the Company Representative before the concrete is placed. The systems holding bars in place must ensure that all steel in the top surface will support the weight without displacement. Mesh shall be held at the proper level.

3.5.4. Welding

a) Welding of reinforcing steel shall not be permitted except as approved by the Inspector, and if approved, shall conform to ACI Specifications and American Welding Society AWS D1.4.

b) Tack welding of assembled mats shall not be permitted. Tie wire shall be used for all bar ties.

3.5.5. Splicing

Splicing the reinforcing bars shall not be permitted except as shown on drawings or as approved by the Company Representative. Where splices are permitted, it shall conform to ACI 318.

3.6. Storage

3.6.1. Cement

Upon its receipt at the site, all cement shall be stored in a dry place and thereafter kept in such storage until used. Cement which has become caked, partially set, or otherwise deteriorated, or which has become damaged or contaminated, shall be rejected for use.

3.6.2. Aggregate

Upon delivery to the site, all sand, gravel, and crushed rock shall be piled and stored separately in a manner and at a location which will afford convenient access for later use, prevent the co-mingling of such materials and minimize the loss of such materials through mixture with surface water, soil, or refuse. Sand, gravel, or crushed rock shall not be piled over existing underground or other facilities.

3.6.3. Reinforcing

Reinforcing steel shall be stored and protected from weather and construction to ensure that it will remain free from structural defects, rust scale, oil, concrete or any other action or agents which would prove deleterious to the material.

3.6.4. Admixtures

Do not allow admixtures to become contaminated, to evaporate, or to be damaged. Agitate admixtures with appropriate equipment to ensure uniform distribution of ingredients when they are in the form of suspension or in the form of unstable solutions. Protect liquid admixtures from freezing and from temperature changes which adversely affect their characteristics.

4. MIX DESIGN

4.1. Strength

Unless otherwise specified, all concrete installed for the Company shall be designed using a minimum compressive strength (f'c) of 3000 psi. The concrete provider is responsible for providing a mix design with past history utilizing the mix design. If sufficient history is available for a particular mix then a history available, then either standard deviation or a corresponding strength may be obtained using the requirements outlined in ACI 318. If it is a new mix without history available then either trial batches need to be created and tested or otherwise the required average compressive strength (f'cr) shall be f'c + 1200 psi.

4.2. Workability

Make concrete sufficiently workable for proper mixing of the materials which compose the concrete, handling, transporting, placing with minimum loss of homogeneity, and for finishing to requirements.

Maintain slump at 6 inches for drilled shafts, 3 inches for concrete flatwork, and 4 inches for all other concrete. Approved water reducers may be used to adjust the slump to the required values.

4.3. Water

The total amount of water in concrete shall be limited to that needed to produce the required slump but it shall not be more than 46% of the weight of cement in the concrete. Water in admixtures shall be considered as part of the total water.

4.4. Entrained Air

The total air content in all concrete shall be as shown in the table below. Measure air content in accordance with ASTM C231, C173 or C138.

Total Air Content for Various Sizes of Coarse Aggregate for Normal Weight Concrete

Nominal Maximum size of coarse aggregate, in.†	Size Number	Total air content by volume
⅜	8	6 - 10
½	7	5 - 9
¾	67	4 - 8
1	57	3.5 - 6.5
1 ½	467††	3 - 6
2	357	2.5 - 5.5
3	-	1.5 - 4.5

† See ASTM C33 for tolerances on oversize for various nominal maximum size designations.

†† Aggregate of these maximum sizes are often batches as two sizes fractions in the correction proportions to yield the grading specified for Sizes 467 or 357. Size 467 would consist of Sizes 4 and 67 material and Size 357 a combination of Sizes 3 and 57.

4.5. Trial Mix

The Project Engineer/Manager may require a trial mix and an analysis of the material used in the ready-mix.

4.5.1. A design trial mix, which will include any admixtures approved by the Company, shall be made by the Company's selected laboratory, or a standard mix already in use by the ready-mix company may be submitted for approval.

4.5.2. Brands of cement may not be changed during any one job.

4.5.3. The ready-mix vendor shall furnish a record showing the quantities of materials for each type of concrete and when any change of constituents is made.

4.5.4. For each trial mixture performed, the following should be reported:

a) The amount of each constituent in the mixture

b) Slump

c) Air Content

d) Concrete Temperature

e) Ambient Air Temperature

f) Wet and Dry Unit Wet

g) Compressive Strength

The compressive strengths shall be determined in accordance with ASTM C39.

5. FORMWORKS

5.1. General

5.1.1. Formwork tolerances shall meet the standards set forth in ACI 301.

5.1.2. Forms shall conform to the shape, lines, and dimensions of the member as designated on the drawings and shall be free from surface defects, sufficiently tight to prevent leakage of mortar, and shall be properly braced tied together to maintain position and shape. Forms shall be treated with a substance such as oil, grease or wax, before concrete is poured, in order to prevent the bonding of concrete to them. Such treatment shall be non-staining.

5.2. Formwork Design

5.2.1. Forms shall be provided for all openings, depressions, recesses, anchorage, and keys required in concrete to receive other work. Drawings shall be carefully examined for such work and various branches of work coordinated in the proper sequence.

5.2.2. Forms, clamps, and form ties shall be able to withstand all loads to be imposed upon them including but not limited to wind, seismic, live, dead, temperature, rain, snow, fluid or construction loads.

5.2.3. Shores for forms of floors and rough slabs shall not be smaller than 4-in. posts or approved patented shores. All shores shall be designed and installed to permit ready adjustment of height. At least one shore shall be installed for each 16 square feet of slab supported.

5.2.4. Keyed joints shall be provided between previously and subsequently constructed walls or portions thereof.

5.3. Removal of Forms

5.3.1. Supports may be removed only when the concrete has set and will be uninjured by construction activities. General guidelines may be found in Table 5.3.1 or as approved by the Company Representative.

5.3.2. After removal of forms, no additional loading shall be applied to the concrete which will injure the placed concrete.

TABLE 5.3.1

	Type of Cement Used	
Operation	**I, II, IV, V**	**III**
Number of curing days concrete shall be continuously kept moist	7 days[a]	3 days
Concrete shall attain specified compressive strength after	28 days	7 days
Applied load not to exceed 50% of the specified design load before	7 days	3 days
For span lengths 10 ft. (3.05m) and less, supporting forms shall not be removed before	7 days[b]	
For span lengths over 10 ft. (3.05 m) but less than 17 ft. 5.2 m), supporting forms shall not be removed before	7-14 days[b][c]	
For span lengths over 17 ft. (5.2 m), supporting forms shall not be removed before	14 days[b]	
Forms shall not be removed and curing shall be continued on all suspended sections of floor slabs for	21 days	

[a] The term "curing day" shall be interpreted as any calendar day on which the temperature is above 50° F (10° C) for at least 19 hours. Colder days may be counted if satisfactory protection is made to maintain the air temperature adjacent to the concrete constantly above 50° F (10° C) throughout the entire day. When the temperature remains between 35° F (1.67° C) and 50° F (10° C) throughout the day, and when artificial heat is not provided, a Company inspector shall establish the additional curing time required.

[b] When no load is to be applied on supported concrete, the side forms may be removed as early as 36 hours when using Types I, II, IV, and V cement. This time may be reduced to 24 hours when Type III cement is used.

[c] Lengths over 10 ft. (3.05 m) and less than 17 ft. (5.2 m) require 7 days plus 1 day for each foot of span over 10 ft. (3.05 m).

6. MIXING AND PLACEMENT

6.1. Mixing

6.1.1. When ready-mixed concrete is used, it shall be mixed, delivered and controlled by Specifications for Ready Mixed Concrete ASTM 94.

6.1.2. Air-slaked or lumpy concrete shall not be used. The contents of the mixer shall be completely discharged before each new batch is loaded.

6.1.3. Addition of water to make concrete more workable shall not be allowed.

6.1.4. Concrete shall be poured in a continuous operation. No concrete may be placed against adjacent concrete which has been placed longer than ½ hour before unless approved by the Company Representative. No cold joints will be permitted unless allowed by design engineer.

6.1.5. Concrete shall be compacted by high frequency internal or external vibrators, keeping contact with strands, reinforcing steel and embedment to a minimum.

6.1.6. Honeycombed concrete shall not be accepted.

6.1.7. When hand mixing is allowed, the materials shall be mixed dry on a water-tight platform until the mixture is homogeneous and a uniform color, then the required amount of water added and the materials turned at least six times until the mass is homogeneous in consistency and color.

6.2. Prior to Placement

6.2.1. No concrete shall be placed until the excavation, forms, reinforcing, and the fill on which the concrete is to be placed has been inspected and approved by the Company Representative.

6.2.2. All items such as anchors, angles, inserts, sleeves, frames, pipes, and other items built into the concrete as required by the drawings shall be correctly positioned in forms then inspected and approved by the Company Representative before the concrete is placed.

6.3. Placement

6.3.1. Concrete shall be deposited in forms without segregation. Concrete shall be handled from the mixer to the forms as rapidly as possible by methods which shall prevent the separation of the ingredients.

6.3.2. Concrete shall not be allowed to drop freely more than 4-ft. Drop chutes of rubber or metal shall be provided in several lengths to place concrete without "dropping." The slope of metal chutes shall not be greater than 3:1 or less than 2:1.

6.3.3. Concrete shall be worked into place by vibration per ACI 301 and 309, using care to avoid product segregation. Vibrators shall have a frequency of between 8,000 and 15,000 pulsations per minute. When using vibrators, contact with anchor bolts, reinforcing steel and embedment and forms shall be kept to a minimum.

6.3.4. When fresh concrete has started to stiffen and is not plastic enough to be readily compacted in the forms, it shall be discarded. No remixing or re-tempering shall be permitted.

6.3.5. In walls, the placing of each layer of concrete shall begin at the center and progress toward each corner. In all cases, the procedure shall prevent water from collecting at the ends and corners of forms and along form faces.

6.3.6. The top surface of the concrete shall be brought uniformly to the respective finished levels by the use of straight edges and screeds. All screeds shall be removed and the spaces displaced filled with concrete before adjacent concrete has set.

6.3.7. In general, the concrete shall be placed in horizontal layers of approximately 18 in. uniform thickness, each layer thoroughly compacted before the next is placed.

6.3.8. Where designated, the top surface of all engine and equipment foundations shall be left with a rough finish suitable for grouting after pouring. All laitance shall be removed before grouting.

6.4. Protection During Adverse Conditions

6.4.1. Cold Weather Protection During Curing

6.4.1.1. Maintain the air temperature at the concrete surface as shown in Figure 1. Be prepared to maintain the required temperatures by heating, covering, insulating and/or housing the concrete indoors. Do not damage the concrete by the heating procedure. Do not use combustion heaters.

6.4.1.2. Concrete shall never be allowed to freeze or placed against frozen soil.

6.4.1.3. When placing concrete in cold weather ACI 305R "Cold Weather Concreting" shall be used.

6.4.2. Hot Weather Protection During Curing

6.4.2.1. Maintain the air temperature at the concrete surface as shown in Figure 1. Be prepared to employ shading, fog spraying, sprinkling, ponding or other pre-approved methods to maintain the above temperature limits.

6.4.2.2. When placing concrete in hot weather, ACI 305R, "Hot Weather Concreting" shall be used.

6.4.2.3. Do not place concrete when it is raining, sleeting, snowing or any other circumstance which threatens the introduction of water into the concrete. If acceptable protective measures are taken, concrete may be placed.

7. JOINTS

7.1. General

Construct all joints to the details shown on the drawings. Only joints specified in the Drawings are permitted. Pre-molded expansion joint filler shall conform to ASTM D994, D1751, or D1752.

7.2. Construction Joints

7.2.1. A monolithic binder shall be used on keyed joints, cold joints where watertight bonding is required, on cold joints where existing foundations are to be extended and for repairing cracks in existing foundations.

7.2.2. The surface where the binder is to be applied shall be scarified, and all laitance removed.

7.2.3. All oil, grease, dirt, efflorescence, loose cement, aggregate, and other foreign residues shall be removed to provide a clean, dense surface.

7.2.4. The applied binder shall be applied per Manufacturer's recommendation.

7.3. Waterstops

7.3.1. General

Construct all waterstops at the locations and to the details shown on the Drawings.

7.3.2. Waterstop Joints

Use the longest pre-molded waterstop lengths possible to keep the number of joints to a minimum. Make joints at intersection and at splices in the manner most appropriate and in accordance with the manufacturers' recommendations.

7.3.3. Joint Water Tightness

Waterstop joints shall develop effective water-tightness fully equal to that of the continuous waterstop material and shall permanently develop not less than 50% of the mechanical strength of the parent material, and shall also retain the flexibility characteristics of the parent material.

8. REPAIR OF SURFACE DEFECTS

8.1. General

8.1.1. Minor surface defects shall be repaired in accordance with procedures in the Portland Cement Association's publication. "Design and Control of Concrete Mixes."

8.1.2. "Minor" defects are defined as those certain surface cracks or other defects such as bug holes, tie holes, etc., which may not be detrimental to the structural integrity of the product. The Company Representative shall approve a defect as "minor" and shall approve all repairs.

8.2. Procedures

8.2.1. Approved procedures shall be used for patching and repairing defects. All affected concrete shall be removed down to sound concrete and the patch shall be well bonded. The area to be patched and the area surrounding it shall be wetted and kept damp to prevent absorption of water from the patching grout or mortar. The patches shall be moist cured for not less than a three-day period.

8.2.2. If chipping is necessary, the edges shall be perpendicular to the surface and slightly undercut. No featheredges shall be permitted.

8.2.3. A monolithic binder or a bonding grout of 1-part cement and 1-part fine sand, mixed to the consistency of thick cream, shall be scrubbed into the surface of the area to be repaired, before patching mortar is applied. The patching mortar shall be mixed as stiff as possible, using 1-part cement and 2½ parts sand passing through a No. 16 sieve, with just enough water to form a ball when the mortar is squeezed in the mud.

8.2.4. Epoxy resin grout may be used to repair certain defects as defined above. If epoxy resin grout is used, the manufacturer's recommendations should be followed, and if chipping is necessary, it shall be performed as described above.

8.2.5. Repairs shall not be considered complete until inspected and approved by the Company Representative.

8.3. Honeycombing

8.3.1. Minor honeycomb areas shall be repaired using proper procedures when approved by the Company Representative.

8.3.2. Whether honeycomb areas are permitted to be repaired will depend on:

a) the extent of the affected area;

b) the depth of the affected area (Any area deep enough to expose reinforcement shall be rejected); and

c) the location of the affected areas: The most critical areas are stress areas, corners, edges, and the bearing points. Any major honeycomb in these areas shall cause the member to be rejected.

8.3.3. Honeycomb areas to be repaired shall be chipped out to sound concrete and repaired in accordance with the above procedures.

8.4. Proprietary Materials

If required, and if approved by the Company Representative, proprietary compounds for adhesion or as patching ingredients may be used in lieu of, or in addition to the foregoing patching procedures. Such compounds shall be approved by the Company Representative and shall be applied in accordance with the Manufacturer's recommendations.

9. FINISHING CONCRETE

9.1. General

9.1.1. All concrete exposed to view shall be surface finished.

9.1.2. Immediately after removing the forms, the exposed surfaces of piers, slabs, supports, etc. shall be rubbed with carborundum stone and grout to remove all blemishes, repair marks, and form marks, leaving a smooth even surface.

9.1.3. Trench bottoms shall be given a wood or mag float finish.

9.1.4. Sidewalks, driveways, ramps, and area paving shall be given a broomed and belted finish.

9.1.5. Concrete floors shall be finished either with Terrazzo topping or steel trowel finish. All floors shall be carefully and evenly provided with pitch towards drain.

9.2. Cement Coloring

When cement coloring is required, it shall be Master Builders Colorcron or approved equal. Material shall be applied per Manufacturer instructions.

9.3. Special Finishes

9.3.1. Dry-Shake Finish

If a dry-shake finish is required by the Contract Documents, blend the metallic or mineral aggregate specified with Portland cement as recommended by the aggregate Manufacturer.

9.3.2. Non-slip Finish

If a non-slip finish is required, dry-shake the surface as specified above using a crushed ceremically bounded aluminum oxide at an application rate of not less than 25 pds. /100 sq. ft.

10. CURING AND PROTECTION

10.1. General

Curing and protection of all concrete construction shall conform to the requirements of ACI 301, ACI 308, ACI 318, and the pertinent portions of these specifications. Seven-day water curing is required on all cooling tower basins. On all other concrete construction, water curing is preferred, but other methods specified below will be allowed.

10.2. Curing

10.2.1. After completion of placement and finishing, prevent the loss of moisture from concrete surfaces not in contact with forms by one of the following methods:

a) Pond or continuously sprinkle the surface with water

b) Cover the surface with absorptive mats made of fabric and keep the mats continuously wet

c) Cover the surface with the sand and keep the sand continuously wet

d) Apply steam to the surface of mist spray it continuously; The steam shall not exceed 150°F

e) Cover the surface with waterproof sheet material conforming to ASTM C171

f) Cover the surface with curing compound conforming to ASTM C309. Apply the compound in accordance with the manufacturer's recommendations. Do not apply the compound to surfaces against which additional concrete or other material is to be bonded. If accidentally or inadvertently placed, remove it completely.

10.2.2. Prevent moisture loss from concrete surfaces against forms by keeping the forms wet until they are removed, then protect the stripped and finished surfaces from moisture loss by one of the methods used above.

10.2.3. Cure high early strength concrete surfaces for at least three days and all other surfaces for at least seven days.

10.3. Protection

The structure may be loaded when concrete has achieved its design strength (f'c) or when deemed appropriate by structural analysis.

11. QUALITY CONTROL

11.1. Inspection

11.1.1. The Company shall employ and pay for the services of an inspection agency that shall inspect and test all of the work described within this specification to the extent necessary to determine, in detail, the extent of compliance with this specification.

11.1.2. The inspection agency shall submit to the Company, in writing, daily reports of all tests and inspections conducted on a specific day, and they shall include but not necessarily be limited to:

a) the specific works constructed;

b) the inspections and tests conducted on the works;

c) the results of the inspection and tests;

d) the work which did not comply with the specification and the basis for the findings; and

e) any work not inspected or tested and the reasons thereof.

11.1.3. Copies of inspection and test reports shall be sent to the Contractor at the same time the reports are sent to the Company.

11.1.4. The Contractor shall, at its own expense, immediately repair or replace such material or Work found to be defective in a manner complying with the Specifications, Drawings, Provisions of the Contract, and to the satisfaction of the Company.

11.1.5. Failure of the Engineer, Inspector or other authorized Representative during the progress of the Work to discover or reject materials or work not in accordance with the Drawings or Specifications shall not be considered as acceptance thereof or a waiver of defects therein, and payment to the Contractor or its subcontractor or partial or entire occupancy by the Company shall not be construed to be acceptance of the Work or materials which are not structurally or otherwise in accordance with the Drawings and Specifications.

11.2. Testing

11.2.1. Compressive Strength

11.2.1.1. The method of preparing and curing of concrete cylinders or specimens for compression tests shall follow ASTM C31, ASTM C29, ASTM C192, and ACI SP2.

11.2.1.2. The average strength indicated by tests shall exceed the specified strength in accordance with ACI 318.

11.2.1.3. A minimum of 6 compression test cylinders shall be taken and cured for each 100 yd^3 or 2,500 $ft.^2$ of surface area for slabs or walls.

11.2.1.4. On smaller pours testing will be performed as determined by the Company Representative.

11.2.2. Slump

11.2.2.1. A slump test shall be made at the beginning of each major pour, prior to the preparing of test cylinders, or whenever a change in consistency is suspected.

11.2.2.2. Slump tests shall be made within 5 minutes after each sampling is complete.

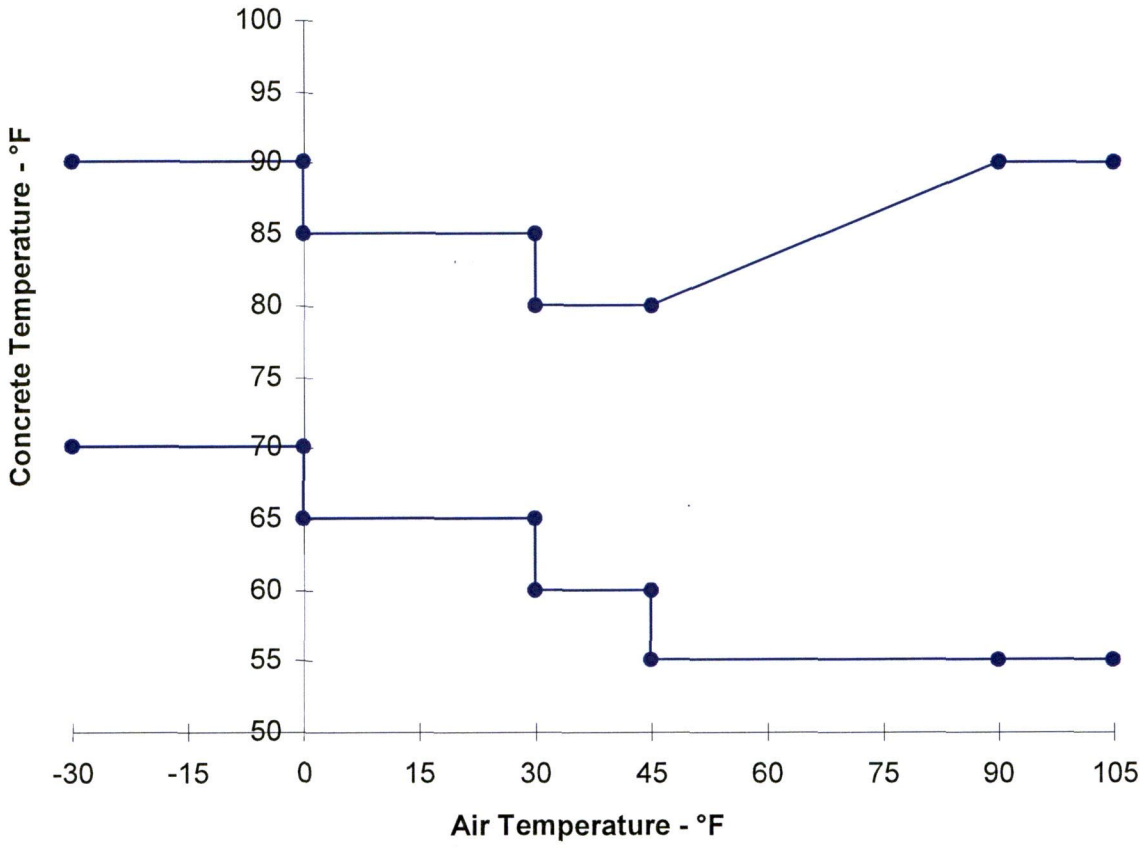
11.2.2.3. The procedure for sampling and performing the slump test is set forth in ASTM C143 and ASTM C172.

11.2.2.4. Concrete slump for various types of construction shall be according to Section 4.2.

11.2.3. Air-Entrainment

The air content tests shall be made at the beginning of each pour and within 5 minutes after sampling is complete, or at any time specified by a Company Representative. The air content tests shall follow ASTM C231.

FIGURE 1
Concrete Temperature Limitations at Time of Placement



CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Pressure and Leak Testing			
Specification No. LP-015	Issue Date: May 25th 2018	Revision Date:	Page 1 of 11

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1. GENERAL

1.1. All new and relocated pressure piping and facilities shall be pressure tested prior to being placed in-service.

1.2. Minimum test duration shall be 8 hours, which will begin after the Company has determine stabilization has occurred, unless a different time duration is specified in the Scope of Work and /or drawings.

1.3. High Pressure Piping: All piping, which is to operate above 100 PSIG.

1.4. Low Pressure Piping: All piping, which is to operate at or below 100 PSIG.

1.5. The Pressure and Leak Test shall be acceptable if no leaks are present during the duration of the test or if pressure variations that occur can be correlated with temperature changes to the satisfaction of the Company Project Engineer.

1.6. Contractor shall provide qualified personnel and equipment to complete testing requirements, to the satisfaction of the Company.

1.7. Connections: All connections regardless of size, which can be practically installed, shall be made prior to pressure testing.

1.8. Piping assemblies, to the maximum extent practical, shall be pressure tested after installation as complete assemblies and extra pipe shall be pressure tested at each tie-in weld so that every foot of piping being added is pressure tested.

1.9. Fabricated piping assemblies may be pressure tested prior to final installation if it is not practical to do so after installation; however, fabrication shall be as complete as possible. Multiple assemblies may be joined and pressure tested as a single unit.

1.10. Pressure testing through any vessel shall not be permitted.

1.11. Ball valves and gate valves are to be tested in the ½ open position (preferred position). Plug valves may be tested in either the full open or full closed position. Pressure testing against any closed ball or gate valve shall not be permitted.

1.12. Only blinds, certified skillets and closures with proper ANSI design and pressure rating shall be used. Field fabricated skillets may only be used with the approval of the Company Project Engineer.

1.13. The Company shall observe all Pressure and Leak Testing.

2. SAFETY REQUIREMENTS

2.1. The Contractor shall ensure that every reasonable precaution is taken to protect its employees and the general public during the testing. Whenever the hoop stress of the segment of the pipeline being tested will exceed 50% of SMYS, the Contractor shall take all practicable steps to keep all persons outside of the testing area until the pressure is reduced to or below 50% of SMYS.

2.2. Existing safety regulations pertaining to work areas, safety devices and work practices are not intended to be replaced by the following safety requirements:

2.2.1. Test equipment and personnel shall be positioned to minimize potential hazards. Typical positioning shall include a barrier between the test equipment and test manifold and/or placement of test equipment a minimum distance of 25 feet from the test manifold, further if test medium is a gas. Personnel performing the test should approach the pressured line only in the performance of their duties.

2.2.2. At no time shall testing personnel attempt to tighten flanges or screwed fittings during testing. The test pressure must be bleed off prior to tightening.

2.2.3. Adequate support, bracing, and location of pumping equipment and pressure piping shall be used in connecting to the facility to be tested.

2.2.4. Adequate lighting shall be available for testing operations performed at night.

2.2.5. When bleeding the pressure from a section of line, extreme caution (adequate support & bracing) shall be taken when deflectors such as ells are used.

2.2.6. The discharge pipe for dewatering the pipeline shall be a minimum of 6 in. Schedule 40, (for pipe diameters over 10 in.) and are not to be attached to mainline until the test pressure has been bled off. The discharge pipe will be cleaned, constructed and secured to the satisfaction of the Company Representative, prior to discharging test medium.

3. PRESSURE REQUIREMENTS

The test pressure for each system or segment shall be as shown within the Scope of Work and/or drawings.

4. PRESSURE TEST DURATION

The test duration for each system or segment shall be as shown within the Scope of Work and/or drawings.

5. OTHER PIPING SYSTEMS

5.1. Utility line piping must comply with the following requirements:

5.1.1. Utility line piping that operates at or above 100 psig shall be tested to 1.5 times MAOP for duration of 1 hour. If water is the test medium, the maximum test pressure is 100% SMYS. If testing pneumatically, the maximum pressure shall be dependent upon the medium as specified in the Scope of Work.

5.1.2. Utility line piping that operates below 100 psig shall be tested to the operating pressure, not less than 90 psig, for duration of 1 hour. The test shall be performed pneumatically and the maximum pressure shall be dependent upon the medium.

5.2. Instrument and control piping may be pressure tested using air, natural gas or inert gas as the test medium. The minimum test pressure, after it stabilizes, shall be maintain for at least one continuous hour and checked for leaks by using a leak detector such as "SNOOP". Soap shall not be used as a leak detector.

6. PRESSURE VOLUME PLOT

6.1. For all hydrostatic tests which exceed 100% SMYS, a pressure volume (PV) plot is required starting when the test pressure reaches 80% of SMYS and plotted in 10 psig increments. (Refer to Figure 1)

6.2. When testing from 90% to 110% of SMYS and yielding occurs, the test shall stop when double deviation occurs; that is, when the volume required to increase the pressure 10 psig is double the volume required to raise the pressure 10 psig at a pressure corresponding to 80% of SMYS.

6.3. For an acceptable strength test, the test pressure shall not exceed the maximum test pressure of the pipeline or any component of the pipeline.

7. MATERIAL

7.1. Unless specifically noted in the Scope of Work, the Contractor will furnish supplies and materials, including squeegees, spheres, manifolds, valves, fittings and other supplies and materials normally used as part of pressure testing work. All material and equipment required for testing shall comply with DOT and Company requirements.

7.2. Test manifolds used to pressure test Company pipeline facilities shall be fabricated in accordance to the following requirements:

7.2.1. The minimum wall thickness and yield strength of pipe and components used to fabricate test headers shall be designed such that the maximum test pressure experienced during facility testing does not exceed 80% of SMYS.

7.2.2. In instances where the proposed test pressure shall exceed 80% of SMYS of the test headers, an initial pre-test shall be conducted on the entire test header to 100 percent of the test header's specified minimum yield strength (SMYS) for two (2) continuous hours. Subsequent testing shall be at the discretion of the Company Representative, dependent upon the condition of the test manifold and verification of qualification documentation (Test, NDE, Welding & Material Records).

7.2.3. A qualified welder using a qualified welding procedure shall weld all pressure piping related to the pressure test.

7.2.4. All butt and fillet welds shall be nondestructively tested in accordance to Company established NDE procedures.

8. TEST WATER

Unless specifically noted in the Scope of Work, the Contractor shall furnish all water for hydrostatic testing, and shall dispose of the water in a proper manner, acceptable to the Company, which complies with all restrictions and requirements of authorities having jurisdiction over disposal of such water. The Company will obtain all water acquisition and discharge permits.

9. FILLING THE LINE WITH WATER

9.1. The Contractor shall fill the pipeline section with water at a continuous fill rate. Should the fill stop at any time due to uncontrollable circumstances, the fill line shall be purged of air. Care shall be taken to ensure that no excess air is entrapped in the pipeline.

9.2. The pipeline and components shall be completely filled with clean water approved by the Company, free of silt, trash or any substance that might be injurious to the system. The contractor shall furnish a filter that shall be rated at sufficient capacity to accommodate the output of the fill pump. Water filtration equipment shall be capable of removing 99 percent of all particles 92 microns in diameter or larger in size, unless otherwise specified. The filter shall be equipped with valves, gauges and fittings sufficient to allow any necessary backwashing. All back flushing operations and test media shall be properly disposed of without damage to land or contamination to the water source. The contractor shall install sufficient gauges on the filter, in order that the differential pressure across the filter and positive pressure on the discharge side of the filter can be observed.

9.3. Contractor shall provide a flow meter of sufficient capacity and accuracy to measure the quantity of fill water pumped into the pipeline, unless waived by the Company Representative. Contractor shall record on charts the pressure and temperature of the test medium during the filling operation, at each end of a test section.

10. PRESSURING

10.1. One of the primary concerns during the pressuring of a test section is safety, both for the public and personnel associated with the Work. There shall be no contractor personnel or equipment working over a test section after the test pressure has exceeded the operating pressure. There shall be a minimum number of personnel around a section during pressuring and testing, and no personnel shall be in the ditch during pressuring. In addition to instruments being kept at a safe distance, consideration should also be given to the location of the pressure pump and its operator. Prior to pressuring, all valves shall be in the half open position and shall be blinded or plugged, and the only valves to be tested in the closed position are the hydrostatic testing valves.

10.2. The stabilization period shall begin after the fill operation is complete. Sufficient time shall be allowed for the temperature of the pipe, test medium and backfill (if

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10.2. The stabilization period shall begin after the fill operation is complete. Sufficient time shall be allowed for the temperature of the pipe, test medium and backfill (if

12. EQUIPMENT

The contractor shall furnish equipment and supplies necessary to make permanent hydrostatic test records. Equipment shall include but not be limited to:

12.1. Dead Weights

Accurate dead weight(s) or Digital gauges (Gauge 2 or equal) shall be used to measure test pressures. The dead weight shall be sensitive to 1 psig change in pressure through a range of 50 to 3,000 psig. Prior to use on the work, the Contractor shall provide the Company with written proof of dead weight equipment calibration and certification within a period of one (1) year and within a period of six (6) months for Digital gauges.

12.2. Pressure Recorder

A continuous record of test pressure shall be obtained by the use of a pressure recorder. The range of the pressure recorder shall be compatible with the test. Prior to use on the work, the Contractor shall provide the Company with written proof of equipment calibration and certification within a period of one (1) year.

12.3. Temperature Recorders

A continuous record of the ambient, ground at the pipe temperature (where applicable), and of the test medium shall be obtained by the use of temperature recorders. The range of the temperature recorders shall be compatible with the test. Prior to the work, the Contractor shall provide the Company with written proof of equipment calibration and certification within a period of one (1) year.

12.4. Recorder Charts

Where possible, recorder charts of nominal 12 in. size shall be used. In no case shall the size be less than 10 in. The Contractor shall verify to the satisfaction of the Company that the range of each recorder chart is compatible to the range of the instrument on which it is used.

13. RECORDS

13.1. The Company shall make, and retain for the useful life of the pipeline, a record of each test performed under this Section. Only Company approved forms shall be

used and they shall be completely filled in, have the pressure recording charts with calibration certifications attached, and shall be properly signed and approved.

13.2. Test reports on pipelines shall include an as-tested profile showing actual elevations whenever significant for the particular test, manifold locations, dead-weight and recorder locations, and any other information of record such as hourly fill log with water temperatures, deadweight pressure log sheets, and pressure volume plots.

13.3. Test reports on plants shall include a piping drawing showing what piping is included in each test and on each test chart.

13.4. The Contractor's Representative and the Company's Representative shall sign and date all original charts, immediately upon completion and acceptance of the test. The original charts shall remain with the Company.

13.5. The Project Name and Project ID are to be included on ALL documentation.

14. DEWATERING

Immediately after completion of tests, the Contractor shall completely dewater the pipeline by running a sufficient number of Contractor supplied pipeline "pigs". The test water shall be filtered as required by permits and/or Right of Way Special Requirements. The discharge pipe shall not be attached to the mainline until the test pressure has been bled off. The discharge pipe will be cleaned, constructed and secured to the satisfaction of the Company. All valves, sections of non piggable pipe, and other places were water may be trapped shall be drained.

15. CALIPER/GEOMETRY INSPECTION

15.1. Unless otherwise stated within the scope of work, the Contractor shall furnish and run a caliper/geometry inspection instrument. The inspection tool shall have defect location capabilities that will provide information necessary to find any significant ID reduction in the pipe in order that the indication may be uncovered, inspected and possibly removed. The Contractor shall furnish all equipment and labor necessary to facilitate the running of the caliper/geometry instrument including, but not limited to, fabricating and installing temporary launchers and receivers if required, air compressors, valves, gauges, hoses, and piping.

15.2. The Contractor shall furnish third-party technicians as required to maintain, calibrate and oversee the operation of the caliper/geometry instrument. Technicians shall be fully qualified to interpret the data collected. Such technicians shall work with the Company and keep the Company Representative fully informed of the

results of such inspection. The technicians shall also demonstrate to the Company that the device is properly calibrated prior to and after each run, and shall assist in locating any significant indications.

15.3. The Contractor shall uncover and remove all indications detrimental to the safety of the pipeline as determined by the Company.

15.4. The Contractor shall submit a complete inspection report to the Company Representative upon completion of the inspection.

16. CLEANING AND DRYING

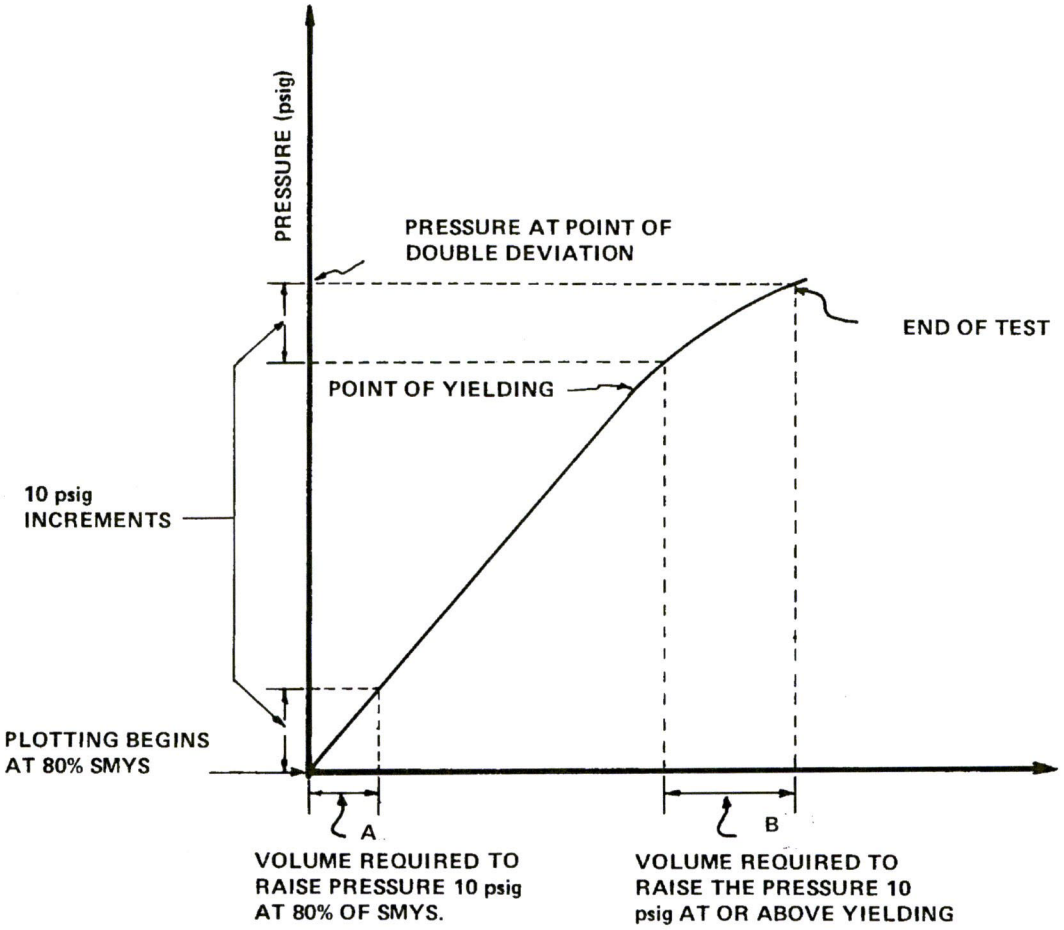
16.1. After dewatering is complete, Contractor or Contractor's sub contractor will run a train of drying pigs until specified dew point of –38°F is achieved inside pipeline or as otherwise specified in the scope of work.

16.2. Pipeline will be considered clean and dry when required dew point has been achieved and dust penetration of one-quarter (¼) in. or less is visible in a 2.5 #/ft.^{3} density foam pig.

16.3. After cleaning and drying, pipeline should be tied-in, purged and loaded per the Company's Commissioning Plan, as soon as practical.

FIGURE 1

PRESSURE/VOLUME PLOT WITH DOUBLE DEVIATION



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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Clean-up & Restoration			
Specification No.	Issue Date:	Revision Date:	Page
LP-016	May 25th 2018		1 of 3

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CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Clean-up & Restoration			
Specification No. LP-016	Issue Date: May 25th 2018	Revision Date:	Page 2 of 3

1. CLEAN-UP

1.1. Right-Of-Way, Temporary Access Roads, and Work Space

1.1.1. The Contractor shall keep the right-of-way clear of litter, skids, defective materials, and all other construction debris to the satisfaction of the Company.

1.1.2. Upon completion of the backfill, the Contractor will clean and grade the right-of-way in a neat and acceptable condition, returning the right of way to pre-construction conditions.

1.1.3. Private roads used by Contractor shall be restored to their former condition and to the satisfaction of the Company Representative and landowner or tenant.

1.1.4. Terraces, levees, and watercourses shall be restored to their former condition to the satisfaction of the Company Representative and landowner or tenant.

1.1.5. Unless directed otherwise by the Company Representative, temporary roadways or access pads along the right-of-way for construction equipment shall be removed and disposed of to the satisfaction of the Company Representative and landowner or tenant

1.1.6. Any rock of a size stipulated in any Special Provisions and/or right-of-way agreement, including loose rock encountered by the grading, trenching, or boring operations and not backfilled according to the Specifications, shall be removed from the right-of-way and disposed of at locations and in a manner that is satisfactory to the Company Representative and the landowners or tenant. Company will acquire written permission if required, from the landowner or tenant to dispose of rock on the property from which it is to be removed by right-of-way agreement.

1.2. Surplus Materials

Surplus materials shall be assembled, inventory, and delivered by Contractor to a location designated by the Company.

1.3. Fences and Gates

Fences disturbed by construction shall be restored to their original or better condition in accordance with the Drawings and to the satisfaction of the Company Representative and landowner or tenant. Gates shall be installed as indicated by the Company. The Contractor shall furnish gates, fencing and posts.

2. SEEDING

The right-of-way shall be disked, limed, seeded, sprigged, fertilized, and mulched as required by the Project Scope, ROW Line List and or Company's environmental requirements. The Contractor shall furnish the lime, seed, mulch, sprigs, and fertilizer. Seeding, sprigging, fertilizing and mulching must be done within 6 days of final clean up or in accordance with Company environmental requirements.

3. PIPELINE MARKERS

Pipeline markers shall be installed at points designated by the Company during clean-up operations. The Company shall furnish line and aerial markers.

4. RESTRICTIONS

The Contractor shall at all times complete the clean-up within 10 days of final grade, including fence replacement, signs, test leads, drainage and terraces.

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CONSTRUCTION SPECIFICATION
FOR LAND PIPELINE CONSTRUCTION

Specification Title: Horizontal Directional Drilling			
Specification No. LP-017	Issue Date: May 25th 2018	Revision Date:	Page 1 of 22

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CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Horizontal Directional Drilling			
Specification No. LP-017	Issue Date: May 25th 2018	Revision Date:	Page 2 of 22

1 GENERAL

Horizontal Directional Drilling (HDD) is a trenchless construction method to install pipelines beneath features that require special attention to environmental and logistical concerns. Contractor shall conduct Work according to this specification or within the intent of this specification. The intent of these specifications is to define the specific, minimum requirements for the installation of the pipeline segments by Horizontal Directional Drilling (HDD). HDD is a method that is accomplished in three phases. The first phase consists of drilling a small diameter pilot hole along a designed directional path. The second phase consists of enlarging the pilot hole to a diameter suitable for installation of the pipeline. The third phase consists of pulling the pipe or conduit into the enlarged hole. HDD is accomplished using a specialized horizontal drilling rig with ancillary tools and equipment. The HDD Contractor shall have a demonstrated experience involving crossings of similar diameter, length of crossing and terrain.

2 FOREIGN LINE AND UTILITY CROSSINGS

The Company will have exercised due diligence in locating foreign pipelines and/or utility line crossings. However, the Contractor shall confirm the location of all such crossings and notify the owner prior to any HDD activity in the vicinity of the crossings. Contractor shall be responsible for all damages to foreign pipelines and/or utility line crossings during HDD operations. Contractor shall repair damaged foreign pipelines and/or utility line crossings to original or better condition and meet Company approval.

3 DRILLING PLAN

The Contractor shall submit with his bid a preliminary drilling plan that describes the pilot hole, hole opening and pullback procedures. At a minimum, the plan shall include the number and diameter of each hole opening pass, manufacturer and type of down hole tools, supports/rollers along the stringing area, guidelines for the bentonite properties (i.e. viscosity, etc.), drilling fluid down hole pressures and drilling fluid flow rate. This plan will be completed during the preconstruction phase for approval by Company. This plan must be approved by Company prior to construction. All drilling operations shall be performed by experienced supervisors and personnel. Contractor shall provide with his proposal resumes for all key personnel. The Contractor shall provide technical support, tool suppliers and required support systems used during this operation.

4 HDD CONTRACTOR RESPONSIBILITIES:

Contractor scope of work is inclusive of all work, materials and labor necessary for and incidental to, the management, planning, preparation, installation, pre-pull profile survey and final as-built documentation for the construction of the Horizontal Directional Drill

(HDD) crossings in accordance with the specifications and drawings included within this Contractual Package, and with Contractor's installation procedures as approved by Company.

Contractor shall provide all necessary labor, supervision, professional and technical services, installation plans and procedures, plants and equipment, vessels, materials (except where stated otherwise in the "Company-supplied Materials" list), consumables, inspections, surveying, diving, testing, mobilization/demobilization transportation, and shall perform the Work described in the Scope of Work including, but not limited to the following:

- Clearing, grading, and general site/access preparation necessary for construction operations, including installation of all turbidity mitigation structures (if required) and excavation of entry and exit holes.
- Transportation of all equipment, labor, consumables, and Company supplied materials, including pipe and appurtenances, to and from the jobsite.
- Erection of horizontal drilling equipment at the rig sites defined on the Drawings.
- Drilling of a small diameter pilot hole along the path defined on the Drawings.
- Reaming the pilot hole to a diameter suitable for installation of the prefabricated pull section.
- Prefabrication of the pull section.
- Hydrostatically pre-testing the fabricated pipe pull section before pullback.
- Installation of the prefabricated pull section in the reamed hole.
- If applicable, the marine pipeline installation contractor is responsible for tie-in of the marine end of the HDD segment to the pipeline system after completion of the final HDD hydrostatic test.
- Clean up and restoration of all work areas, including removal of installation aids and backfilling of entry and exit holes.

Contractor shall comply with the requirements of all permits issued by Federal or State Regulatory Agencies.

Contractor shall for the duration of the Work, assign the necessary qualified and experienced personnel, equipment, work areas, craftsmen, supervision, tools and all other materials and supplies to meet Project milestones. Key personnel shall be identified in Contractor's bid proposal. A qualified HDD Superintendent, approved by Company, shall

directly supervise construction at all times. At no time shall other work pre-empt Work being performed for Company, without Company written consent. Contractor shall not reassign key project personnel and/or equipment or vessels from Work being performed for Company without Company written consent.

Contractor shall work such hours, including extra shifts and overtime, necessary to meet the Contract Schedule specifically including the field coordination necessary to accommodate pull-back of the pipeline string fabricated and tested by others. Contractor and its Subcontractors shall accept the presence of Company Representatives on its premises, facilities and vessels for the purpose of coordination, inspection, monitoring, and review of any aspect of the Work.

All vessels and equipment required to perform the Work in State waters will be required to meet the "Zero Discharge" requirements. Contractor shall develop plans and procedures unique to onshore and offshore construction as designated by regulatory bodies.

5 ENVIRONMENTAL

Environmental concerns addressed within this section include those actions necessary to execute the Work, including reduction of impacts to the surrounding water and land, regulatory impacts, and general public impacts.

5.1 Work Space

Dewatering, including storm water, shall be completed per the Storm Water Pollution Prevention Plan (SWPPP).

All trash, removed vegetation, and waste shall be removed from the site and disposed of in a manner acceptable to the Company.

Workspace and access furnished by Company are defined on the Drawings. Additional workspace and access may be acquired by Contractor only with Company approval. The expense of acquiring additional workspace shall be borne by Contractor.

5.2 Water Supply

Contractor shall procure and transport water for drilling operations and hydrostatic testing from sources approved by the Company.

5.3 Hydrostatic Test Water Discharge

All hydrostatic test water shall be treated by Contractor to satisfy the SWPPP and all applicable permit requirements and discharged at a Company approved site. At no time shall discharge cause soil erosion, bottom sediment disturbance, nor affect safety.

5.4 Bentonite

Technical criteria for bentonite shall be as given in API Spec. 13A, Specification for Oil Well Drilling Fluids Material. The composition of all drilling fluids proposed for use shall be submitted to Company for approval. Drilling fluids shall comply with all applicable permit requirements and environmental regulations.

5.5 Drilling Fluids and Cuttings Disposal

Waste cuttings and drilling fluids shall be disposed of by Contractor at a Company approved disposal site. The construction areas will be checked a minimum of twice daily for signs of unplanned leaks or seeps. A written record shall be maintained by the Contractor of all inspections and submitted with his daily report to the Company Representative.

5.6 Sanitation Facilities

Sanitation facilities shall be provided and human waste shall be transported off-site for disposal. Contractor shall provide portable toilets, garbage containers, and services to empty and clean these facilities at all work sites.

5.7 Refueling and Equipment Maintenance

All activities involving fuels and lubricants shall be performed in accordance with the Contractor's Spill Prevention Control Plan (SPCP).

Both the Pipeline Installation Contractor and the HDD Subcontractor shall satisfy the requirements of appropriate regulatory agencies by providing a means to contain, monitor, and abate turbidity (if required) in the marine environment while performing HDD's, including to the maximum possible extent, the capture and containment of any drilling mud/fluids that may escape the HDD holes.

Contractor shall provide all appropriate means to suppress the sound level at onshore residential and business areas to a level that will not disturb the occupants of those areas.

These noise suppression means shall include but shall not be limited to sound -reducing engine exhaust systems, enclosing the engines and equipment in tents and temporary acoustic walls between the occupied buildings and the work site.

Contractor shall comply with all the environmental and erosion and sediment control requirements. An Environmental Response Team shall be formed to respond to changing environmental conditions and emergencies. Examples where an Environmental Response Team would be required include:

- Potential sedimentation or watercourses, wetlands, or waterbodies as a result of rainfall.
- Earthen berm failure.
- Inadvertent discharges.
- Zero Discharge violation from marine vessel.

The Environmental Response Team shall be available on a 24-hour basis and be responsible for responding to and implementing the necessary remedial action.

6 SAFETY

The safety of the general public, Contractor personnel, and Company personnel is of paramount importance. No construction activity shall occur which in any way compromises a safe operation. The Contractor shall at all times provide for the safety of all pipeline construction personnel and the general public during drilling operations by doing the following:

- Restricting access to the immediate area involving the drilling operation to only those personnel engaged in the actual operation of the drilling equipment, Company Inspectors, and Company visitors that have been subject to a safety presentation.
- Prohibiting pipeline work in or around the drilling site not directly associated with the drilling operation.
- Providing and installing construction warning signs as necessary in the vicinity of the work site.

The Contractor shall comply with all applicable laws, orders, regulations, and ordinances, whether Federal, State, County, or Local, pertaining to safety. Adherence to these regulations shall be mandatory in and around all Company workplaces, including off right-of-way sites that the Contractor set up as part of the overall project. Personal

protective equipment shall be worn at all times. The equipment shall include safety shoes, hard hats, and eye protection and hearing protection as needed.

7 PROTECTION OF UNDERGROUND FACILITIES

Contractor shall undertake the following steps prior to commencing drilling operations in a location that might contain underground facilities.

- Contact the utility location/notification service (One Call), if available, for the construction area. Records of the appropriate "one calls" shall be kept for the duration of construction. If, after initiating the "one call" process, there are known facilities in the area that have not been marked, the owner/operator shall be contacted to mark their facility.
- Positively determine the location and depth of and stake all existing lines, cables, or other underground facilities including exposing any facilities that are located within 15 feet of the designed drilled path.
- Modify drilling practices and downhole assemblies to prevent damage to existing facilities.

Contractor shall be responsible for locating all underground facilities regardless of Company previous efforts in this regard. Contractor shall be responsible for all losses and repairs occasioned by damage to underground facilities resulting from drilling operations.

8 SUBMITTALS

All procedures or material descriptions requiring Company approval must be submitted by the Contractor a minimum of ten (10) days prior to commencing any HDD activities at the proposed crossing locations. The work shall not commence until said documentation has been approved by Company and lack of Contractor-obtained approval shall not constitute grounds for extra work claims by Contractor.

9 RIGHT-OF-WAY, WORKSPACE AND ACCESS

All Contractor and equipment must stay within the designated right-of-way, access roads, and workspace as shown in the construction drawings. No work is allowed outside of the right-of-way and workspace. The Contractor shall set-up all necessary equipment, personnel and materials, set up work areas on the entry and exit sides of the crossing and prepare the sites for construction. The Company will mark the construction workspace

and sensitive area boundaries. The Contractor shall not go outside the provided workspace or disturb any sensitive area. The Contractor shall meet the requirements and/or stipulations of each landowner in accordance with the ROW Line List.

If additional workspace is required for an onshore worksite, Contractor shall prepare a written request including drawings that describe the extent of the workspace requested and a compelling argument that clearly demonstrates the need for the additional workspace. Any expense associated with acquiring additional workspace shall be the responsibility of the Contractor. The Contractor is advised that the acquisition of additional workspace will be subject to review by the various permitting agencies. The Company will make an effort to acquire the requested workspace; however, the Company cannot guarantee the timely approval of the request.

All access roads and routes, both public and private, shall be prepared and maintained by the Contractor. The Contractor shall restore access roads to their original condition. This work shall meet with the approval of the applicable land owner(s) and/or agencies.

9.1 Entry Side

The Contractor shall remove fences, trees, shrubs, trash and debris, and set up workspace shown on plan and profile drawing. Contractor shall, at a Company approved site, dispose of all timber, stumps and rock as required to not impede construction activity. Contractor shall not damage those trees marked and/or fenced by Company on and/or adjacent to the workspace. The area shall be graded and a 12-in. high containment berm built around the mud pit or as required by permits. The site shall contain the horizontal drilling rig, pipe storage racks, mud pumps, primary pickup pits, mud tank, shaker/desander-desilter, disposal pits, water cleaning equipment, dry storage area for drilling fluid additives (etc.), offices, a crane area and parking facilities.

9.2 Exit Side Including Pipe Stringing Area

The Contractor shall remove fences, trees, shrubs, trash and debris, and set up a temporary work area as shown on plan and profile drawing. Contractor shall, at a Company approved site, dispose of all timber, stumps and rock as required to not impede construction activity. Contractor shall not damage those trees marked and/or fenced by Company on and/or adjacent to the workspace. The area shall be graded and a 12-inch high containment berm built around the mud pit or as required by permits.

10 PLANS AND PROCEDURES

10.1 Prior to Award of Contract

Preliminary data shall be submitted with the proposal in sufficient detail for Company to evaluate the compliance of the proposed directional drilling plan with the specification, Corps of Engineers (COE) permit and other governmental regulations.

10.2 Prior to Commencement of Work

Contractor shall submit written descriptions of equipment, methods and procedures for completion of the Work prior to commencement of Work. Equipment descriptions shall include model, date of manufacture and data sheets including capacities and ratings. Methods and procedures shall include descriptions of approach to the Work and individual procedures required to affect the overall method. As part of this requirement, Contractor shall show the plan of the drill site equipment layout, including location of erosion and sediment control devices, water, drilling mud treatment equipment, design profile drawings, etc., and a site specific safety program to protect Contractor and Company personnel, the public and the environment.

Contractor shall submit an execution plan with scope of work and schedule, design profile drawings, and detailed procedures to Company for approval prior to commencing Work for the following operations as applicable for marine and land HDD:

- Type and size of drilling rig
- Type and size of drill pipe
- Type and size of rollers and other support equipment
- List of other equipment to be used
- Procedures for excavation of entry and exit transition trenches, including type of vessels, expected production rate and method of retaining resultant spoil to be used for marine trenching.
- Mud plume discharge control during excavation and directional drilling.
- Pilot hole drilling procedure
- Reaming operation
- Mud system and control
- Buoyancy control
- Pullback procedure

- Type of drilling fluid including additives
- Inadvertent discharge control
- As applicable for onshore worksites, drilling fluid disposal including name and location of off-site facility.
- Directional drilling profile, pipe stress calculations, drawings, and method for monitoring the borehole profile.
- Procedures for directional drilling of the crossing, including design profile, specified limits on pressures, tensions, sea-state motion, flow or other limits within the capabilities of Contractor's equipment.
- Method of monitoring drilling progress.
- Procedures for positioning of the pipeline and pull back of the pipeline in the crossing.
- Maximum variance expected during directional drilling due to variations in mud types, weights and flow capacities.
- Procedures for insuring stability of the pipeline at the transition areas until the final tie-ins are completed.

10.3 Construction Final Report

Contractor shall maintain a separate set of plan and profile construction drawings on site during construction. Details will be neatly marked on these drawings on a daily basis. If changes are required which cannot be marked on the drawings, the Contractor shall prepare a neat sketch complete with dimensions and notes. At the end of the job the Record As-Built Drawing will be signed by the Contractor and turned over to the Company.

Prior to pipe pullback, Contractor's actual drill profile shall be submitted to the Company for approval.

Within ten (10) days of completion of all Work, Contractor shall submit six copies and one reproducible of the as-built drawing, accurately depicting the location of the directionally drilled crossing entry and exit points, a plan and profile of the pipeline in grid coordinates and the drilling mud and water disposal records.

11 DIRECTIONAL DRILLING REQUIREMENTS

11.1 General

Contractor shall ensure that all HDD operations are performed utilizing supervisors and construction personnel thoroughly experienced in HDD. All required support, including drilling tool suppliers, survey systems, mud cleaning and disposal (excluded for water-to-water HDD), and other required support systems to be used during the HDD operation shall be provided by the Contractor.

The Contractor shall take precautions, if applicable, to maintain all benchmarks, survey monuments and other stationing positions in and around the onshore drill site.

11.2 Preliminary Trenching Requirements

Contractor shall be responsible for preparing all entry and exit holes prior to commencement of drilling operations. The holes shall be contoured to attain the design radii of curvature of the Company-approved design. All spoil resulting from the formation of the holes shall be returned to the hole after completion of the Work. The longitudinal and transverse profiles of the holes shall be proven to the satisfaction of the Company Representative with appropriate survey methods - diver pneumo readings shall not be accepted as an appropriate survey method in marine drills.

11.3 Drilling Fluids

The composition of all drilling fluids proposed for use shall be submitted to Company for approval. No fluid will be approved or utilized that does not comply with permit requirements and environmental regulations.

The drilling fluid used shall be a mixture of freshwater, bentonite, and polymers. Any polymers used to enhance the drilling fluid shall be environmentally safe and be approved for use by the Company. The polymers that are to be used shall be submitted with the Bid. The specific composition of the proposed drilling fluids shall be submitted to the Company for approval. No fluid will be approved that does not comply with the permit requirements and environmental regulations. All fluids and materials used shall have the corresponding MSDS information available on site.

The Contractor shall maximize the re-circulation of drilling fluid surface returns, with the understanding that subsea returns are typically not recoverable. Contractor shall provide solids control and fluid cleaning equipment at onshore drilling site(s). The equipment used shall be capable of processing the surface

returns and produce a fluid that is suitable for reuse. The Company shall have the option of specifying standards for the equipment performance and the treatment of excess drilling fluids and spoil.

Disposal of excess drilling fluids is the responsibility of Contractor and shall be conducted in compliance with all environmental regulations, right-of-way and workspace agreements, and permit requirements. Drilling fluid disposal procedures proposed for use shall be submitted to Company for approval. No procedure may be used which has not been approved by Company.

11.4 Inadvertent Returns

The Horizontal Directional Drilling operation will be a closed system to eliminate the discharge of water, drilling fluids and cuttings to areas involved in the construction process other than the entry and exit pits. Contractor shall employ his best efforts to maintain full annular circulation of drilling fluids. Drilling fluid returns at locations other than the entry and exit points shall be minimized. Contractor shall provide equipment and procedures to maximize the recirculation of drilling fluid to minimize waste. In the event annular circulation is lost, Contractor shall take steps to restore circulation. If inadvertent returns of drilling fluids occur, they shall be immediately contained with barriers (i.e. hay bales, silt fences, etc.) and/or a containment pit as necessary. Drilling fluids shall be collected using pumps or if the amount of inadvertent returns is not enough to practically pump, the affected area shall be diluted with fresh water and the drilling fluid will be allowed to dry and dissipate naturally in upland areas. If surface returns exceed what can be contained as described, drilling operations shall cease until inadvertent returns are under control.

Contractor shall provide equipment (graders, shovel, etc.) and materials (such as ground sheets, hay bales and/or silt fences, booms, absorbent pads, etc.). Equipment shall be maintained on site and materials stockpiled and readily available for use during clean-up, erosion control and contingencies, as necessary.

11.5 Drilling Water

Contractor shall be responsible for obtaining, transporting, and storing any water required for drilling fluids and, as applicable, for the containment and the disposal of all drilling water in accordance with the governing permits and requirements. Company, at its option, may secure a water source for Contractor.

11.6 Instrumentation and Survey

Contractor shall at all times provide and maintain instrumentation which will accurately locate the pilot hole, measure drill string axial and torsional loads, and measure drilling fluid discharge rate and pressure. Company will have access to these instruments and their readings at all times. A log of all recorded readings shall be kept and become a part of the "As-Built" information to be supplied by Contractor.

The path of the pilot hole shall be monitored during drilling by taking downhole survey readings at intervals not to exceed 30 feet. These readings shall be used to calculate the horizontal and vertical coordinates of the downhole probe as it progresses along the pilot hole. Recorded data and calculations from downhole surveys shall include, but not be limited to, the following items.

- Course Length. The distance between two downhole surveys as measured along the drilled path.
- Measured Distance. The total distance of a downhole survey from the entry point as measured along the drilled path; also the summation of the course lengths
- Inclination. The angle at which the downhole probe is projecting from the vertical axis at a particular downhole survey point; vertically downward corresponds to zero degrees.
- Azimuth. The angle at which the downhole probe is projecting in the horizontal plane at a particular downhole survey point; magnetic north corresponds to zero degrees.
- Station. The horizontal position of a downhole survey measured from an established horizontal control system.
- Elevation. The vertical position of a downhole survey measured from an established vertical control system.
- Right. The distance of a downhole survey form the design path reference line; positive values indicate right of the reference line while negative values indicate left of the reference line.

Additional data that shall be recorded is listed below:

- Bit of Probe. The distance from the drilling bit (leading edge) to the downhole probe.
- Heading. The magnetic line azimuth to which the drilled path reference line corresponds.

- Rig Setback. The distance from the drill bit when first placed on the drilling rig as measured from the staked entry point.
- BHA Length. The length of the Bottom-Hole Assembly

The Contractor shall provide the necessary HDD equipment including a wireline magnetic guidance system supplemented by the Tru-Tracker System (or Company approved equivalent as applicable for marine HDD operations) and readout instrumentation. The Contractor shall provide HDD operators experienced in the operation of the above equipment. At the beginning of the drill, the course azimuth shall be verified and adjusted as needed.

Contractor shall monitor the position of the drill string with precise downhole survey instruments and verified with surface location equipment, i.e., tru-tracker or equal. Contractor shall compute the position in the X, Y and Z axis relative to ground surface from down-hole survey data a minimum of once per length of each drilling pipe (approximately 30-ft. interval). Deviations between the recorded position of the drill string and the plan and profile drawing shall be documented and immediately brought to the attention of the Company.

11.7 Pilot Hole Drill Tolerances

Contractor shall provide and maintain instrumentation that will accurately measure drilling fluid discharge rate and pressure. Company shall have access to instruments and their readings at all times.

The Pilot hole shall be drilled along the path shown on the plan and profile drawing within Company tolerances. However, right-of-way restrictions, foreign lines, utility crossings and/or structures shall take precedence over Company tolerances. Regardless of the tolerance achieved, no pilot hole will be accepted if it will result in any, or all, of the pipeline being installed in violation of right-of-way restrictions. The entry and exit points as shown on plan and profile drawings shall be located using traditional survey methods.

Allowance of tolerances does not relieve Contractor from responsibility for safe operations or damage to adjacent utilities and structures.

- The elevation along the profile shall be within plus 0 feet and minus 10 feet.
- The horizontal alignment shall be within plus or minus 10 feet as long as the pilot hole does not come to within 10 feet of the permanent right of way.
- The pilot hole shall penetrate the ground at the Entry Point at the exact location shown on the drawings and staked by the Company in the field.

- The pilot hole shall exit the ground surface at the Exit Point within plus or minus 15 feet of the alignment and plus 40 feet minus 0 feet of the length as shown on the drawings.

If the pilot hole fails to meet with the above tolerances, the deviations will be subject to approval by the Company. If the Company does not approve the deviations, the Contractor shall drill another pilot hole, at its cost.

11.8 Pilot Hole Final Location

The Contractor shall, upon completion of the pilot hole, provide a tabulation of the coordinates. This tabulation shall be in addition to the log of recorded readings required under "Instrumentation". The coordinates shall be referenced to the drilled entry point and shall accurately describe the location of the following:

- Entry and exit points
- Drilled profile
- Actual entry and exit angles
- Actual entry and exit radii of curvature

11.9 Reaming

Once the pilot hole has been completed, the hole must be enlarged to a suitable diameter for the pipeline. The reaming is accomplished by enlarging the hole by pulling back the reamers in successively larger diameters. The Contractor shall determine the number and sizes of the reaming passes.

11.10 Lost or Stuck Tools

Any tools or other metal objects lost downhole shall be reported to the Company Representative. Metal objects shall be fully recovered prior to pipe pullback unless specifically approved otherwise by the Company Representative. Failure to recover metal objects lost downhole shall constitute just cause for rejection of the hole. Company is not responsible for the cost of lost tools downhole.

11.11 Minimum Curve Radius

Curves shall be drilled according to Company-provided Construction Drawings. Curves shall be drilled at a radius equal to or greater than that shown on the plan and profile drawing. Contractor shall calculate the drilled radius over any three joint (range 2 drill pipe) segments using the following formula:

$$R_{drilled} = (L_{drilled}/A_{avg})*57.32$$

Where:

$R_{drilled}$ = drilled radius over $L_{drilled}$

$L_{drilled}$ = length drilled, no less than 75 feet and no greater than 100 feet

A_{avg} = total change in angle over $L_{drilled}$

The horizontal deflection shall not exceed the limits of the permanent ROW as shown on plan and profile drawing; however, in all cases, right-of-way restrictions, foreign lines and utility crossings shall take precedence over horizontal deflection tolerance. Contractor shall provide to the Company, on demand, the data generated by the down-hole survey tools in a form suitable for independent calculation of the pilot hole profile.

Contractor shall conduct field measurements and shall provide to Company those as-built sketches and supporting documentation required to satisfy company that the final overbend of the pipe string will meet the tolerances of the designed overbend.

11.12 Hole Rejection and Abandonment

In the event the drilled profile fails to meet these specifications, or metal objects are lost downhole, the Company may reject the drilling attempt. Upon notice of rejection, the Contractor shall abandon the hole. The Contractor shall submit a proposed profile for an additional drill attempt to the Company for approval. If approved, the Contractor shall complete the crossing accordingly. No additional compensation shall be paid for failed attempts.

11.13 Pipe Fabrication

The pipe string shall be fabricated in the workspace in one continuous section unless otherwise specified on a site-specific basis. Pipe fabrication shall be conducted in accordance with the Specification for Onshore or Offshore Pipeline Installation.

The completed prefabricated pipe section will be subject to a 4-hr preliminary hydrostatic test conducted in accordance with the Specification for Onshore or Offshore Pipeline Installation.

12 PIPE INSTALLATION AND PULLBACK OPERATIONS

12.1 Welding

The Contractor shall provide qualified welders to perform the work. Every welder shall be tested by Company in accordance with API 1104 and Company Specifications.

All girth welds will have 100% radiographic inspection and be in accordance with API 1104 and Company Specifications.

12.2 Girth Weld Coating and Coating Repairs

The Contractor shall repair pipe coating damaged after receipt from the Company. FBE coating repair shall be inspected with a Company-approved electronic holiday detector. Surface preparation, pipe coating repairs and inspection of coating repairs shall be in accordance with the Company Specifications. Contractor shall coat all field joints in accordance with Company specifications to the thickness specified in the Scope of Work.

12.3 Pre-reaming

Contractor shall conduct pre-reaming operations to insure that a hole sufficient to accommodate the pull section has been produced. The hole shall be pre-reamed to the minimum of: 150% of the outside diameter of the pull section, or twelve inches (12") plus the outside diameter of the pull section. Any damage to the pipe resulting from inadequate pre-reaming shall be the responsibility of Contractor.

12.4 Pullback

Prior to pull back, the HDD Contractor shall submit the actual drilled profile to the Company for approval. Contractor shall conduct field measurements and shall provide to Company those as-built sketches and supporting documentation required to satisfy company that the final overbend of the pipe string will meet design tolerances.

The pull back section shall be installed in one continuous string with no tie-in welds unless stated otherwise in the Company approved drilling plan. Once pullback operations have begun, the Contractor shall work continuously until the pipeline has been successfully installed.

12.5 Pulling Loads

The maximum allowable tensile load imposed on the pull section shall be equal to 90% of the product of the specified minimum yield strength of the pipe and the area of the pipe section. If more than one value is involved for a given pull section, the lesser shall govern.

Contractor shall provide and maintain instrumentation, which will accurately measure drill string axial and torsional loads. Company shall have access to instruments and their readings at all times.

12.6 Pull Section Support

The pull section shall be supported as it proceeds during pull back so that it moves freely and the pipe and corrosion coating are not damaged. During the pullback operation, Contractor shall monitor roller operation and use sidebooms if required to assist movement of the pipe. Situations that cause coating damage shall be corrected immediately. Contractor shall repair coating damage to Company Coating Specifications before pulling operations resume.

12.7 Torsional Stress

A swivel shall be used to connect the pull section to the reaming assembly to minimize torsional stress imposed on the section. The swivel will be load tested prior to mobilization to site. The load test will be witnessed and documented by Company representative.

12.8 External Collapse Pressure

As applicable particularly for HDPE pipelines, the pull section shall be installed in the reamed hole in such a manner that external pressures are minimized and an appropriate counter balancing internal pressure is maintained. Any damage to the pipe resulting from external pressure during installation is the responsibility of the Contractor.

12.9 Buoyancy Modification

A buoyancy control system may be required during pull back, and if so, the installation plan shall be submitted to the Company for approval a minimum of ten (10) days prior to start of work. The Contractor is responsible for supply of all appurtenances necessary to add either weight or buoyancy to the pipe string. Any damage to the pull section resulting from the buoyancy modification is the responsibility of the Contractor.

12.10 Hydrostatic Testing

The entire pull section shall be subjected to a hydrostatic test prior to being installed in the hole. The test pressure and duration shall be as per the Scope of Work and in accordance with Construction Specifications.

The entire pull section shall be tested complete or as sub-assemblies prior to final reaming. Test pressure shall be for a minimum four (4) continuous hour duration or per test design and be documented and performed in conformance with Company Specifications.

This preliminary hydrostatic test is a pretest and shall not preclude the requirement for an 8-hour test of the entire in-place crossing after installation.

12.11 Caliper Pig/Sizing Plate

If required by Company, the completed crossing will be inspected with a caliper pig or a sizing plate to determine if any dents, buckles or ovalities are present. Any dents, buckles or ovalities found that do not meet the criteria of the Company, must be rectified to the satisfaction of the Company Representative.

13 MARINE SUPPORT

13.1 Mobilization and Demobilization for Each Phase of Work

Mobilization of installation vessels and equipment spread(s) to the Project Site will be deemed complete when all Contractor vessels including primary work vessels, water supply vessels, and all supporting vessels, equipment and personnel for that spread are at the Project Site, in position and able to commence work. For anchored barges, this implies mobilization is complete when the last anchor is set.

Demobilization of an installation vessel spread(s) will be deemed complete when all Contractor's vessels including primary work vessel(s), survey vessel, and other vessels, and all required spread equipment and personnel for that spread have departed the Project Site and de-rigged the drilling equipment from the marine vessels upon completion of the Work.

Contractor shall not mobilize an installation spread to site until it has been inspected by Company personnel and until it has received Company agreement with the installation procedures proposed for execution of the Work. Contractor shall not demobilize an installation vessel spread until Company and Contractor mutually agree that the Work for that spread is materially complete.

13.2 Marine Support Equipment for Horizontal Directional Drill (HDD) Crossing Installation

The Pipeline Installation Contractor shall be responsible to perform excavation operations at the HDD entry and exit holes to ensure the pipeline maintains the designed overbend radius and is not overstressed at either location. Flotation excavation for the installation equipment and ditches for the pipe strings may also be required, dependent on Company-approved installation procedures. The top of all pipelines shall be installed a minimum of three (3) feet below pre-disturbed natural bottom. The method proposed by contractor shall be approved by Company before implementation.

At all locations where the pipeline installation activities and vessels may pose a hazard to marine traffic, Contractor shall provide all markings with signs and lights throughout the installation in accordance with current Coast Guard standards and practices. Contractor shall provide all personnel, equipment, services and consumables required to maintain these markings throughout the duration of the project.

The Pipeline Installation Contractor will be responsible for laying the pipeline. A length of pipeline "tail" will be installed with the drill string pipe during pipe lay operations for the drill string. This will allow the pipeline to extend from the drill entry and exit holes for a length that will allow the pipeline installation Contractor to safely continue with pipeline installation, whether by standard lay methods or by davit lift. Contractor shall review the length of exposed pipeline "tail" required to lift the drill string pipe and tie it into the pipeline system. Should marine installation requirements merit such, alternative HDD profiles may be proposed upon contract award and such alternatives will be subject to Company approval.

In all cases Contractor is responsible to confirm to Company within seven (7) days of contract award the total length of pipeline tail required such that Company may have as much time as possible to acquire the requested line pipe.

Contractor shall provide/mobilize/demobilize all personnel, consumables, installation aids and equipment necessary to establish and monitor the position of the drilling string, including but not limited to performance of a preliminary survey prior to start of the work as well as to the tasks required to monitor the location of the drill string on an ongoing basis during running of the pilot string. Contractor shall also provide all personnel, consumables, installation aids, support vessels, and equipment required at the HDD entry hole (drill rig side) for a successful HDD installation, including but not limited to jackup vessel(s) and/or

moored barge(s), guides (goal posts) for drill string, mooring piles and hold-back anchors as required, HDD equipment and frac tanks or other acceptable method of storing fresh water for the drilling mud. Contractor shall be responsible for supply of all drilling mud constituents. Contractor vessels and equipment shall be marked and lighted and Contractor shall take all appropriate action (maintain radio and radar watches, notification to the USCG Safety Office, etc.) to ensure its safety especially when operating in close proximity to ship channels.

Contractor shall provide/mobilize/demobilize all personnel and specialty equipment required at the HDD exit hole (pipeline side) to support a successful HDD installation, specifically including those services and equipment necessary to communicate with and coordinate with the drilling operations in progress at the HDD entry hole.

Contractor shall be fully responsible for coordinating its activities with its HDD subcontractor to ensure delays are not encountered. Contractor shall be fully responsible for all Work performed by its subcontractor as if the subcontractor were fully integrated within Contractor's organization.

All Contractor's equipment and subcontracted marine vessels shall be in good working condition, properly rigged for its intended purpose and be capable to perform the Work. Contractor's marine vessels and equipment shall be in compliance with all applicable laws, rules, and regulations and shall be in every way fit for service in all weather conditions with its machinery, equipment and hull in such conditions as to permit the most efficient working thereof, and with a full and competent complement of master, officers, and crew appropriate for such vessel.

Contractor shall ensure that all marine vessels have, on the date of commencement of the Work, and throughout the performance of the Work, valid certificates of seaworthiness appropriate for the marine vessel's intended service hereunder issued by the appropriate governmental authority, a copy of which shall be made available to Company at Company's request, and Contractor shall at all times abide by its stipulations.

Contractor shall ensure that there are sufficient spare parts for such marine vessels and associated equipment to ensure that prolonged breakdown does not occur. Maintenance shall be so scheduled as to not take the vessel and its associated equipment out of its scheduled productive work cycle.

All marine equipment is subject to survey and acceptance by Company. Company will have the right to require additional, or alternative, marine equipment if Company vessel inspection finds that the spread is inadequate to perform the Work, or does not meet Company safety and environmental expectations. All Contractor provided installation vessels shall meet the Inspection Requirements, particularly related to Zero Discharge Requirements, if required.

14 AS-BUILT DATA

The Contractor shall maintain a set of construction drawings on site during the HDD operation. At the end of the job, a corrected set of drawing shall be submitted to the Company within ten (10) days.

15 BACKFILL AND SITE RESTORATION

The Contractor shall ensure that all trenched and excavated areas at the entry and exit sites have been restored to the approximate original contours as required by Company and/or regulatory agencies.

Contractor shall remove all equipment, material (fencing, pit liners, etc.) and waste from all work areas. The general work area and all other construction areas used during construction shall be restored and graded by Contractor to their original contours.

Fences, gates, and utilities, which were removed or altered during construction, shall be restored or replaced by Contractor.

Land restoration shall satisfy Company General Conditions, landowner conditions, specifications and agency approved permits and Environmental Construction Plan (ECP).

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CONSTRUCTION SPECIFICATION FOR LAND PIPELINE CONSTRUCTION

Specification Title: Pipeline Construction Near Powerlines			
Specification No. LP-018	Issue Date: May 25th 2018	Revision Date:	Page 1 of 22

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1. OVERVIEW

1.1. Introduction

The following specifications apply to pipeline construction that parallels overhead high voltage electric transmission lines in the same right-of-way or in close proximity thereto.

These specifications are not intended to be all inclusive, but represent minimum requirements only. These specifications are intended to minimize the hazard of electrical shock to personnel from induced voltages or fault currents that might appear on the pipe during the progress of construction. They are designed to remind the Contractor of the potential hazards, which may be associated with pipeline construction in the vicinity of induced voltages, fault current, and contact to high voltage electric transmission lines. Precautions in addition to those listed below may be necessary as conditions warrant. All personnel and material associated with this procedure will be provided by the Contractor.

The Contractor should review the project and initiate additional requirements as he/she deems necessary to ensure safety of persons and property affected thereby.

1.2. Guidelines

1.2.1. Piping parallel to, crossing, or in proximity of electric power transmission lines are subject to electrostatic and electromagnetic induced voltages and currents. The Contractor is required to provide trained electrical safety inspectors to supervise the necessary mitigating procedures associated with electrical safety on the pipeline. The Contractor and his/her personnel should be aware of safety requirements when construction crosses or parallels electrical power lines.

1.2.2. Department of Transportation regulation 49 CFR Ch. I states:

"Where a pipeline is located in close proximity to electrical transmission tower footings, ground cables or counterpoise, or in other areas where fault currents or unusual risk of lightning may be anticipated, it must be provided with protection against damage due to fault currents or lightning, and protective measures must also be taken at insulating devices."

1.2.3. The principal limiting factors of construction are the minimum sag of the wires and the distance from the conductors that must be maintained by

equipment operators to ensure against electrical shock resulting from induced voltage. In the latter case, the Occupational Safety and Health Administration (29 CFR Ch. XVII) dictates:

Except where electrical distribution and transmission lines have been deenergized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following:

1.2.3.1. For lines rated 50 kV., or below, minimum clearance between the lines and any part of the crane of load shall be 10 ft.

1.2.3.2. For lines rated over 50 kV., minimum clearance between the lines and any part of the crane or load shall be 10 ft. plus 0.4 in. for each 1 kV. over 50 kV., or twice the length of the line insulator, but never less than 10 ft.

1.2.3.3. In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 ft. for voltages less than 50 kV., and 10 ft. for voltages over 50 kV., up to and including 345 kV., and 16 ft. for voltages up to and including 750 kV.

The Contractor shall adhere to these regulations at all times. In addition, the minimum clearance for lines 750 to 1,000 kV shall be 20 ft. These guidelines are for ideal weather conditions, and the clearances shall be greater under more adverse weather conditions.

2. ELECTRICAL SAFETY INSPECTOR

2.1. Guidelines

The electrical safety inspector is the responsible person in charge of electrical safety during construction of the pipeline.

The Contractor with approval of the Company shall supply this inspector.

2.2. Requirements

2.2.1. The Electrical Safety Inspector shall:

a) have extensive knowledge of National and State codes for electrical safety;

b) be fully aware of proper grounding procedures and the dangers associated with inductive and conductive coupling, lightning, fault current, power arc, etc. on above and below ground structures; and

c) know the intrinsic hazards of the construction equipment being used and the safe distances from overhead conductors required.

2.2.2. The Electrical Safety Inspector shall:

a) furnish the instrumentation required to monitor voltage levels, and ascertain vehicle instrumentation, equipment, and authority required to ensure safe working conditions;

b) communicate at least daily with the power company dispatcher controlling the involved electric lines;

c) have stop task authority;

d) obtain weather information daily from the local weather office;

e) have the authority to inspect all pipeline and construction equipment grounding procedures; and

f) have a strong background in electrical distribution and grounding so that these duties can be fully understood.

3. WORK STOPPAGES

3.1. Introduction

Further reduction of the possibility of electrical hazards can be achieved if work on the pipeline is suspended during periods of severe weather, or when adjacent power lines are being energized or de-energized.

3.2. Guidelines

Since temporary grounding is not intended to safely mitigate voltages arising from lightning or power line faults, it may be necessary to halt all pipeline construction during inclement weather conditions.

The Electrical Safety Inspector, after discussions with the Contractor & Company Representative, shall decide when work is to be stopped.

3.3. Conditions

Work may be stopped if one or more of the following conditions prevail:

3.3.1. Any thunderstorm activity, in the area of overhead high voltage power lines.

3.3.2. Local electrical storms denoted by visible lightning or sound of thunder.

3.3.3. High winds and rain.

3.3.4. Scheduled switching on the electric power transmission system.

3.3.5. Repeated contravention by Contractor of any grounding procedure.

4. POTENTIAL MEASUREMENTS OF METALLIC FOREIGN STRUCTURES

4.1. Introduction

A foreign structure is any metallic structure in the right-of-way of the pipeline construction. Exposure of any metallic structure during trenching operations can represent a potential hazard.

4.2. Guideline

4.2.1. Measure voltage between the pipe and the exposed metallic foreign structure.

4.2.2. Record the voltage measurement on a data sheet (Figure 1).

4.3. Equipment Required

4.3.1. AC Voltmeter (Comparable to the Fluke 87 Series II Analog/Digital Multimeter)

4.3.2. Insulated Rubber Sheet

4.4. Procedure

If any metallic structures are exposed, check to see if they are coated. In the event that the structure is coated, the coating should prevent contact with any voltages that exist between the pipe and the foreign structure, although (if deemed necessary by the Electrical Safety Inspector) the structure should regardless be tested for high voltages. If the structure is not coated, then follow these steps:

4.4.1. Measure AC voltage(s) on the foreign structure

4.4.2. Record value(s) on a data sheet (Figure 1)

4.4.3. Pipe to foreign structure voltage > 15 volts?

a) YES - Wrap the structure with an insulated rubber sheet, similar to what electrical linesmen use when working on live conductors. If this does not prevent the voltage hazard, Grounding or Bonding procedures may be required. See page 15 for Grounding procedures, or page 18 for Bonding procedures.

b) NO - No special procedures are required.

The pipe shall not be grounded or bonded to a foreign structure without permission of the owner of the foreign structure. If the owner will not allow direct bonding or grounding, other provisions shall be made.

5. POTENTIAL MEASUREMENTS OF PIPE

5.1. Introduction

The pipeline to ground voltage of any string of pipe, exposed to contact by personnel, shall be measured periodically using a calibrated voltmeter of suitable range and high impedance (approved by Electrical Safety Inspector).

5.2. Equipment Required

5.2.1. AC Voltmeter (Comparable to the Fluke 87 Series II Analog/Digital Multimeter)

5.2.2. Pipe End Clamp.

5.3. Guidelines

5.3.1. The pipe to ground voltage must be measured on all welded pipe strings each day.

5.3.2. Measure voltage between the pipe and a steel pin at least 10 in. in the ground and 3 ft. from the string of pipe.

5.3.3. Record each voltage measurement on a data sheet.

5.4. Procedure (Figure 2)

5.4.1. Connect a pipe end clamp to the uncoated edge of the pipe joint.

5.4.2. Install a ground rod at least 10 in. in the ground and at least 3 ft. from the pipe. In the event ground rods cannot be driven to this depth due to solid rock in the area, a large metal plate or mesh with bonding cables attached shall be used. The plate should be around 20 ft. x 6 ft. in size, and should be dragged onto the site and covered with soil to make a ground connection.

NOTE: This step may be omitted if a ground rod or adequate ground system, meeting this criteria, is already in place.

5.4.3. Connect voltmeter to both pipe clamp and ground cable.

5.4.4. Set meter for AC volts.

5.4.5. Read AC volts from meter.

5.4.6. Record value on a data sheet at pipe - ground voltage.

5.4.7. Remove meter connections.

5.4.8. Measure pipe string length. Record value on data sheet.

5.4.9. Pipe to ground voltage > or = 15 volts?

a) YES - Grounding procedures required. See page 15 for grounding procedures.

b) NO - Grounding not required.

5.4.10. In the event that measured AC voltage above ground exceeds 30 volts, the electrical safety inspector shall issue appropriate warnings, and all work on the pipe string shall be suspended until potential is reduced to less than 15 volts with the driven ground rods.

5.4.11. Once the work on the pipe is complete and potential measurements are no longer required, remove the clamp.

6. GROUNDING OF PIPE TO CONSTRUCTION EQUIPMENT

6.1. Introduction

Each piece of equipment used to handle pipe in any way, such as for unloading, picking up, transporting, bending, or bonding, in the event current measurements show it is necessary, shall be equipped with a cable assembly capable of grounding the individual joints of pipe to the equipment handling that piece before the piece is moved. "Setting-in" booms shall be equipped with a ground cable, and the ground must be maintained at least until the stringer bead is completed. Rubber tired equipment should be grounded prior to grounding pipe to equipment.

6.2. Equipment Required

Grounding Cable Assembly

6.3. Procedure

a) Connect grounding cable assembly from construction equipment to the pipe joint.

b) Install supporting straps or slings as required.

c) Move pipe with construction equipment to desired location.

d) When pipe is set in place, remove all supporting straps.

e) Remove grounding cable assembly from the pipe joint.

7. GROUNDING OF PIPE DURING STACKING & STRINGING

7.1. Introduction

When handling pipe near, or parallel to, power lines, the following procedure as stated herein shall be followed:

7.2. Equipment Required

7.2.1. Ground Rod(s)

7.2.2. Grounding Cable Assembly

7.3. Procedure

7.3.1. Stack pipe joints per applicable stacking specs, or stack in a 10 (or less) joint stack.

7.3.2. Install a ½ in. (minimum size) ground rod at least 10 in. in the ground and at least 4 ft. from the stack.

7.3.3. Install a grounding cable between the ground rod and the stack.

7.3.4. Using grounding cables, daisy-chain each pipe joint in the stack to assure the entire stack of pipe is grounded.

7.3.5. Maintain the ground connection until each individual joint is removed from the stack.

7.3.6. Stringing of pipe is permitted as long as each joint is connected to a ground.

A single ground rod can be used for multiple joints of pipe connected together up to 400 ft. in total length.

8. OPERATION OF CONSTRUCTION EQUIPMENT

8.1. Introduction

Rubber tired vehicles operating on the right-of-way are also subjected to induced voltages from the proximity to power lines.

8.2. Equipment Required

8.2.1. Grounding Chain

8.2.2. Grounding Cable Assembly

8.2.3. Ground Rod

8.3. Procedure

8.3.1. Upon entering and operating on an electric power transmission right-of-way, attach a chain to the vehicle's frame of suitable length to maintain contact with the ground.

8.3.2. Park vehicles no closer than 200 ft. from the right-of-way unless the vehicle is grounded.

Each fuel truck shall be equipped with a cable assembly capable of completing an electrical bond between the truck and any piece of equipment to be fueled. Fuel trucks and equipment must be grounded with a ground rod prior to grounding between them. It is required that this bond be made each and every time, prior to any part of refueling operations are completed. Care shall be taken where the cable attachments are made so that good electrical continuity is established.

Rubber tired vehicles shall not be refueled on the electric power right-of-way unless (1) the vehicle is electrically bonded to the fueling facility/vehicle prior to commencement of the refueling operation, and (2) the refueling vehicle is grounded to earth.

Rubber tired equipment parked for any appreciable time on a power line right-of-way may collect a considerable charge of static electricity. Efforts should be made to park such vehicles away from overhead lines. Vehicles should be parked no closer than 100 ft. from the base of electric line towers.

All tired vehicles, if parked on the right-of-way for over 5 hours, must be grounded with at least a ½ in diameter ground rod that is driven or screwed to a depth of at least 4 ft. All vehicles which might be parked on the right-of-way for 5 hours or more at a time shall be equipped with a ½ in. copper ground rod and connecting cable assembly. Cable shall be at least No. 8 AWG and have insulated clips capable of completing an electrical bond between the ground rod and the automobile. Each time an automobile is parked on the power line right-of-way, the ground rod shall be pushed as far as possible into the ground, and an electrical connection made between the rod and the automobile. This bond shall remain as long as the car is parked on the power line right-of-way. Signs shall be posted for "authorized vehicles only."

If rubber tired equipment is required to move about, then a short chain can be dragged behind the equipment for grounding in lieu of using a ground rod as stated above. The chain shall be heavy duty with at least 1½ in. links. The Contractor is to provide the Company's vehicles with the equipment for grounding.

At all times during construction, care must be exercised to assure that booms and cables are no closer than 10 ft. from overhead power lines. Minimum mid-span height between power line towers can range anywhere between 20 and 25 ft. Usually this height is greater, but in some cases the power lines may sag to this low, or even lower. Height should never be taken for granted, but should be investigated in each case. Check with the local power company for vehicle clearance. Consideration must also be given to the possibilities of broken cables whiplashing close to power lines. Each piece of equipment shall be positioned so that should this occur, the cable would not come closer than 25 ft. from a power line.

9. CONNECTING & DISCONNECTING GROUNDING FACILITIES

9.1. Introduction

Pipeline grounding is accomplished using ground rods and clamps as shown below. To avoid personal injury or arc damage on the pipe, the following steps are required.

9.2. Guidelines

Ground pipe using single No. 2 AWG welding cable or equivalent.

9.3. Equipment Required

9.3.1. Ground Rod

9.3.2. Grounding Cable Assembly

9.3.3. Pipe End Grounding Clamp

9.4. Procedure (Figure 3)

9.4.1. A ground rod at least 10 in. in the ground and at least 3 ft. from the pipe.

9.4.2. Connect pipe end grounding clamp to the pipe. WARNING: there is a possibility that a voltage will occur on the pipe that may be a safety problem even while the operator is connecting the pipe end grounding clamp to the pipe. Due to this risk, the operator should use insulating tools and gloves, and should avoid standing in wet ground. Any other special precautions deemed necessary should also be followed.

9.4.3. Connect grounding cable to the grounding facility/rod.

9.4.4. Connect grounding cable to the pipe end grounding clamp.

9.4.5. Cables used for temporary grounding attachments shall have good mechanical strength as well as high conductivity. The cable shall be single conductor AWG No. 3, 1715-strand welding cable or equivalent. Cable attachments to temporary grounding systems shall be made using a method that assures good electrical contact with the pipe metal, and which applies firm pressure. The method of attachment should have a current carrying capacity of at least 200 amperes. Connections may also be made by the Thermite weld process, but under no circumstances should there ever be any arc welding of temporary clamps.

When grounding joints or strings of pipe, the ground rod shall be driven, and the connection between the rod and the ground cable made first. The connection between pipe and ground cable may then be made. Removal of all cables shall be in reverse order, that is, the cable should be disconnected from the pipe first. All grounding attachments or removals will be made by or under the direct supervision of the electrical safety inspector.

Each string of welded pipe that is between loose ends shall temporarily be grounded to a ground rod at least ½ in. in diameter, and which is driven to a

depth of at least 4 ft. Any string of continuously welded pipe in excess of 2,000 ft. shall be grounded at least twice, and strings of pipe should be limited to 3,000 ft. long. These temporary grounds shall be maintained until the sections are tied into portions of line that have permanently been grounded with zinc wire or magnesium anodes and backfilled.

It is acceptable to use bare road casing for additional grounding during construction. This may be done by attaching a bond cable between any exposed metallic surface of the pipeline and the bare casing. Any bonds made for this purpose must be removed before the backfilling operation.

It is acceptable to use straight polarity welding for stringer bead should the electromagnetic field produced by the power lines cause magnetization of the pipe.

When the pipeline no longer requires grounding, the grounding system may be disconnected.

9.4.6. Disconnect the grounding cable from the pipe end grounding clamp.

9.4.7. Disconnect the pipe end grounding clamp to the pipe joint.

9.4.8. Disconnect the grounding cable from the ground rod.

9.4.9. Remove the ground rod.

To avoid injury, follow the connecting and disconnecting procedures in the order shown.

10. BONDING OF PIPING AT TIE-INS & CUT-OUTS

10.1. Introduction

Coordination is essential when conducting tie-ins and bonding across these pipes. Bonding of a tie-in can transmit a voltage hazard remote from this tie-in.

10.2. Guidelines

10.2.1. Bond all piping at tie-ins and cut-outs regardless of pipe-ground voltage, prior to piping work (tie-in, cut-out).

10.2.2. Bond piping with single No. 2 AWG welding cable or equivalent.

10.3. Equipment Required

10.3.1. Grounding Cable Assembly

10.3.2. Grounding Clamps

10.4. Procedure (Figure 4)

10.4.1. Connect pipe grounding clamps to each side of the tie-in.

10.4.2. Connect the grounding cable between the pipe grounding clamps.

10.4.3. When bond is installed, a pipe-ground voltage measurement should be taken and recorded. (See section E for Potential Measurements of Pipe). If the pipe-ground potential exceeds 15 volts, the Electrical Safety Inspector shall mandate special precautions.

10.4.4. Coordinate and schedule all tie-in bonding with the Electrical Safety Inspector and the Contractor.

10.4.5. Begin piping work (tie-in or cut-out).

10.4.6. Maintain all temporary grounds until section is tied-in to the line and permanent grounding is installed.

10.4.7. Final Coating of all tie-in welds and Thermite weld points must be performed using insulated gloves and boots, and under the supervision of the Electrical Safety Inspector.

11. TEMPORARY GRADIENT CONTROL MATS

11.1. Introduction

Temporary Gradient Control Mats are required during construction for personnel safety when working on exposed portions of the pipeline. The mats are also used after construction on aboveground portions of the pipe, in areas where a permanent gradient control mat is not present and there is a possibility of touch and step voltages greater than 15 volts.

11.2. Guidelines

All attachments for temporary grounding systems shall be made by a method that assures good electrical contact and applies firm pressure. Cable for temporary pipeline grounding shall have good mechanical strength as well as high conductivity.

The grounding cable shall be single conductor No.6 AWG welding cable or equivalent. The method of attachment must have a current carrying capacity of at least 200A. Connections may also be made by Thermite weld process, but absolutely no arc welding of temporary clamps will be permitted.

Construct temporary mats of 50mm chain linked galvanized steel fencing per diagram below.

11.3. Equipment Required

11.3.1. Gradient Control Mat (chain linked galvanized steel fencing).

11.3.2. Grounding Cables.

11.4. Procedure (Figure 5)

11.4.1. Stretch fencing in the "Y" direction.

11.4.2. Tighten tension bars.

11.4.3. Extend ground mat a minimum of 3 ft. outside work area in all directions.

11.4.4. Connect grounding mat to the pipeline at two separate connections with grounding cables.

12. GRADIENT CONTROL MATS

12.1. Introduction

A part of the permanent pipeline mitigation system are the gradient control mats at above ground structures. These mats should be constructed and installed following pipeline installation, but prior to making a tie-in.

12.2. Guidelines (Figure 6)

A gradient control mat consisting of zinc ribbon (or an approved six-gauge zinc coated steel mesh) covered with a washed crushed stone shall be installed at valve sites or appurtenances, where required.

Permanent zinc ribbon grounding facilities shall be installed by grounding personnel in accordance with the specifications of the pipeline project.

These facilities shall be installed at each grounding location following pipeline installation.

Grounding cable between zinc ribbon and the pipe shall be No.6 AWG.

Crushed stone shall extend a minimum of 1ft. beyond zinc ribbon and at least 3 ft. beyond the fencing.

FIGURE 1

POTENTIAL MEASUREMENTS OF METALLIC FOREIGN STRUCTURES VOLTAGE MEASUREMENT DATA SHEET

Data Sheet – Project No. _____

Date	Time	Location	Pipe-Ground Voltage	Other	Comments

FIGURE 2

PROCEDURE - POTENTIAL MEASUREMENTS OF PIPE

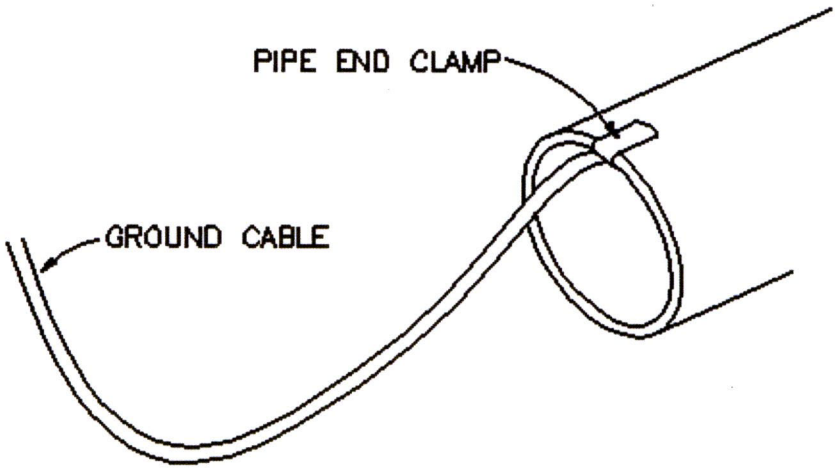

FIGURE 3

PROCEDURE - CONNECTING & DISCONNECTING GROUNDING FACILITIES

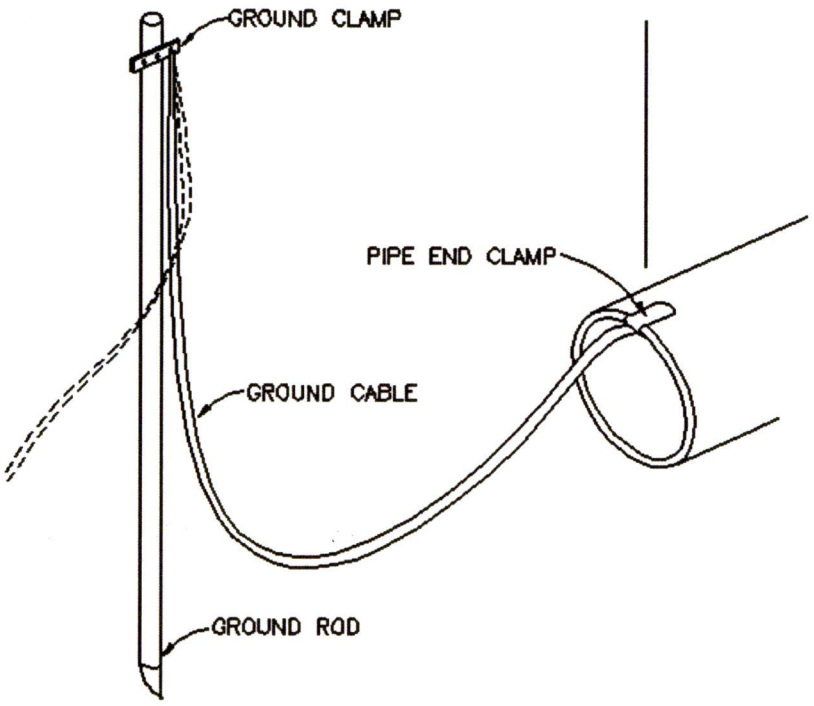

FIGURE 4

PROCEDURE - BONDING & PIPING AT TIE-INS & CUTOUTS

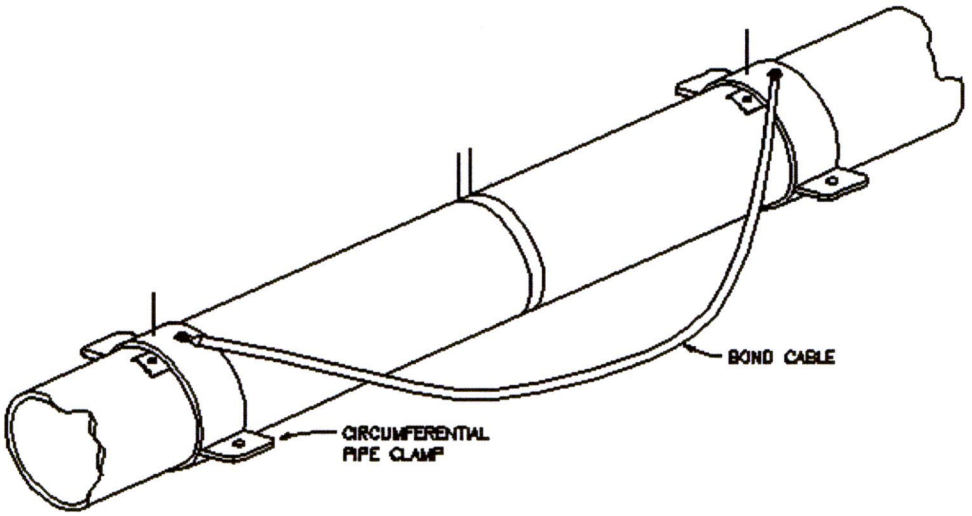

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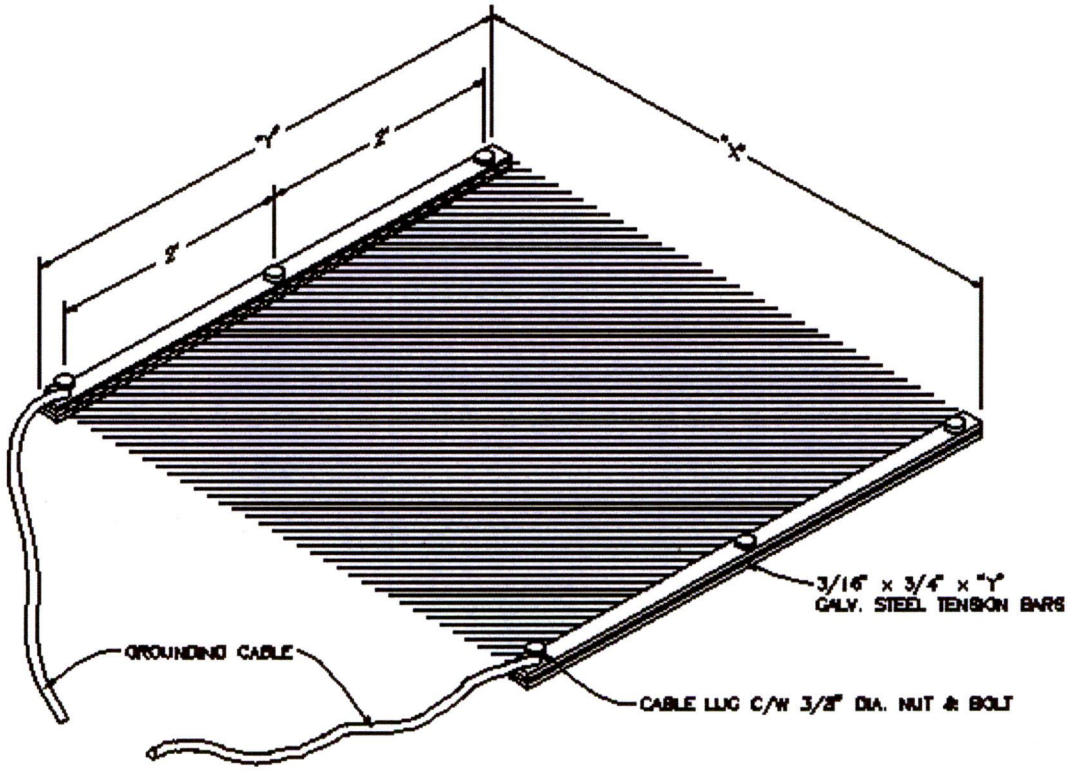
FIGURE 5

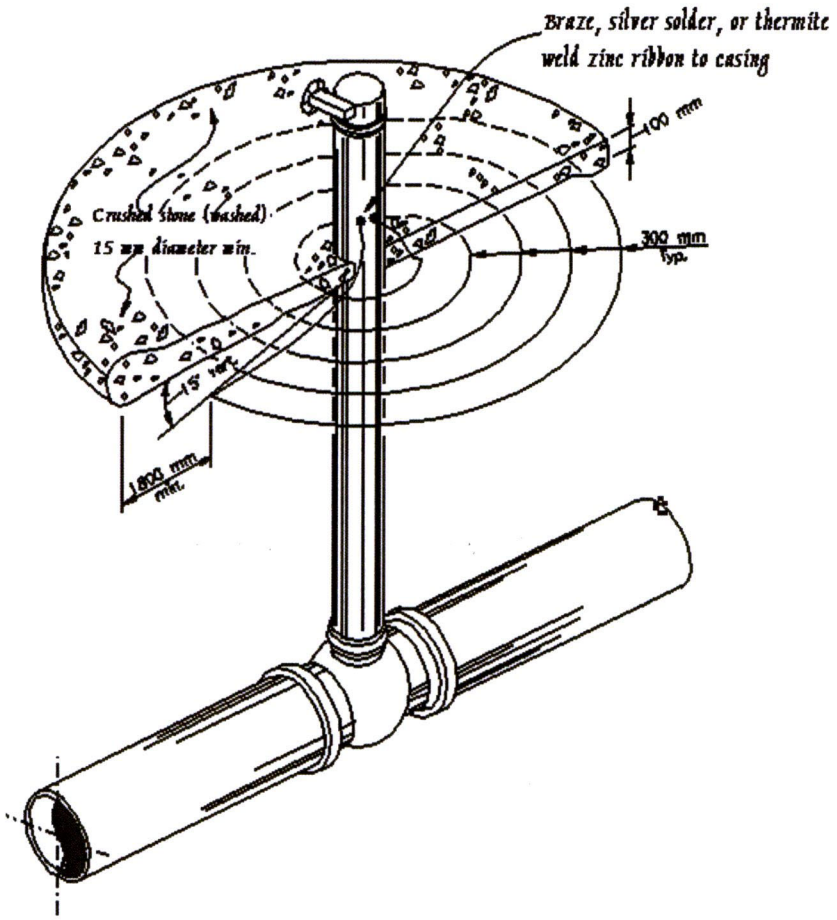
PROCEDURE - TEMPORARY GRADIENT CONTROL MATS



NOTE: "X" & "Y" DIMENSIONS MUST BE SUCH THAT MAT EXTENDS A MINIMUM OF 3 FEET BEYOND WORK AREA.

FIGURE 6

PROCEDURE – TEMPORARY GRADIENT CONTROL MAT AT VALVE



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ACTIVETY		Day -1	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Day 15	Day 16	Day 17	Day 18	Day 19	DAY 20+
		Pre-construction		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Day 1 remobilization #2	Day2 - remobilization #2	Day 3 - remobilization #2	As-Built
		Protect welders & weld qualification; survey to lay out construction area, stake entrance and exit locations, extra work space and temporary access to right of way; survey pile prep; The work space on both ends of the drill will require additional temporary work space and access negotiated prior to the mobilization of the drilling rig.		Mobilize HDD rig, set up rig, excavate bore pit; bore down hill; excavate breaking pit; begin exposing existing 8" pipe for removal	Receive and begin stringing 8" plain fr pull back area; Begin exposing existing 8" pipe for removal; Begin drilling; begin welding	continue drilling and continue welding; removal of existing 8"	continue drilling and finish welding; removal of existing 8"; mobilize X-ray	Bore drilling continues; continue x-ray/drilling complete excavation of existing 8", weld and caps with 2" steel grout 8" abandoned under Decker Road.	Bore drilling continues, finish x-ray (ultra), set tie -ins, hydrotest, perform 4 hr. hydrotest	OFF	Bore drilling completed; begin and complete pull back; haul drilling fluid from pits to railroad construction off and geo-waste disposal site approximately 40 miles away.	Demob Rig; fabricate tie-in bends; prepare for tie-in; in place hydrotest	8 hour hydrotest; as-built survey	make the tie-in x-ray back fill and compact excavation; complete as-built survey; joint coating	repair damages to parking lot and/or driveway	repair damages to parking lot and/or driveway	repair damages to parking lot and or driveway	OFF	repair damages to parking lot and or driveway	DEMOB	pipe removal of pipe under I-27 of Dicker Road; expose pipe, cut in 20' lengths, load on flat bed trailer haul from site	pipe removal of pipe under I-27 of Dicker Road; expose pipe, cut in 20' lengths, load on flat bed trailer haul from site	pipe removal of pipe under I-27 of Dicker Road; expose pipe, cut in 20' lengths, load on flat bed trailer haul from site	Update pipeline records for the as-built.		

April 13, 2018

Re: 17MH033- 8in Natural Gas PL located in McAllen, TX.

Attn: Mark Gerding

Strike, LLC is pleased to present our Estimate on the above referenced projects.

Listed Below Are The Items Included in the Estimate:

- String, weld and install 500ft of 8" PL section by HDD method.
- Sandblast and coat welds with power-crete.
- 4hr pre-test above ground and 8hr post Hydro-test after HDD is installed.
- Transition and tie-in to existing PL.
- Install end caps and abandon in place existing 8" PL under Dicker RD.

Listed below are the work clarifications:

- Estimate is based on working up to10 hour days, 6 days per week.
- Estimate is based on company providing all pipe/fittings and delivery of material to jobsite.
- Estimate is based on hydro-test water hauled off-site.
- Estimate is based coating welds with power-crete.
- Estimate is based on 2 days of Hydro-vac.
- Estimate **does not include** any rock excavation, rock bore, padding or wireline for bore.
- Estimate **does not include** any trench boxes.
- Estimate **does not include** any production delays caused by uncontrollable circumstances.
- Estimate **does not include** any removal or disposal of ACM.
- Estimate **does not include** any X-ray.
- Estimate **does not include** state or local tax and or permits.

Strike LLC's Estimate for this Project: **$392,572.00**
Estimated schedule to complete: 10-12days

We appreciate the opportunity to submit this Estimate and look forward to working with M&H Energy Services in the future. If you should have any questions or should require additional information, please do not hesitate to call me at (832)-794-8048.

Sincerely,
Juan Salinas, E.I.T
Project Manager

Schedule of Labor Rates

Classification	Standard Time Hourly Rate	Overtime Hourly Rate
General Management & Safety & Quality Control Personnel		
Senior Project Manager	$ 98.53	$ 141.83
Project Manager	$ 83.70	$ 119.78
QA/QC Manager	$ 95.56	$ 137.06
QA/QC Specialist	$ 68.87	$ 97.48
Safety Manager	$ 77.76	$ 110.68
Safety Specialist	$ 68.87	$ 97.48
Construction Manager	$ 95.56	$ 137.42
Program Management & Administrative		
Program Specialist	$ 41.62	$ 57.24
Program Coordinator	$ 52.32	$ 73.14
Sr. Program Coordinator	$ 73.71	$ 104.94
Assistant Program Manager	$ 87.98	$ 126.14
Program Manager	$ 98.67	$ 142.04
Sr. Program Manager	$ 134.33	$ 195.05
Technical Consultants & Engineering		
Technical Consultant I	$ 55.89	$ 78.44
Technical Consultant II	$ 73.71	$ 104.94
Technical Consultant III	$ 87.98	$ 126.14
Engineering Specialist I	$ 63.02	$ 89.04
Engineering Specialist II	$ 98.67	$ 142.04
Project Engineer	$ 116.50	$ 168.54
Sr. Project Engineer	$ 134.33	$ 195.05
Drafting & Mapping & Design		
Design Manager	$ 116.51	$ 168.55
Designer - A	$ 95.56	$ 137.42
Designer - B	$ 80.73	$ 115.37
Draftsman - A	$ 71.83	$ 102.14
Draftsman - B	$ 59.97	$ 84.50
Project Controls & Scheduling		
Project Controls Specialist	$ 61.45	$ 86.49
Project Controls Manager	$ 71.83	$ 101.88
Project Admin Support Specialist	$ 33.27	$ 44.81
Project Coordinator	$ 61.45	$ 86.71
Cost Controller	$ 63.02	$ 89.04
Sr. Cost Controller	$ 80.85	$ 115.54
Planner / Scheduler	$ 61.45	$ 86.49
Scheduling Manager	$ 68.87	$ 97.48
Procurement		
Procurement Clerk	$ 34.49	$ 46.64
Buyer / Expeditor	$ 61.45	$ 86.49
Program Procurement Coordinator	$ 63.02	$ 89.04
Field Receiving / Handling Specialist	$ 46.62	$ 64.50
Project Field Materials Coordinator	$ 63.02	$ 89.04
Procurement Manager	$ 68.87	$ 97.48
Document Control		
Document Control Specialist	$ 42.17	$ 57.91
Document Control Manager	$ 73.71	$ 104.94

Continued on next page

I. LABOR

A. Overtime for the staff designated with an * will be charged at 1.35 times the regular rates listed below. Overtime is defined as all time in excess of 40 hours per week. Time charged will include travel time to and from job site.

B. This rate schedule is for the continental United States only. Pricing outside the United States must be requested through your M&H Project Manager.

C. For work outside the M&H office, a minimum of four (4) hours will be billed.

D. Rates will be billed at double time for Thanksgiving, Christmas and New Year's Day

E. Offshore work will be billed at twelve (12) hours per day minimum.

F. Rates and terms in project specific proposals take precedence over standard M&H rates

G. M&H reserves the right to add lump sum Certificate Issuance/Accreditation Fees for selected audits as specified in project specific proposals

Principals

Partner	**$ 287/hr**
Senior Principal Consultant	**$ 263/hr**
Principal Consultant	**$ 221/hr**
Associate Principal Consultant	**$ 193/hr**
Senior Technical Director	**$ 194/hr**
Technical Director	**$ 183/hr**
Senior Project Director	**$ 181/hr**
Project Director	**$ 168/hr**
Senior Project Manager	**$ 155/hr**
Project Manager	**$ 144/hr**
Senior Project Engineer	**$ 132/hr**
Project Engineer	**$ 123/hr**
Project Coordinator 1	**$ 114/hr**
Project Coordinator 2	**$ 105/hr**

Engineering Department

Senior Specialist Engineering Consultant.....	$ 168/hr
Specialist Engineering Consultant.....	$ 153/hr
Senior Lead Engineering Consultant.....	$ 142/hr
Lead Engineering Consultant.....	$ 130/hr
Engineering Consultant 1.....	$ 119/hr
Engineering Consultant 2.....	$ 109/hr
Engineering Consultant 3.....	$ 103/hr
Engineering Consultant 4.....	$ 91/hr
Graduate Engineering Consultant.....	$ 84/hr
Engineering Technician.....	$ 74/hr
Design Supervisor	$ 160/hr*
Senior Designer.....	$ 155/hr*
Designer 1	$ 153/hr*
Designer 2.....	$ 144/hr*
Designer 3.....	$ 131/hr*
Designer 4.....	$ 121/hr*
CAD Operator 1	$ 95/hr*
CAD Operator 2	$ 86/hr*
CAD Operator 3	$ 79/hr*
CAD Operator 4	$ 74/hr*
Senior Construction Specialist.....	$ 97/hr
Construction Specialist 1	$ 92/hr
Construction Specialist 2.....	$ 86/hr
Construction Specialist 3.....	$ 80/hr

Plant Services Department

Discipline Manager	$ 179/hr
Account Manager	$ 142/hr
Project Lead	$ 134/hr
O&M Services Consultant/Specialist	$ 160/hr
Senior Technical Writer	$ 132/hr
Technical Writer 1	$ 116/hr
Technical Writer 2	$ 92/hr
Technical Writer 3	$ 85/hr
Senior Technical Editor	$ 116/hr
Senior Editor	$ 105/hr
Editor 1	$ 93/hr
Editor 2	$ 79/hr
Editor 3	$ 75/hr
Senior Data Analyst	$ 100/hr*
Data Analyst 1	$ 90/hr*
Data Analyst 2	$ 80/hr*
Data Analyst 3	$ 65/hr*
Data Analyst 4	$ 55/hr*
Associate Data Analyst	$ 62/hr*
Senior EAM Specialist	$ 151/hr
EAM Specialist 1	$ 145/hr
EAM Specialist 2	$ 140/hr
EAM Specialist 3	$ 130/hr

EAM Training Specialist	$ 138/hr
Senior EAM Technician	$ 125/hr
Senior EAM Technician 1	$ 110/hr
Senior EAM Technician 2	$ 95/hr
Senior EAM Technician 3	$ 80/hr
Discipline Specialist (XOM)	$ 114/hr
Senior Reliability Specialist	$ 184/hr
Senior Reliability Specialist 1	$ 170/hr
Senior Reliability Specialist 2	$ 155/hr
Plant/Pipeline Planner/Scheduler 1	$ 148/hr
Plant/Pipeline Planner/Scheduler 2	$ 110/hr

Compliance Department

Senior Regulatory Specialist	$ 163/hr
Lead Regulatory Specialist	$ 152/hr
Regulatory Specialist	$ 134/hr
Associate Regulatory Specialist	$ 119/hr
PHA Facilitator 1	$ 163/hr
PHA Facilitator 2	$ 141/hr
PHA Facilitator 3	$ 117/hr
PHA Scribe/Documentation Specialist	$ 91/hr
Audit Director	$ 166/hr
Audit Manager	$ 148/hr
Auditor	$ 148/hr

Audit Documentation Specialist	$ 64/hr*

IT & Systems Department

IT Project Manager	$ 187/hr
Senior IT Consultant	$ 187/hr
DBA/EDMS/BPM/VB.net Developer	$ 182/hr
IT Consultant	$ 154/hr
IT Analyst	$ 105/hr
Planner/Scheduler 1	$ 131/hr
Planner/Scheduler 2	$ 93/hr

Administrative & Support Services

Purchasing Manager	$ 149/hr
Senior Purchasing Agent	$ 126/hr
Purchasing Agent 1	$ 118/hr
Purchasing Agent 2	$ 105/hr
Purchasing Agent 3	$ 97/hr
Senior Documentation Specialist	$ 104/hr*
Documentation Specialist 1	$ 88/hr*
Documentation Specialist 2	$ 76/hr*
Documentation Specialist 3	$ 64/hr*
Senior Project Administrator	$ 107/hr*
Project Administrator 1	$ 98/hr*
Project Administrator 2	$ 87/hr*
Project Administrator 3	$ 75/hr*

Project Administrator 4	**$ 55/hr***
Project Controls Manager	**$ 121/hr**
Senior Project Controls Coordinator	**$ 108/hr**
Project Controls Coordinator 1	**$ 100/hr**
Project Controls Coordinator 2	**$ 91/hr**
Project Controls Coordinator 3	**$ 76/hr**
Project Controls Coordinator 4	**$ 61/hr**

II. EXPENSES

A. Miscellaneous Expenses

The following expenses are covered in the rate schedule above.

1. IT equipment and support
2. Computers and standard software

B. Travel Expenses

1. Out-of-pocket expenses for travel, accommodation, meals, and long distance telephone calls will be charged at cost plus 10%. Expenses charged will be documented.
2. For employees traveling or working outside the US, a minimum of twelve (12) hours per calendar day will be billed.
3. A mileage charge of $0.79 will apply to the use of personal/company automobile for customers' business.

C. Specialty Computer Software

1. Outside computer services and software will be billed at cost plus 10%.

2. In-house specialty computer software will be billed at an hourly use rate inclusive of all equipment, software, hardware and printing.

3. Hourly rates for computer software shall be as follows:

a)	SACS	$ 25.00/hr
b)	Neo-Tech	$ 40.00/hr
c)	FlareNet	$ 25.00/hr
d)	Trace	$ 25.00/hr
e)	HYSIS/HYSIM	$ 35.00/hr
f)	ProMax	$ 35.00/hr
g)	AutoCad	$ 12.00/hr
h)	Blue Sky	$ 15.00/hr
i)	Caesar II	$ 22.00/hr

D. Third Party Services

1. Outside services (reproduction, courier, custom supplies, Fed Ex, etc) will be billed at cost plus 10%.

2. Third party technical services will be billed at cost plus 10%.

E. Printing

1. 8.5" x 11" Color $ .70/ea, B/W $ .15/ea
2. 11" x 17" Color $ 2.00/ea, B/W $ .20/ea
3. 22" x 34" Color $ 48.00/ea, B/W $ 5.00/ea
4. 24" x 36" Color $ 48.00/ea, B/W $ 5.00/ea

III. INVOICING

1. Invoices will be submitted on a monthly basis.
2. Invoice payments are due net 30 days from the date of the invoice unless otherwise specified.
3. All charges for services and expenses will be summarized on the invoice.

ATTACHMENT B

Attachment "B"

Utility Accounting Method

[X] **Actual Cost Method of Accounting**

The utility accumulates cost under a work order accounting procedure prescribed by the Federal or State regulatory body; and
The utility proposes to request reimbursement for actual direct and related indirect costs,

[ ] **Lump Sum Method of Accounting**

Utility proposed to request reimbursement based on an agreed lump sum amount supported by detailed cost analysis.

[ ] **Alternative Method of Accounting**

The utility accumulates costs under an accounting procedure developed by the utility and approved by the State; and,
The utility proposes to request reimbursement for actual direct and indirect costs; and
The utility owner is a municipality

Initials: _____ Date: 01/17/19

ATTACHMENT C

ATTACHMENT "C"

(Utility Schedule of Work and Estimated Date of Completion)

Company Name: Lonestar Pipeline Company, LLC

U-Number: U15219

Start Date: 03/01/2019

Duration: 40 (Working days)

Estimated Completion Date: 05/31/2019

Initials: _____ Date: 01/17/19

ATTACHMENT D

STATEMENT COVERING UTILITY CONSTRUCTION CONTRACT WORK
(AS APPEARING IN ESTIMATE)

U-Number: 15219

ROW CSJ Number: 0921-02-370 District: PHARR

County: HIDALGO Highway No.: Dicker Road

Federal Project No.:

I, Mark S. Gerding, a duly authorized and qualified representative of Lonestar Pipeline Company, LLC, hereinafter referred to as **Owner**, am fully cognizant of the facts and make the following statements in respect to work which will or may be done on a contract basis as it appears in the estimate to which this statement is attached.

It is more economical and/or expedient for **Owner** to contract this adjustment, or **Owner** is not adequately staffed or equipped to perform the necessary work on this project with its own forces to the extent as indicate on the estimate.

Procedure to be Used in Contracting Work

☐ A. Solicitation for bids is to be accomplished through open advertising and contract is to be awarded to the lowest qualified bidder who submits a proposal in conformity with the requirements and specifications for the work to be performed. Associated bid tabulations will be provided to the **State**.

☒ B. Solicitation for bids is to be accomplished by circulating to a list of pre-qualified contractors or known qualified contractors and such contract is to be awarded to the lowest qualified bidder who submits a proposal in conformity with the requirements and specifications for the work to be performed. Associated bid tabulations will be provided to the **State**. Such presently known contractors are listed below:

1. Driver Pipeline Company
2. Strike Construction LLC
3. Holloman Corporation
4. Troy Construction
5.

☐ C. The work is to be performed under an existing continuing contract under which certain work is regularly performed for **Owner** and under which the lowest available costs are developed. A copy of the existing contract will be provided to the **State**. If only part of the contract work is to be done under an existing contract, give detailed information by attachment hereto.

☐ D The utility proposes to contract outside the foregoing requirements and therefore evidence in support of its proposal is attached to the estimate in order to obtain the concurrence of the State, and the Federal Highway Administration Division Engineer where applicable, prior to taking action thereon (approval of the agreement shall be considered as approval of such proposal).

☐ E. The utility plans and specifications, with the consent of the State, will be included in the construction contract awarded by the State. In the best interest of both the **State** and the **Owner**, the **Owner** requests the **State** to include the plans and specifications for this work in the general contract for construction of Highway _____ in this area, so that the work can be coordinated with the other construction operations; and the construction contract is to be awarded by the **State** to the lowest qualified bidder who submits a proposal in conformity with the requirements and specifications for the work to be performed. If this option is chosen, attach form ROW-U-48-1, the terms of which are incorporated herein by reference.

Signature

01/17/19
Date

Pipeline Director - Consultant
Title

U48

ATTACHMENT E

Form ROW-U-1A
Rev. 3/2004
Replaces Form D-15-U1
GSD-EPC

AFFIDAVIT

(for Utility Owner)

U-No.

THE STATE OF NEW JERSEY	§	District:
	§	County:
COUNTY OF MERCER	§	Federal Project No.:
		ROW CSJ No.:
		Highway No.:
		(To be filled in by State)

BEFORE ME, THE UNDERSIGNED AUTHORITY, on this day personally appeared William Lee Davis of Lonestar Pipeline Company, LLC, ("Utility"), who after being by me duly sworn upon his oath deposes and says as follows:

"I, William Lee Davis am over the age of 18 years and am fully competent to testify to the matters set forth in this Affidavit. I have personal knowledge of all facts and swear that such facts are true and correct.

1. I am the CEO for Lonestar Pipeline Company, LLC ("Lonestar"). Effective August 7, 2014, Lonestar purchased a pipeline with associated easements from Mission Pipeline LLC, including the easements listed below and attached hereto as Exhibit A to this Affidavit:

a) That certain Agreed Judgment dated January 11, 1958 between Texas Eastern Transmission Corporation and F. A. Theser et al, which is recorded in Volume 882, Page 184, Deed Records, Hidalgo County, Texas;

b) That certain Easement between John G. and Margaret Olive Noser and Texas Eastern Transmission Corporation, which is recorded in Volume 873, Page 344, Deed Records, Hidalgo County, Texas; and

c) That certain easement between Frank A. and M. Irma Jones and Texas Eastern Transmission Corporation dated October 31, 1956, which is recorded as Document 20444 in the Deed Records, Hidalgo County, Texas.

(Collectively, the "Easements")

2. Attached hereto as Exhibit B to this affidavit is a plat of Hidalgo County's Dicker Road project, which denotes the ownership of the Lonestar Easement and pipeline. I have reviewed and am familiar with this plat.

3. Lonestar has been in continuous ownership and possession of the pipeline and Easements since taking title to the same on August 7, 2014.

Further affiant sayeth not."

William Lee Davis
Signature

William Lee Davis, CEO
Printed Name, Title

Lonestar Pipeline Company, LLC
Company

Corporate Acknowledgment

State of New Jersey
County of Mercer

This instrument was acknowledged before me on May 30, 2018, by **William Lee Davis**, the CEO of Lonestar Pipeline Company, LLC, a Delaware Limited Liability Company, on behalf of said Limited Liability Company.

Liana Buccino
Notary Public's Signature

LIANA BUCCINO
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires 1/29/2023

Exhibit A to Affidavit

Investar Pipeline 50' Easement

2899

CAUSE NO. CL-1550

TEXAS EASTERN TRANSMISSION CORPORATION Petitioner	I	IN THE COUNTY COURT AT LAW
VS.	I	OF
F. A. THESER, ET AL Respondents	I	HIDALGO COUNTY, TEXAS

AGREED JUDGMENT

BE IT REMEMBERED that on this the 11th day of JANUARY ~~December~~, A.D. 195~~9~~, in the above entitled and numbered cause, came the Petitioner, Texas Eastern Transmission Corporation, by and through its attorneys of record, Stafford, Atlas & Spilman, of McAllen, Texas, and came the Respondents, F. A. Theser and wife, Grace Theser; Mike Theser and wife, Theresa Theser; and John Theser, a single man, by and through their attorneys of record, Kelley, Looney, McLean and Littleton, of Edinburg, Texas, whereupon the parties announced to the Court that they had fully settled and compromised all matters and issues in dispute in this cause and agreed to the entry of the following judgment.

It appearing to the Court that this Court has jurisdiction over the parties and the subject matter of this cause and that all proceedings necessary to invest this Court with jurisdiction over the subject matter and parties to this cause, as said subject matter is described in Petitioner's Statement in Writing heretofore filed in this cause, have been instituted, maintained and complied with as required by law to invest this Court with jurisdiction over the subject matter and the parties to this cause; and that the Respondents, F. A. Theser and wife, Grace Theser; Mike Theser and wife, Theresa Theser; and John Theser, a single man, are the owners of the hereinafter described land; and that it is necessary that

882/184 DH

Petitioner acquire, take, hold and enjoy a fifty foot wide right-of-way and easement in and across property owned by Respondents, whereunder Petitioner may construct, operate and maintain a pipeline and appurtenances for the transportation of natural gas over and through said lands owned by Respondents in Hidalgo County, Texas, which said fifty foot strip of land and right-of-way is hereinafter described as follows, to-wit:

> A Right-of-Way through a tract of land owned by F. A. Theser and wife, Grace Theser; Mike Theser and wife, Theresa Theser; and John Theser, a single man, consisting of Lots 5 and 11 and the North Half of Lot 12, Section 3, Hidalgo Canal Company's Subdivision, Porcion 64 and 65, Hidalgo County, Texas; said tract being fully described in deed to John Theser, Mike Theser and Frank Theser, which is recorded in Vol. 473, Page 502, of the Deed Records of said County; said Right-of-Way being temporarily 50 feet in width and being 25 feet in width on each side of a centerline described as follows:
>
> BEGINNING at a Point on the West line, said point being 263 feet Northerly along said line from the Southeast corner of a tract of land in the name of Hidalgo County Drainage District No. 1;
>
> THENCE S 65 degrees 55 minutes E, 2401 feet to a stake;
>
> THENCE S 64 degrees 17 minutes E, 595 feet to a point on the East line, said point being 627 feet Northerly along said line from the Southeast corner of said tract, and containing 3.44 acres of land, more or less.

And it further appearing to the Court that the said Petitioner, Texas Eastern Transmission Corporation, has paid to the Respondents the sum of One-Thousand Eight-Hundred Fifty and no/100 Dollars ($1,850.00) in full settlement of all damages incurred or which might be incurred by Respondents; and it likewise appearing to the Court that Petitioner has paid to the Clerk of this Court all costs of suit herein;

It is by the Court ORDERED, ADJUDGED and DECREED that Petitioner, Texas Eastern Transmission Corporation, recover of and from Respondents, F. A. Theser and wife, Grace Theser; Mike Theser and wife, Theresa Theser; and John Theser, a single man, a fifty foot wide right-of-way and easement over and through land owned and held by Respondents in Hidalgo County, Texas, described as follows, to-wit:

> A Right-of-Way through a tract of land owned by F. A. Theser and wife, Grace Theser; Mike Theser and wife, Theresa Theser; and John Theser, a single man, consisting of Lots 5 and 11 and the North Half of Lot 12, Section 3, Hidalgo Canal Company's Subdivision, Porcion 64 and 65, Hidalgo County, Texas; said tract being fully described in deed to John Theser, Mike Theser and Frank Theser, which is recorded in Vol. 473, Page 502, of the Deed Records of said County; said Right-of-Way being temporarily 50 feet in width and being 25 feet in width on each side of a centerline described as follows:
>
> BEGINNING at a point on the West line, said point being 263 feet Northerly along said line from the Southeast corner of a tract of land in the name of Hidalgo County Drainage District No. 1;
>
> THENCE S 65 degrees 55 minutes E, 2401 feet to a stake;
>
> THENCE S 64 degrees 17 minutes E, 595 feet to a point on the East line, said point being 627 feet Northerly along said line from the Southeast corner of said tract, and containing 3.44 acres of land, more or less;

for the purpose of constructing, inspecting, repairing, operating, maintaining, replacing and removing a gas pipeline, in whole or in part, and the appurtenances thereto, for the transportation of natural gas; that said fifty foot wide easement is reasonable and necessary for said purposes; that said pipeline shall be buried below the surface of the land to a sufficient depth so as not to interfere with the cultivation of the soil, and the surface over the pipeline shall be filled and graded so as to restore its

original level. For which said right-of-way and easement Petitioner Texas Eastern Transmission Corporation, shall have its writ of possession.

It is further the order of this Court that Petitioner, Texas Eastern Transmission Corporation, shall stand fully and finally released and discharged of and from all liabilities to Respondents, and each of them, by reason of this condemnation proceeding and the easement and right-of-way vested in them by the Court.

It is further ordered that upon completion of construction said right-of-way shall become permanently thirty feet in width, being fifteen feet on each side of the centerline of said pipeline as constructed within said fifty foot strip hereinabove described, which said permanent easement contains 2.064 acres, more or less.

SIGNED AND ENTERED, this the 10th day of ~~December~~ JANUARY, A.D. 1958.

Tom L. Hartley
Judge, County Court at Law
Hidalgo County, Texas

APPROVED AND AGREED TO:

KELLEY, LOONEY, McCLEAN & LITTLETON

BY: Jackson Littleton
Attorneys for Respondents, F. A. Theser and wife, Grace Theser; Mike Theser and wife, Theresa Theser; and John Theser, a single man.

STAFFORD, ATLAS & SPILMAN

BY Morris Atlas
Attorneys for Petitioner, Texas Eastern Transmission Corporation

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CAUSE NO. CL-1550

TEXAS EASTERN TRANSMISSION CORPORATION, Petitioner

VS.

F. A. THESER, ET AL, Respondents

IN THE COUNTY COURT AT LAW OF

HIDALGO COUNTY, TEXAS

AGREED JUDGMENT

FILED
4:00 P. M. o'clock
JAN 11 1957
GEO. L. ANDERSON, Clerk
County Court at Law of Hidalgo County, Texas
By [signature] Deputy

Vol 4 - pgs 74 - 78

STAFFORD, ATLAS AND SPILMAN
ATTORNEYS AT LAW
MCALLEN, TEXAS

THE STATE OF TEXAS §
COUNTY OF HIDALGO §

I, GEO. L. ANDERSON, CLERK, of the County Court At Law, Hidalgo County Texas, do hereby certify that the foregoing is a full, true and correct copy of

JUDGEMENT

which was filed in this office on January 11, 1957, and as same appears of record in Volume 4, Pages 74-78 of the Civil Minutes of this County. Cause No. CL-1550, and Styled: TEXAS EASTERN TRANSMISSION CORPORATION vs F. A. THESER ET AL.

GIVEN UNDER MY HAND AND OFFICIAL SEAL, at office in Edinburg, Texas, this the 21st day of February 1957.

GEO. L. ANDERSON, CLERK,
COUNTY COURT AT LAW
HIDALGO COUNTY, TEXAS
BY: [signature] Deputy

Filed for Record on the 21st day of February A. D. 1957 at 11:33 o'clock A. M.
Duly Recorded this the 26th day of February A. D. 1957 at 2:50 o'clock P. M.
Instrument No. 2899
GEO. L. ANDERSON, County Clerk
Hidalgo County, Texas
By [signature] Deputy

FORM 5-17

17481

T-71 &

R/W NO.	T-73
MAP NO.	
W. O. NO.	4516
CHK.	373 07
RODS	159

873-344

STATE OF TEXAS,
County of HIDALGO } ss. KNOW ALL MEN BY THESE PRESENTS

That for and in consideration of ONE HUNDRED FIFTY-NINE AND NO/100 - - - - - - - - - - -
($ 159.00) Dollars to the undersigned (herein styled Grantor, whether one or more), in hand paid, the receipt of which is hereby acknowledged, the said Grantor does hereby Grant, Bargain, Sell, Convey and Warrant unto Texas Eastern Transmission Corporation, a Delaware Corporation (herein styled Grantee), its successors and assigns, a right of way and easement to construct, lay, maintain, operate, alter, repair, re-

move, change the size of, and replace pipe lines and appurtenances thereto (including without limitation Corrosion Control equipment) for the transportation of oil, gas, petroleum products or any other liquids, gases, or substances which can be transported through pipe lines, the Grantee to have the right to select, change, or alter the route under, upon, over and through lands which the undersigned owns or in which the undersigned has an interest, situated in the County of HIDALGO, State of Texas, described as follows:

Lot sixteen (16) in Section Three (3) of Hidalgo Canal Company's Subdivision of Porciones 64, 65 and 66; ALSO, Lot 10 Section 3 of Hidalgo Canal Company's Subdivision of Porciones 64, 65 and 66

more fully described in deed ___ from Paul L. Ford to John G. Noser recorded in Volume 593, Page 191-192-193 Deed Records of said County, to which reference is here made for further description.

By the terms of this agreement, Grantee has the right to lay, construct, maintain, operate, alter, repair, remove, change the size of, and replace at anytime, or from time to time, one or more additional lines of pipe and appurtenances thereto (including without limitation Corrosion Control equipment). Provided, however, that for each additional line laid after the first line is laid hereunder, Grantee shall pay Grantor, his heirs or assigns, one dollar per lineal rod of additional pipe line laid under, upon, over or through said hereinabove described property.

TO HAVE AND TO HOLD unto Grantee, its successors and assigns, with ingress to and egress from the premises, for the purposes herein granted.

The said Grantor is to fully use and enjoy the said premises, except for the purposes granted to the said Grantee and provided the said Grantor shall not construct nor permit to be constructed any house, structures or obstructions on or over, or that will interfere with the construction, maintenance or operation of, any pipe line or appurtenances constructed hereunder, and will not change the grade over such pipe line.

Grantee hereby agrees to bury all pipes to a sufficient depth so as not to interfere with cultivation of soil, and agrees to pay such damages which may arise to growing crops, timber, or fences from the construction, maintenance and operation of said lines.

All payments hereunder may be made direct to the Grantor or to _____, who is hereby appointed agent and authorized to receive and receipt for the same, or, at the option of the Grantee, such payments may be made by depositing the same in _____ Bank, at _____, to the credit of Grantor or said agent.

The Grantor represents that the above described land is rented to No Tenant until _____ 19___.

It is hereby understood that the party securing this grant in behalf of Grantee is without authority to make any covenant or agreement not herein expressed.

WITNESS the execution hereof on this the 9th day of October, 1956.

WITNESSES:

Paul Tungate
Paul Tungate

DOCUMENTARY 55 CENTS 55

John G. Noser
John G. Noser

Margaret Olive Noser
Margaret Olive Noser

STATE OF TEXAS }
County of Hidalgo }

BEFORE ME, the undersigned authority, on this day personally appeared John G. Noser and wife Margaret Olive Noser, both known to me to be the person whose names are subscribed to the foregoing instrument, and acknowledged to me that they executed the same for the purposes and considerations therein expressed, and the said Margaret Olive Noser, wife of the said John G. Noser, having been examined by me privily and apart from her husband and having the same by me fully explained to her, she, the said Margaret Olive Noser acknowledged such instrument to be her act and deed and declared that she had willingly signed the same for the purposes and considerations therein expressed, and that she did not wish to retract it.

GIVEN under my hand and seal of office, this 9 day of Oct, 1956.

H. F. JOHNS
NOTARY PUBLIC, HIDALGO COUNTY, TEXAS
MY COMMISSION EXPIRES JUNE 1, 1957

H. F. Johns
Notary Public in and for Hidalgo County, Texas.

My Commission expires:

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Filed for Record on the 26th day of October A. D. 1956, at 2 30 o'clock P. M.

Duly Recorded this the 29th day of October A. D. 1956, at 8 00 o'clock A. M.

Instrument No. 17481

GEO. L. ANDERSON, County Clerk
Hidalgo County, Texas

By P. McDonald Deputy

20444

7: 7-72
Ck# 38670

THE STATE OF TEXAS §
§
COUNTY OF HIDALGO §

KNOW ALL MEN BY THESE PRESENTS that for and in consideration of the sum of TWENTY-FOUR and NO/100 DOLLARS ($24.00) to the undersigned, (herein styled Grantor, whether one or more), in hand paid, the receipt of which is hereby acknowledged, the said Grantor does hereby Grant, Bargain, Sell, Convey and warrant unto TEXAS EASTERN TRANSMISSION CORPORATION, a Delaware Corporation (herein styled Grantee), its successors and assigns, a right of way and easement to construct, lay, maintain, operate, alter, repair, remove, change the size of, and replace a pipe line and valves thereto (including without limitation Corrosion Control equipment), for the transportation of oil, gas, petroleum products or any other liquids, gases or substances which can be transported through pipe lines over and through lands which the undersigned has an interest in, situated in the County of Hidalgo, State of Texas, described as follows, to-wit:

> All Lot Nine (9), Section Three (3), Hidalgo Canal Company's Subdivision of Porciones 64, 65 and 66 in Hidalgo County, Texas;

the same being a right of way through said property,

> The centerline of said right of way entering said property at a point on the west line, said point being approximately 115 feet northerly along said line from the southwest corner of said property; THENCE S 64° 17' E, 385 feet more or less to a point on the south line of said property, said point being approximately 310 feet easterly along said line from the southwest corner of said property;

said right of way being initially for the purposes of construction, being thirty-seven and one-half (37-1/2) feet on each side of said centerline and after construction, twenty-five (25) feet on each side of said centerline.

The above described lands and premises are more fully described in the deed from I. S. Knops and wife, Bertha P. Knops, to Frank A. Jones and wife, M. Irma Jones, recorded in Vol. 711, p. 49, Deed Records of said County, to which reference is here made for further description.

TO HAVE AND TO HOLD unto Grantee, its successors and assigns, with ingress to and egress from the premises for the purposes herein granted.

The said Grantor is to fully use and enjoy the said premises, except for the purposes granted to the said Grantee and provided the said Grantor shall

not construct nor permit to be constructed any house, structures or obstructions on or over, or that will interfere with the construction, maintenance or operation of any pipe line or appurtenances constructed hereunder, and will not change the grade over such pipe line.

Grantee hereby agrees to bury all pipes to a sufficient depth so as not to interfere with cultivation of soil, and agrees to pay such damages which may arise to growing crops, timber or fences from the construction, maintenance and operation of said lines; and to maintain the backfill over such pipe line at the same level as adjacent lands so as not to interfere with the irrigation thereof.

It is hereby undersgood that the party securing this grant in behalf of Grantee is without authority to make any covenant or agreement not herein expressed.

WITNESS THE EXECUTION HEREOF on this, the 31st day of October, 1956.

Frank A. Jones
Frank A. Jones

M. Irma Jones
M. Irma Jones

THE STATE OF TEXAS §
§
COUNTY OF HIDALGO §

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared Frank A. Jones and M. Irma Jones, his wife, both known to me to be the persons whose names are subscribed to the foregoing instrument, and acknowledged to me that they each executed the same for the purposes and consideration therein expressed, and the said M. Irma Jones, wife of the said Frank A. Jones, having been examined by me privily and apart from her husband, and having the same fully explained to her, she, the said M. Irma Jones, acknowledged such instrument to be her act and deed, and she declared that she had willingly signed the same for the purposes and consideration therein expressed and that she did not wish to retract it.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this, the 31st. day of October, 1956.

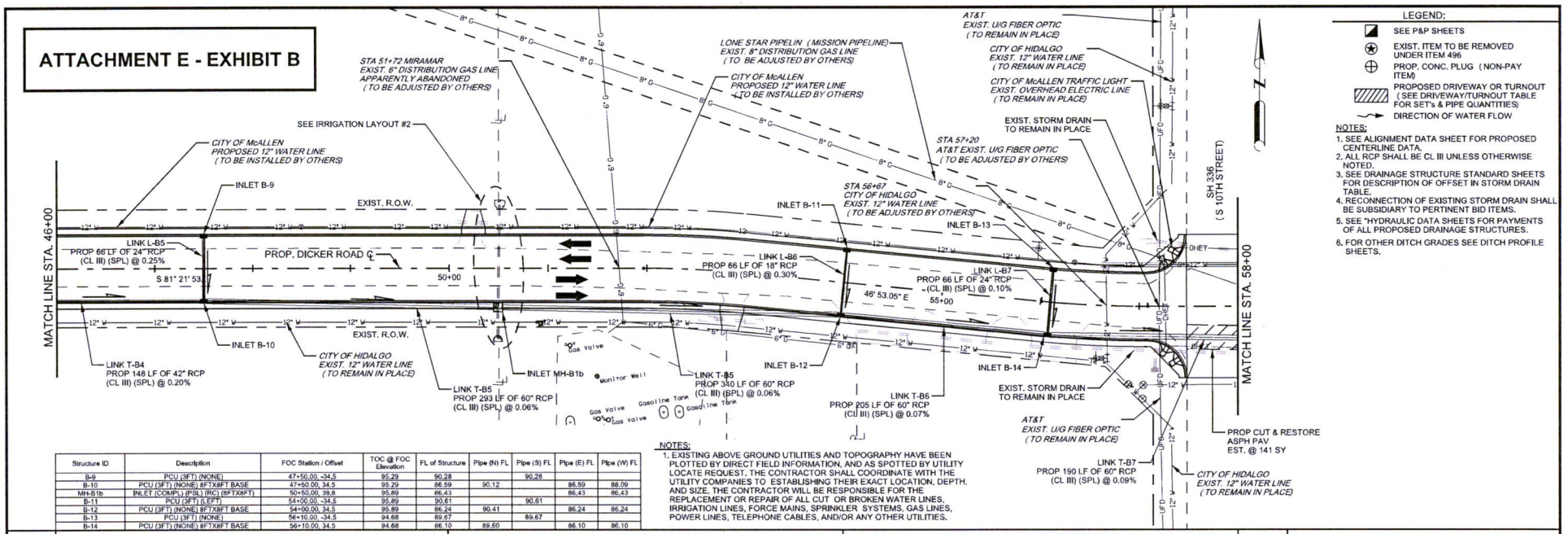
HIDALGO COUNTY TEXAS PUBLIC

FOOTE TOOTHAKER

Notary Public in and for said County and State.

Filed for Record on the 28th day of December A. D. 1956 at 9 45 o'clock A M.
Duly Recorded this the 7th day of January A. D. 1957 at 3 26 o'clock P M.
Instrument No. 20444
GEO. L. ANDERSON, County Clerk
Hidalgo County, Texas
By L. Garcia Deputy

ATTACHMENT E - EXHIBIT B



Structure ID	Description	FOC Station / Offset	TOC @ FOC Elevation	FL of Structure	Pipe (N) FL	Pipe (S) FL	Pipe (E) FL	Pipe (W) FL
B-9	PCU (3FT) (NONE)	47+50.00, -34.5	95.29	90.28		90.28		
B-10	PCU (3FT) (NONE) 8FTX8FT BASE	47+50.00, 34.5	95.29	86.59	90.12		86.59	88.09
MH-B1b	INLET (COMPL) (PSL) (RC) (8FTX8FT)	50+50.00, 39.8	95.89	86.43			86.43	86.43
B-11	PCU (3FT) (LEFT)	54+00.00, -34.5	95.89	90.61		90.61		
B-12	PCU (3FT) (NONE) 8FTX8FT BASE	54+00.00, 34.5	95.89	86.24	90.41		86.24	86.24
B-13	PCU (3FT) (NONE)	56+10.00, -34.5	94.68	89.67		89.67		
B-14	PCU (3FT) (NONE) 8FTX8FT BASE	56+10.00, 34.5	94.68	86.10	89.60		86.10	86.10

NOTES:

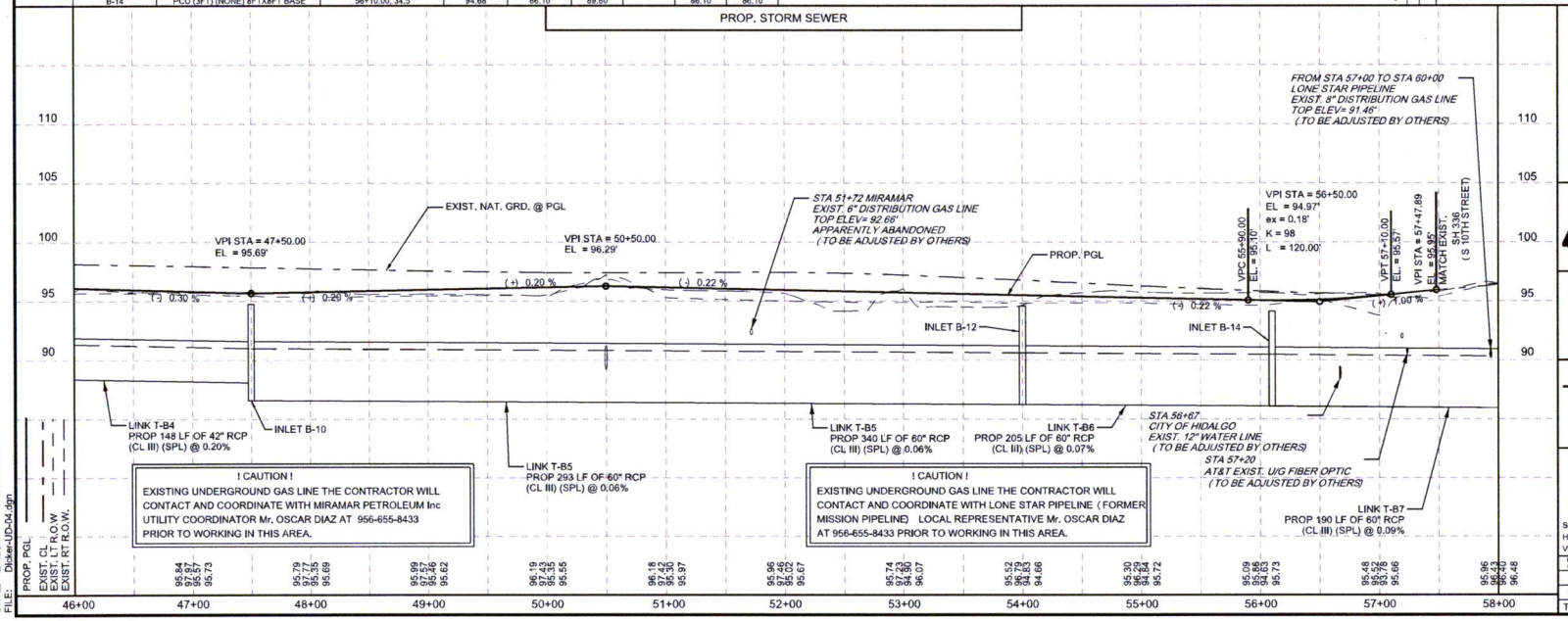
1. EXISTING ABOVE GROUND UTILITIES AND TOPOGRAPHY HAVE BEEN PLOTTED BY DIRECT FIELD INFORMATION, AND AS SPOTTED BY UTILITY LOCATE REQUEST. THE CONTRACTOR SHALL COORDINATE WITH THE UTILITY COMPANIES TO ESTABLISHING THEIR EXACT LOCATION, DEPTH, AND SIZE. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REPLACEMENT OR REPAIR OF ALL CUT OR BROKEN WATER LINES, IRRIGATION LINES, FORCE MAINS, SPRINKLER SYSTEMS, GAS LINES, POWER LINES, TELEPHONE CABLES, AND/OR ANY OTHER UTILITIES.

LEGEND:

- SEE P&P SHEETS
- EXIST. ITEM TO BE REMOVED UNDER ITEM 496
- PROP. CONC. PLUG (NON-PAY ITEM)
- PROPOSED DRIVEWAY OR TURNOUT (SEE DRIVEWAY/TURNOUT TABLE FOR SET's & PIPE QUANTITIES)
- DIRECTION OF WATER FLOW

NOTES:

1. SEE ALIGNMENT DATA SHEET FOR PROPOSED CENTERLINE DATA.
2. ALL RCP SHALL BE CL III UNLESS OTHERWISE NOTED.
3. SEE DRAINAGE STRUCTURE STANDARD SHEETS FOR DESCRIPTION OF OFFSET IN STORM DRAIN TABLE.
4. RECONNECTION OF EXISTING STORM DRAIN SHALL BE SUBSIDIARY TO PERTINENT BID ITEMS.
5. SEE "HYDRAULIC DATA SHEETS FOR PAYMENTS OF ALL PROPOSED DRAINAGE STRUCTURES.
6. FOR OTHER DITCH GRADES SEE DITCH PROFILE SHEETS.



DATE: 2/7/2017 8:51:15 AM
FILE: Dicker-UD-04.dgn

THIS DOCUMENT IS FOR INTERIM REVIEW AND NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES.

ROBERTO FINA CARRAL
P.E. 116857

2/7/2017
DATE

The County of Hidalgo
Pct 2

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Texas Department of Transportation

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TBPE F-1640

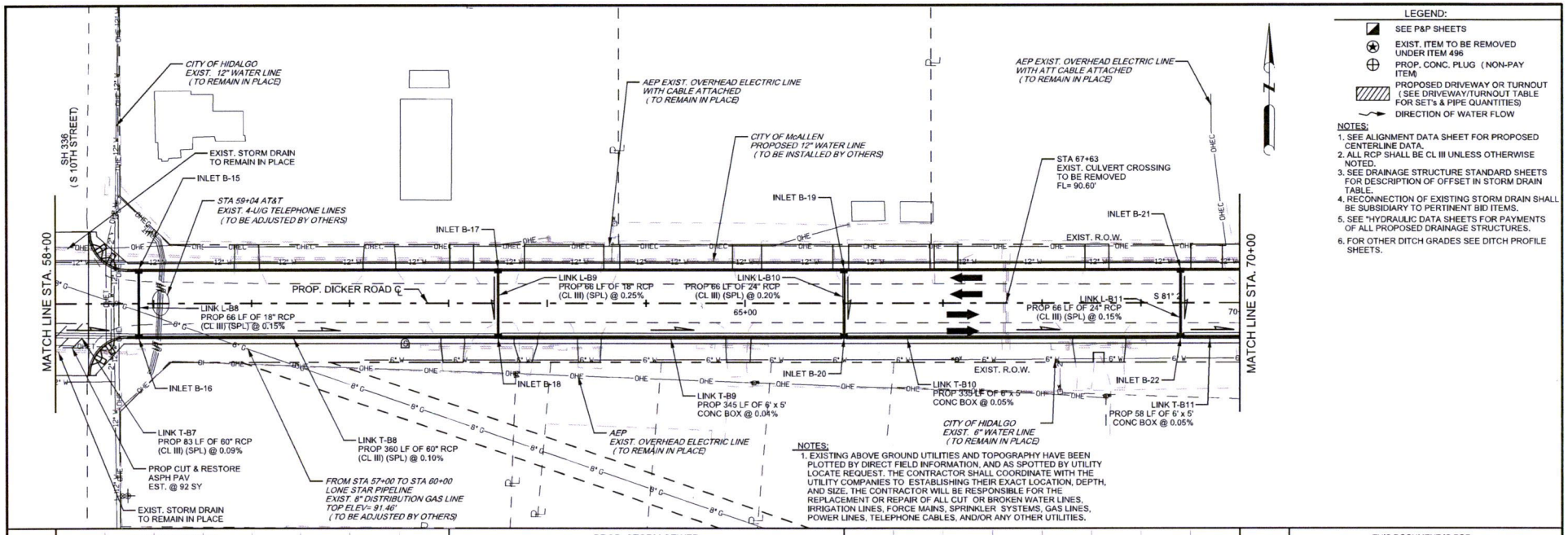
DICKER ROAD
UTILITIES AND DRAINAGE

STA. 46+00 TO STA. 58+00

SCALE:
HOR: 1"= 100'
VER: 1"= 10'

SHEET 4 OF 12

FED. RD DIV. NO.	CONT	SECT	JOB	HIGHWAY
06	0921	02	312	DICKER ROAD
STATE	DIST	COUNTY	PCT	CITY	SHEET NO.
TEXAS	PHR	HIDALGO	No 2	HIDALGO	150



LEGEND:

- SEE P&P SHEETS
- EXIST. ITEM TO BE REMOVED UNDER ITEM 496
- PROP. CONC. PLUG (NON-PAY ITEM)
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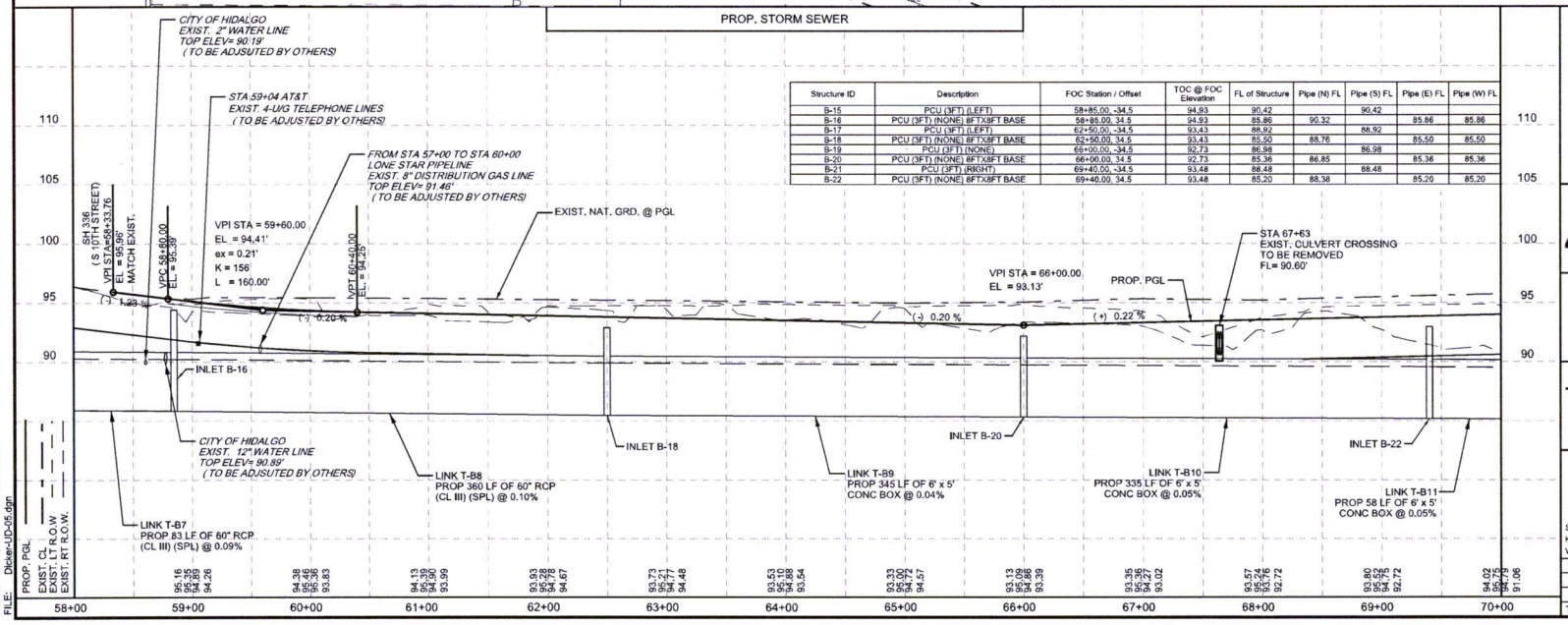

Structure ID	Description	FOC Station / Offset	TOC @ FOC Elevation	FL of Structure	Pipe (N) FL	Pipe (S) FL	Pipe (E) FL	Pipe (W) FL
B-15	PCU (3FT) (LEFT)	58+85.00, -34.5	94.93	90.42		90.42		
B-16	PCU (3FT) (NONE) 8FTX8FT BASE	58+85.00, 34.5	94.93	85.86	90.32		85.86	85.86
B-17	PCU (3FT) (LEFT)	62+50.00, -34.5	93.43	88.92		88.92		
B-18	PCU (3FT) (NONE) 8FTX8FT BASE	62+50.00, 34.5	93.43	85.50	88.76		85.50	85.50
B-19	PCU (3FT) (NONE)	66+00.00, -34.5	92.73	86.98		86.98		
B-20	PCU (3FT) (NONE) 8FTX8FT BASE	66+00.00, 34.5	92.73	85.36	86.85		85.36	85.36
B-21	PCU (3FT) (RIGHT)	69+40.00, -34.5	93.48	88.48		88.48		
B-22	PCU (3FT) (NONE) 8FTX8FT BASE	69+40.00, 34.5	93.48	85.20	88.38		85.20	85.20

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ROBERTO FINA CARRAL
P.E. 116857

2/7/2017
DATE

The County of Hidalgo
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DICKER ROAD
UTILITIES AND DRAINAGE

STA. 58+00 TO STA. 70+00

SCALE:
HOR: 1"= 100'
VER: 1"= 10'

SHEET 5 OF 12

FED. RD DIV. NO	CONT	SECT	JOB	HIGHWAY	
06	0921	02	312	DICKER ROAD	
STATE	DIST	COUNTY	PCT	CITY	SHEET NO.
TEXAS	PHR	HIDALGO	No 2	HIDALGO	151

DATE: 2/7/2017 8:51:16 AM
FILE: Dicker-L0-05.dgn

ATTACHMENT F

Eligibility Ratio-Sheet
Showing Calculation

ATTACHMENT "F"

Eligibility Ratio

Lonestar Pipeline Company, LLC._____ (Initials) determined that the Eligibility Ratio according to their calculation for reimbursement is 100%, as indicated on this attachment.

Calculation of Ratio: 580'/580' = 100% Eligibility Ratio

Additional comments.

Notation: Lonestar Pipeline Company, LLC. will adjust existing gas systems within ROW due to Dicker Road Improvements per minimum TAC utility relocations/adjustments requirements pursuing applicable compensability measures due to a Right of Way Easement under VOL 1054 PG 117-119.

Private Easement = 580

Public ROW = 0'

Total 580

Initial

1/17/19

Date

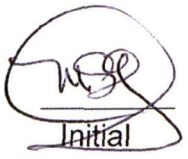
ATTACHMENT G

Betterment Calculation and Estimates

ATTACHMENT "G"

Betterment Calculation and Estimates:

There are no betterments within this utility adjustment. This shall be a replacement in-kind.



1/17/19
Date

ATTACHMENT H

ATTACHMENT "H"

No Quit Claim Deed Statement:

There will not be a quitclaim on any tract or parcel of land on this utility adjustment.

Initial

1/17/19

Date